TIA Toolbox Documentation

Release 1.5.1

TIA Lab

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CONTENTS

GETTING STARTED

TIAToolbox is a computational pathology toolbox developed by TIA Centre that provides an end-to-end API for pathology image analysis using best practices. It is based on **PyTorch**, a popular deep learning framework that enables efficient and flexible implementation of state-of-the-art algorithms. TIAToolbox supports many features through a command-line interface and can integrate with standard PyTorch modules. It also offers tools for data loading, pre-processing, model inference, post-processing, and visualization. Whether you are a computational, biomedical, or clinical researcher, TIAToolbox can help you get started in digital pathology with minimal effort.

1.1 All Users

This package is for those interested in digital pathology: including graduate students, medical staff, members of the TIA Centre and of PathLAKE, and anyone, anywhere, who may find it useful. We will continue to improve this package, taking account of developments in pathology, microscopy, computing and related disciplines. Please send comments and criticisms to **tia@dcs.warwick.ac.uk**.

tiatoolbox is a multipurpose name that we use for 1) a certain computer program, 2) a Python package of related programs, created by us at the TIA Centre to help people get started in Digital Pathology, 3) this repository, 4) a certain virtual environment.

1.2 Developers

Anyone wanting to contribute to this repository, please first look at our Wiki and at our web page for contributors. See also the *Prepare for development* section of this document.

1.3 Links, if needed

The bash shell is available on all commonly encountered platforms. Commands in this README are in bash. Windows users can use the command prompt to install conda and python packages.

conda is a management system for software packages and virtual environments. To get conda, download Anaconda, which includes hundreds of the most useful Python packages, using 2GB disk space. Alternatively, miniconda uses 400MB, and packages can be added as needed.

GitHub is powered by the version control system git, which has many users and uses. In GitHub, it is used to track versions of code and other documents.

1.4 Examples Taster

1. Click here for jupyter notebooks, hosted on the web, with demos of `tiatoolbox`. All necessary resources to run the notebooks are remotely provided, so you don't need to have Python installed on your computer.

2. Click on a filename with suffix `.ipynb` and the notebook will open in your browser.

3. Click on one of the two blue checkboxes in your browser window labelled either **Open in Colab** or **Open in Kaggle**: colab and kaggle are websites providing free-of-charge platforms for running jupyter notebooks.

4. Operate the notebook in your browser, editing, inserting or deleting cells as desired.

5. Changes you make to the notebook will last no longer than your colab or kaggle session.

1.5 Install Python package

If you wish to use our programs, perhaps without developing them further, run the command `pip install tiatoolbox` or `pip install --ignore-installed --upgrade tiatoolbox` to upgrade from an existing installation. Detailed installation instructions can be found in the documentation.

To understand better how the programs work, study the jupyter notebooks referred to under the heading **Examples Taster**.

1.6 Command Line

tiatoolbox supports various features through command line. For more information, please try `tiatoolbox --help`

1.7 Prepare for development

Prepare a computer as a convenient platform for further development of the Python package `tiatoolbox` and related programs as follows.

1. Install pre-requisite software

2. Open a terminal window

```
$ cd <future-home-of-tiatoolbox-directory>
```

3. Download a complete copy of the `tiatoolbox`.

```
$ git clone https://github.com/TissueImageAnalytics/tiatoolbox.git
```

4. Change directory to `tiatoolbox`

```
$ cd tiatoolbox
```

5. Create virtual environment for TIAToolbox using

```
$ conda create -n tiatoolbox-dev python=3.9 # select version of your choice
$ conda activate tiatoolbox-dev
$ pip install -r requirements/requirements_dev.txt
```

or

```
    $ conda env create -f requirements/requirements.dev.conda.yml # for linux/mac↵
↪only.
    $ conda activate tiatoolbox-dev
```

6. To use the packages installed in the environment, run the command:

```
    $ conda activate tiatoolbox-dev
```

1.8 License

The source code TIA Toolbox (tiatoolbox) as hosted on GitHub is released under the BSD-3-Clause license. The full text of the licence is included in LICENSE.

Models weights are dependent on the datasets that they were trained on. Please refer to the documentation for more details.

1.9 Cite this repository

If you find TIAToolbox useful or use it in your research, please consider citing our paper:

```
@article{
    Pocock2022,
    author = {Pocock, Johnathan and Graham, Simon and Vu, Quoc Dang and Jahanifar,↵
↪Mostafa and Deshpande, Srijay and Hadjigeorghiou, Giorgos and Shephard, Adam and↵
↪Bashir, Raja Muhammad Saad and Bilal, Mohsin and Lu, Wenqi and Epstein, David and↵
↪Minhas, Fayyaz and Rajpoot, Nasir M and Raza, Shan E Ahmed},
    doi = {10.1038/s43856-022-00186-5},
    issn = {2730-664X},
    journal = {Communications Medicine},
    month = {sep},
    number = {1},
    pages = {120},
    publisher = {Springer US},
    title = {{TIAToolbox as an end-to-end library for advanced tissue image analytics}↵
↪},
    url = {https://www.nature.com/articles/s43856-022-00186-5},
    volume = {2},
    year = {2022}
}
```

INSTALLATION

2.1 Prerequisites

The prerequisites for tiatoolbox installation are OpenSlide binaries and OpenJpeg version 2.3.0 or above. Please follow the instructions below to install prerequisite software according to the platform you are using.

2.1.1 Linux (Ubuntu)

On Linux the prerequisite software can be installed using the command

```
$ apt-get -y install libopenjp2-7-dev libopenjp2-tools openslide-tools
```

The same command is used when working on the Colab or Kaggle platforms. When working on Google Colab, we remove the packages `datascience` and `albumentations` because they conflict and produce an error message.

2.1.2 Windows (10+)

1. Download OpenSlide binaries from this page. Extract the folder and add `bin` and `lib` subdirectories to Windows system path. If you are using a conda environment you can also copy `bin` and `lib` subdirectories to `[Anaconda Installation Path]/envs/[tiatoolbox-environment]/Library/`.

2. Install OpenJPEG. The easiest way is to install OpenJpeg is through conda using

```
C:\> conda install -c conda-forge openjpeg
```

2.1.3 macOS

On macOS there are two popular package managers, homebrew and macports.

Homebrew

```
$ brew install openjpeg openslide
```

MacPorts

```
$ port install openjpeg openslide
```

2.2 Installing Stable Release

Please note that TIAToolbox is tested for python version 3.9, 3.10, 3.11 and 3.12.

2.2.1 Recommended

To install TIAToolbox, run this command in your terminal after you have installed the prerequisite software:

```
$ pip install tiatoolbox
```

This is the preferred method to install TIA Toolbox, as it will always install the most recent stable release.

2.2.2 Upgrade

To upgrade an existing version of tiatoolbox to the latest stable release, run this command in your terminal:

```
$ pip install --ignore-installed --upgrade tiatoolbox
```

2.2.3 Without Dependencies

If you already have setup a Python environment with all the pre-requisite software and dependencies installed and you would like to keep the existing versions of these dependencies, run this command in your terminal:

```
$ pip install --no-deps tiatoolbox
```

If you don't have pip installed, this Python installation guide can guide you through the process.

2.3 Alternative Method(s)

2.3.1 Using Anaconda

After installing Anaconda (or miniconda / mamba), you can install TIAToolbox using the following command:

```
$ conda install -c conda-forge tiatoolbox
```

Please note that conda-forge installation support is limited on Windows as openslide binaries are not supported on official conda channels. An alternate way to install using conda on Windows could be to install it in WSL2 with CUDA support. In some cases, WSL2 runs faster on Python codes and therefore we **recommend** this option.

2.3.2 From sources

The sources for TIA Toolbox can be downloaded from the Github repo.

You can either clone the public repository:

```
$ git clone https://github.com/TissueImageAnalytics/tiatoolbox.git
```

Or download the tarball:

```
$ curl -OJL https://github.com/TissueImageAnalytics/tiatoolbox/tarball/master
```

Once you have a copy of the source, you can install it with:

```
$ python setup.py install
```

2.3.3 Using Docker

To run TIA toolbox in an isolated environment, use our Docker image . We host different Dockerfiles in our github repository tiatoolbox-docker. Please report any issues related to the docker image in the repository tiatoolbox-docker.

After installing Docker (or Docker Desktop), you can use our TIA toolbox image in 3 different ways.

Use the Pre-Built Docker Image

TIAToolbox provides pre-built docker containers which can be downloaded using the instructions below:

1. Pull the Image From Github Container Registry

```
$ docker pull ghcr.io/tissueimageanalytics/tiatoolbox:latest
```

2. Use the Pre-Built Docker Image as a Base Image in a Dockerfile

```
$ FROM ghcr.io/tissueimageanalytics/tiatoolbox:latest
```

Build the image locally

1. Navigate to the Dockerfile that you want to use, based on the Python version and Operating System that you prefer

2. Build the Docker image

```
$ docker build -t <IMAGE_NAME> .
```

3. Check that the image has been created

```
$ docker images
```

4. Deploy the image as a Docker container

```
$ docker run -it --rm --name <CONTAINER_NAME> <IMAGE_NAME>
```

5. Connect to the running container

```
$ docker exec -it <CONTAINER_NAME> bash
```

To add your own script and run it through the Docker container, first copy your script into the docker environment and then execute it.

```
$ COPY /path/to/<script>.py .
$ CMD ["python3", "<script>.py"]
```

USAGE

To use TIA Toolbox in a project:

```python
import tiatoolbox
```

3.1 Reading WSI Image Data

- *wsireader*
- *WSIReader*
  - *DICOMWSIReader*
  - *NGFFWSIReader*
  - OmnyxJP2WSIReader
  - *OpenSlideWSIReader*
  - *TIFFWSIReader*
  - *VirtualWSIReader*

3.2 Accessing Metadata

- *WSIMeta*

3.3 Functional

The wsicore module also includes some functional syntax for quickly obtaining information about a slide or generating tiles.

- slide_info
- save_tiles

3.4 Stain Extraction

- *Stain Extraction*

3.5 Stain Normalization

- *get_normalizer*
- *StainNormalizer*
- *CustomNormalizer*
- *RuifrokNormalizer*
- *MacenkoNormalizer*
- *VahadaneNormalizer*
- *ReinhardNormalizer*

3.6 Tissue Masking

- *Tissue Mask*

3.7 Stain Augmentation

- *Stain Augmentation*

3.8 Patch Extraction

- *get_patch_extractor*
- *PointsPatchExtractor*
- *SlidingWindowPatchExtractor*

3.9 Graph Construction

- *Slide Graph Constructor*

3.10 Tile Pyramid Generation

- *Tile Pyramid Generator*
- *Zoomify*

3.11 Dataset

- *Kather Dataset*

3.12 Deep Learning Models

3.12.1 Engine

- *Patch Prediction*
- *Semantic Segmentation*
- *Feature Extraction*
- *Nucleus Instance Segmnetation*

3.12.2 Neural Network Architectures

- *Torch Vision CNNs*
- *Simplified U-Nets*
- *HoVerNet*
- *HoVerNet+*
- *MicroNet*
- *MapDe*
- *SCCNN*

Pipelines:

- *IDARS*

3.13 Utilities

- *Environment Detection*
- *Exceptions*
- *Image*
- *Metrics*
- *Miscellaneous*
- *Transforms*

- *Visualization*

FOUR

PRETRAINED NEURAL NETWORK MODELS

Despite the source code of TIAToolbox being held under a permissive license, the licenses of model weights are dependent on the datasets that they are trained on. We provide the licenses associated with the utilised datasets, but recommend that users also do their own due diligence for confirmation.

4.1 Patch Classification

4.1.1 Kather Patch Dataset

The following models are trained using `Kather Dataset`. Model weights obtained from training on the Kather100K dataset are held under the Creative Commons Attribution 4.0 International License. They share the same input output configuration defined below:

```python
from tiatoolbox.models import IOPatchPredictorConfig
ioconfig = IOPatchPredictorConfig(
    patch_input_shape=(224, 224),
    stride_shape=(224, 224),
    input_resolutions=[{"resolution": 0.5, "units": "mpp"}]
)
```

- alexnet-kather100k
- resnet18-kather100k
- resnet34-kather100k
- resnet50-kather100k
- resnet101-kather100k
- resnext50_32x4d-kather100k
- resnext101_32x8d-kather100k
- wide_resnet50_2-kather100k
- wide_resnet101_2-kather100k
- densenet121-kather100k
- densenet161-kather100k
- densenet169-kather100k
- densenet201-kather100k
- mobilenet_v2-kather100k

- mobilenet_v3_large-kather100k

- mobilenet_v3_small-kather100k

- googlenet-kather100k

4.1.2 Patch Camelyon (PCam) Dataset

The following models are trained using the PCam dataset. The model weights obtained from training on the PCam dataset are held under the CC0 License. They share the same input output configuration defined below:

```python
from tiatoolbox.models import IOPatchPredictorConfig
ioconfig = IOPatchPredictorConfig(
    patch_input_shape=(96, 96),
    stride_shape=(96, 96),
    input_resolutions=[{"resolution": 1.0, "units": "mpp"}]
)
```

- alexnet-pcam

- resnet18-pcam

- resnet34-pcam

- resnet50-pcam

- resnet101-pcam

- resnext50-pcam

- resnext101-pcam

- wide_resnet50_2-pcam

- wide_resnet101_2-pcam

- densenet121-pcam

- densenet161-pcam

- densenet169-pcam

- densenet201-pcam

- mobilenet_v2-pcam

- mobilenet_v3_large-pcam

- mobilenet_v3_small-pcam

- googlenet-pcam

4.2 Semantic Segmentation

4.2.1 Tissue Masking

The following models are trained using internal data of TIA Centre and are held under the Creative Commons Attribution-NonCommercial-ShareAlike Version 4 (CC BY-NC-SA 4.0) License. They share the same input output configuration defined below:

```python
from tiatoolbox.models import IOSegmentorConfig
ioconfig = IOSegmentorConfig(
    input_resolutions=[
        {'units': 'mpp', 'resolution': 2.0}
    ],
    output_resolutions=[
        {'units': 'mpp', 'resolution': 2.0}
    ],
    patch_input_shape=(1024, 1024),
    patch_output_shape=(512, 512),
    stride_shape=(256, 256),
    save_resolution={'units': 'mpp', 'resolution': 8.0}
)
```

- fcn-tissue_mask

4.2.2 Breast Cancer

The following models are trained using the BCSS dataset. The model weights obtained from training on the BCSS dataset are held under the CC0 License. They share the same input output configuration defined below:

```python
from tiatoolbox.models import IOSegmentorConfig
ioconfig = IOSegmentorConfig(
    input_resolutions=[
        {'units': 'mpp', 'resolution': 0.25}
    ],
    output_resolutions=[
        {'units': 'mpp', 'resolution': 0.25}
    ],
    patch_input_shape=(1024, 1024),
    patch_output_shape=(512, 512),
    stride_shape=(256, 256),
    save_resolution={'units': 'mpp', 'resolution': 0.25}
)
```

- fcn_resnet50_unet-bcss

4.3 Nucleus Instance Segmentation

4.3.1 PanNuke Dataset

We provide the following models trained using the PanNuke dataset. All model weights trained on PanNuke are held under the Creative Commons Attribution-NonCommercial-ShareAlike Version 4 (CC BY-NC-SA 4.0) License. The input output configuration is as follows:

```python
from tiatoolbox.models import IOSegmentorConfig
ioconfig = IOSegmentorConfig(
    input_resolutions=[
        {'units': 'mpp', 'resolution': 0.25}
    ],
    output_resolutions=[
        {'units': 'mpp', 'resolution': 0.25},
        {'units': 'mpp', 'resolution': 0.25},
```

```
        {'units': 'mpp', 'resolution': 0.25}
    ],
    margin=128
    tile_shape=[1024, 1024]
    patch_input_shape=(256, 256),
    patch_output_shape=(164, 164),
    stride_shape=(164, 164),
    save_resolution={'units': 'mpp', 'resolution': 0.25}
)
```

- hovernet_fast-pannuke

- 0: Background

- 1: Neoplastic

- 2: Inflammatory

- 3: Connective

- 4: Dead

- 5: Non-Neoplastic Epithelial

4.3.2 MoNuSAC Dataset

We provide the following models trained using the MoNuSAC dataset. All model weights trained on MoNuSAC are held under the Creative Commons Attribution-NonCommercial-ShareAlike Version 4 (CC BY-NC-SA 4.0) License. The input output configuration is as follows:

```
from tiatoolbox.models import IOSegmentorConfig
ioconfig = IOSegmentorConfig(
    input_resolutions=[
        {'units': 'mpp', 'resolution': 0.25}
    ],
    output_resolutions=[
        {'units': 'mpp', 'resolution': 0.25},
        {'units': 'mpp', 'resolution': 0.25},
        {'units': 'mpp', 'resolution': 0.25}
    ],
    margin=128
    tile_shape=[1024, 1024]
    patch_input_shape=(256, 256),
    patch_output_shape=(164, 164),
    stride_shape=(164, 164),
    save_resolution={'units': 'mpp', 'resolution': 0.25}
)
```

- hovernet_fast-monusac

- 0: Background

- 1: Epithelial

- 2: Lymphocyte

- 3: Macrophage

- 4: Neutrophil

4.3.3 CoNSeP Dataset

We provide the following models trained using the CoNSeP dataset. The model weights obtained from training on the CoNSeP dataset are held under the Apache 2.0 License. The input output configuration is as follows:

```python
from tiatoolbox.models import IOSegmentorConfig
ioconfig = IOSegmentorConfig(
    input_resolutions=[
        {'units': 'mpp', 'resolution': 0.25}
    ],
    output_resolutions=[
        {'units': 'mpp', 'resolution': 0.25},
        {'units': 'mpp', 'resolution': 0.25},
        {'units': 'mpp', 'resolution': 0.25}
    ],
    margin=128
    tile_shape=[1024, 1024]
    patch_input_shape=(270, 270),
    patch_output_shape=(80, 80),
    stride_shape=(80, 80),
    save_resolution={'units': 'mpp', 'resolution': 0.25}
)
```

- hovernet_original-consep

- 0: Background

- 1: Epithelial

- 2: Inflammatory

- 3: Spindle-Shaped

- 4: Miscellaneous

```python
from tiatoolbox.models import IOSegmentorConfig
ioconfig = IOSegmentorConfig(
    input_resolutions=[
        {'units': 'mpp', 'resolution': 0.25}
    ],
    output_resolutions=[
        {'units': 'mpp', 'resolution': 0.25}
    ],
    tile_shape=[2048, 2048]
    patch_input_shape=(252, 252),
    patch_output_shape=(252, 252),
    stride_shape=(150, 150),
    save_resolution={'units': 'mpp', 'resolution': 0.25}
)
```

- micronet_hovernet-consep

4.3.4 Kumar Dataset

We provide the following models trained using the Kumar dataset. All model weights trained on Kumar are held under the Creative Commons Attribution-NonCommercial-ShareAlike Version 4 (CC BY-NC-SA 4.0) License. The Kumar dataset does not contain nuclear class information, and so TIAToolbox pretrained models based on Kumar for nuclear segmentation, will only perform segmentation and not classification. The input output configuration is as follows:

```python
from tiatoolbox.models import IOSegmentorConfig
ioconfig = IOSegmentorConfig(
    input_resolutions=[
        {'units': 'mpp', 'resolution': 0.25}
    ],
    output_resolutions=[
        {'units': 'mpp', 'resolution': 0.25},
        {'units': 'mpp', 'resolution': 0.25},
        {'units': 'mpp', 'resolution': 0.25}
    ],
    margin=128
    tile_shape=[1024, 1024]
    patch_input_shape=(270, 270),
    patch_output_shape=(80, 80),
    stride_shape=(80, 80),
    save_resolution={'units': 'mpp', 'resolution': 0.25}
)
```

- hovernet_original_kumar

4.4 Nucleus Detection

4.4.1 CRCHisto Dataset

We provide the following models trained using the CRCHisto dataset. All model weights trained on CRCHisto are held under the Creative Commons Attribution-NonCommercial-ShareAlike Version 4 (CC BY-NC-SA 4.0) License. The input output configuration is as follows:

```python
from tiatoolbox.models import IOPatchPredictorConfig
ioconfig = IOPatchPredictorConfig(
    patch_input_shape=(31, 31),
    stride_shape=(8, 8),
    input_resolutions=[{"resolution": 0.25, "units": "mpp"}]
)
```

- sccnn-crchisto

```python
from tiatoolbox.models import IOPatchPredictorConfig
ioconfig = IOPatchPredictorConfig(
    patch_input_shape=(252, 252),
    stride_shape=(150, 150),
    input_resolutions=[{"resolution": 0.25, "units": "mpp"}]
)
```

- mapde-crchisto

4.4.2 CoNIC Dataset

We provide the following models trained using the CoNIC dataset. All model weights trained on CoNIC are held under the Creative Commons Attribution-NonCommercial-ShareAlike Version 4 (CC BY-NC-SA 4.0) License. The input output configuration is as follows:

```python
from tiatoolbox.models import IOPatchPredictorConfig
ioconfig = IOPatchPredictorConfig(
    patch_input_shape=(31, 31),
    stride_shape=(8, 8),
    input_resolutions=[{"resolution": 0.25, "units": "mpp"}]
)
```

- sccnn-conic

```python
from tiatoolbox.models import IOPatchPredictorConfig
ioconfig = IOPatchPredictorConfig(
    patch_input_shape=(252, 252),
    stride_shape=(150, 150),
    input_resolutions=[{"resolution": 0.25, "units": "mpp"}]
)
```

- mapde-conic

4.5 Multi-Task Segmentation

4.5.1 Oral Epithelial Dysplasia (OED) Dataset

We provide the following model trained using a private OED dataset. The model outputs nuclear instance segmentation and classification results, as well as semantic segmentation of epithelial layers. All model weights trained on the private OED dataset are held under the Creative Commons Attribution-NonCommercial-ShareAlike Version 4 (CC BY-NC-SA 4.0) License. The model uses the following input output configuration:

```python
from tiatoolbox.models import IOSegmentorConfig
ioconfig = IOSegmentorConfig(
    input_resolutions=[
        {'units': 'mpp', 'resolution': 0.5}
    ],
    output_resolutions=[
        {'units': 'mpp', 'resolution': 0.5},
        {'units': 'mpp', 'resolution': 0.5},
        {'units': 'mpp', 'resolution': 0.5},
        {'units': 'mpp', 'resolution': 0.5}
    ],
    margin=128
    tile_shape=[1024, 1024]
    patch_input_shape=(256, 256),
    patch_output_shape=(164, 164),
    stride_shape=(164, 164),
    save_resolution={'units': 'mpp', 'resolution': 0.5}
)
```

- hovernetplus-oed

- 0: Background

- 1: Other

- 2: Epithelial

- 0: Background

- 1: Other Tissue

- 2: Basal Epithelium

- 3: (Core) Epithelium

- 4: Keratin

JUPYTER NOTEBOOKS

5.1 About the Example Notebooks

In this directory, you will find some example use cases of the TIAToolbox functionalities in the form of Jupyter Notebooks. All of these notebooks are designed and maintained to run on Colab platforms (unless otherwise stated) but you can run them on your own system as well. In the first cell of each example notebook, there are links to open the notebook in Google Colab and GitHub. Simply clicking on one of these links opens that notebook on the selected platform. You can right-click on "Open in Colab" and select "Open in new tab" if the left click does not work for you.

5.1.1 Local Machine

To run the notebook on other platforms, such as your own computer, set up your Python environment, as explained in the installation guide.

5.1.2 Google Colab

Each notebook contains all the information needed to run the example remotely on Colab. All that you need is a local computer at your fingertips, with a standard browser connected to the Internet. The local computer does not even need a programming language to be installed—all the crucial resources are provided at the remote site, free of charge, thanks to Google Colaboratory. Check that "colab" appears in the address bar. Familiarize yourself with the drop-down menus near the top of the window. You can edit the notebook during the session, for example substituting your own image files for the image files used in this demo. Experiment by changing the parameters of functions. It is not possible for an ordinary user to permanently change this version of the notebook on GitHub or Colab, so you cannot inadvertently mess it up. Use the notebook's File Menu if you wish to save your own (changed) notebook.

GPU or CPU runtime

Processes in the notebooks can be accelerated by using a GPU. Therefore, whether you are running the notebook on your system or Colab, you need to check and specify if you are using GPU or CPU hardware acceleration. In Colab, you need to make sure that the runtime type is set to GPU in the *"Runtime→Change runtime type→Hardware accelerator"*. If you are *not* using GPU, consider changing the ON_GPU flag to False value, otherwise, some errors will be raised when running the following cells.

> **IMPORTANT**: If you are using Colab and install tiatoolbox, please note that you need to restart the runtime after tiatoolbox installation before proceeding through (menu) *"Runtime→Restart runtime"* . This is needed to load the latest versions of prerequisite packages installed with TIAToolbox. Doing so, you should be able to run all the remaining cells altogether (*"Runtime→Run after"* from the next cell) or one by one.

5.1.3 Structure of the examples directory

We explain here the structure of the examples directory and briefly describe our notebooks. (Except for technical minutiae, the words *folder* and *directory* are interchangeable.) The examples directory includes general notebooks explaining different functionalities/modules incorporated in TIAToolbox. Most of these notebooks are written with less advanced users in mind—some familiarity with Python is assumed—but the capabilities they demonstrate would also be useful to more advanced users.

The example directory contains two subdirectories called `full-pipelines` and `inference-pipelines` that include examples of using TIAToolbox in training of neural networks or inference of WSIs for high-level CPath applications, such as patient survival prediction and MSI status prediction from H&E whole slide images.

5.1.4 A) Examples of TIAToolbox functionalities

We now give a list of our Jupyter notebooks, giving a brief description of the TIAToolbox functionalities that each of the notebook provides.

1- Reading Whole Slide Images (01-wsi-reading)

This notebook shows how to use TIAToolbox to read different kinds of WSIs. TIAToolbox provides a uniform interface to various WSI formats. To see what formats are dealt with, click here and then search for *format*. In this notebook, you will learn some well-known techniques for WSI masking and patch extraction.
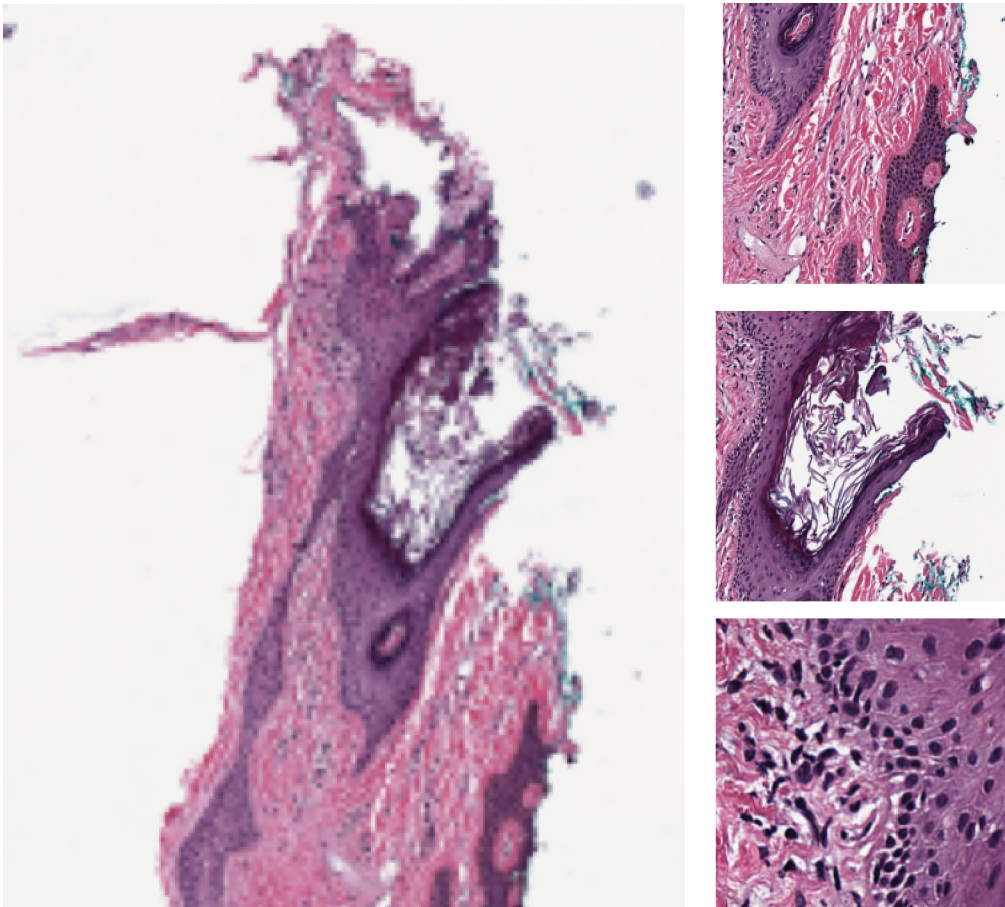
2- Stain normalization of histology images (02-stain-normalization)

Stain normalization is a common pre-processing step in computational pathology, whose objective is to reduce, as much as possible, colour variation that has no clinical significance. This variation may be caused by using different scanners, different staining protocols and practices, staining agents that have been left on the laboratory shelf for different lengths of time, different settings when using the scanner, etc. It has been shown in many studies that stain normalization can make an algorithm more robust against such differences. TIAToolbox makes a few different stain-normalization algorithms available to the use. The implemented stain normalization methods in TIAToolbox are:

- Reinhard stain normalization

- Ruifork

- Macenko

- Vahadane.

Alternatively, if you prefer, you can use your own stain matrix for stain normalization. In the images below, the object of an algorithm is to change to source image to make its colours similar to those in the target image.

)
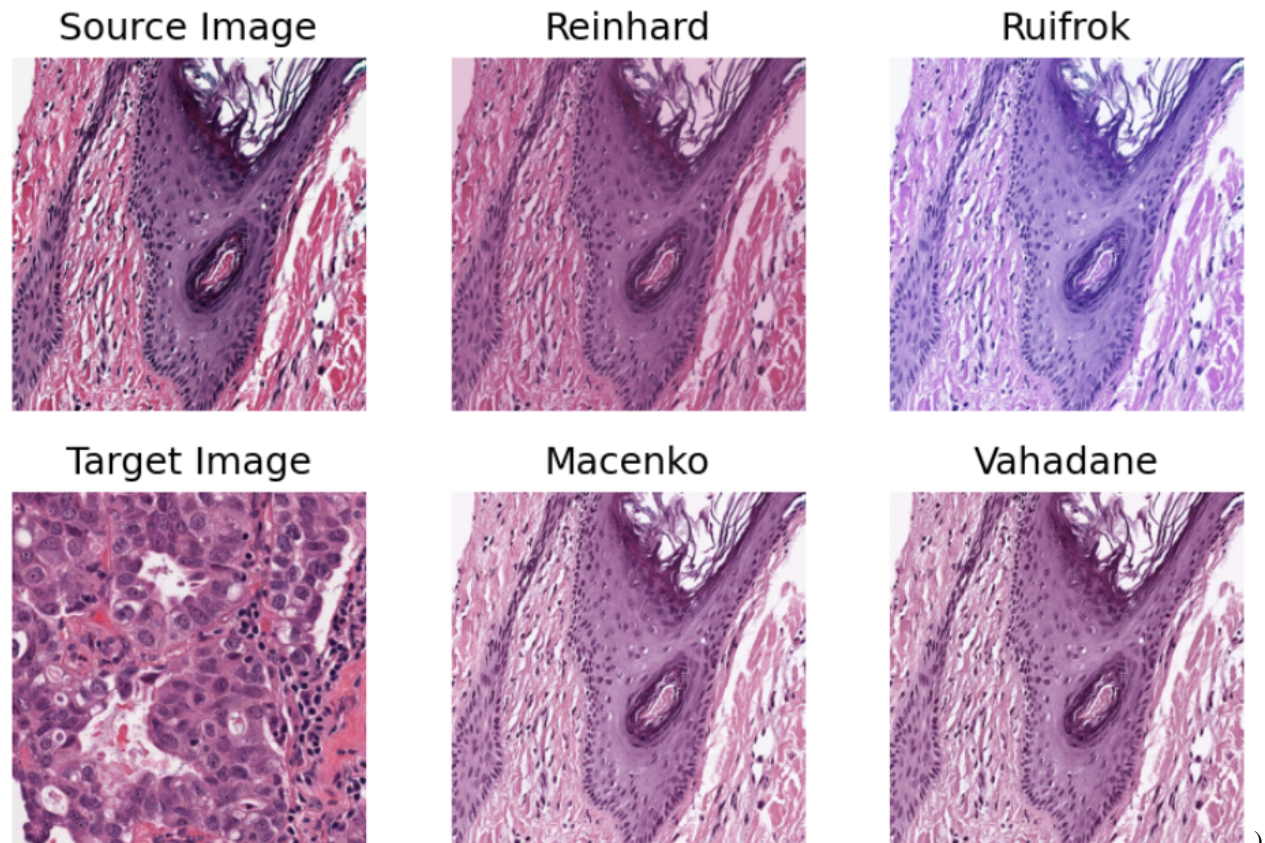
3- Extracting tissue mask (tissue region) from whole slide images (03-tissue-masking)

WSIs often show large blank (glass) background areas that contain no information. Therefore, it is essential to detect the informative (tissue) region in the WSI before taking any action (like patch extraction and classification). We call this step, "tissue masking" which is the focus of this example notebook. This notebook shows how to extract tissue regions from a WSI with the help of TIAToolbox and a single line of Python code.
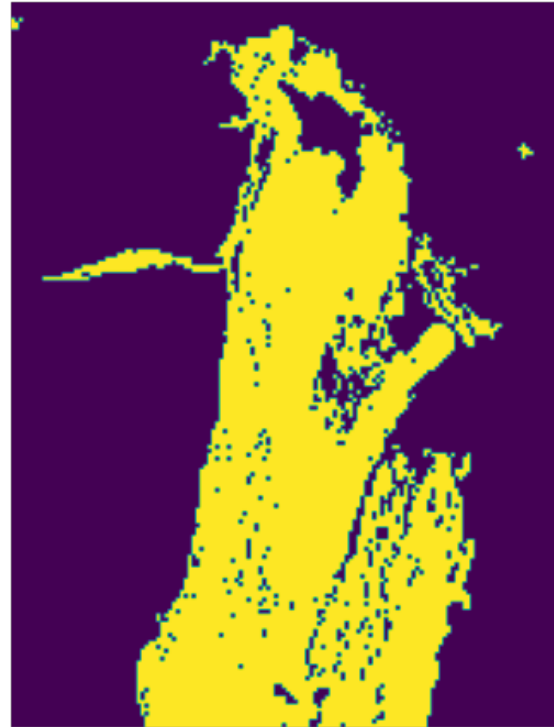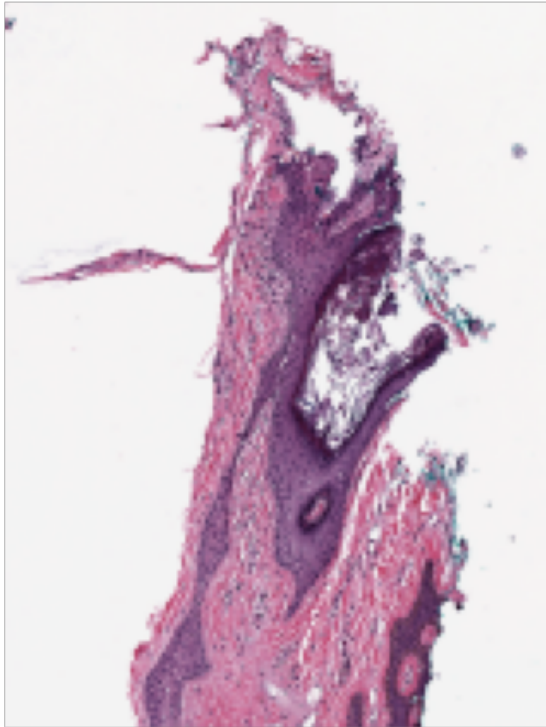
4- Extracting patches from whole slide images (04-patch-extraction)

This notebook uses TIAToolbox to extract patches from a large histology image. Tiatoolbox can extract patches based on point annotations or using a fixed-size sliding window. The patch extraction module of TIAToolbox supports mask-based patch extraction which means you can extract (overlapping, if you prefer) patches from a certain region of WSI (for example a region consisting of a particular type of tissue).
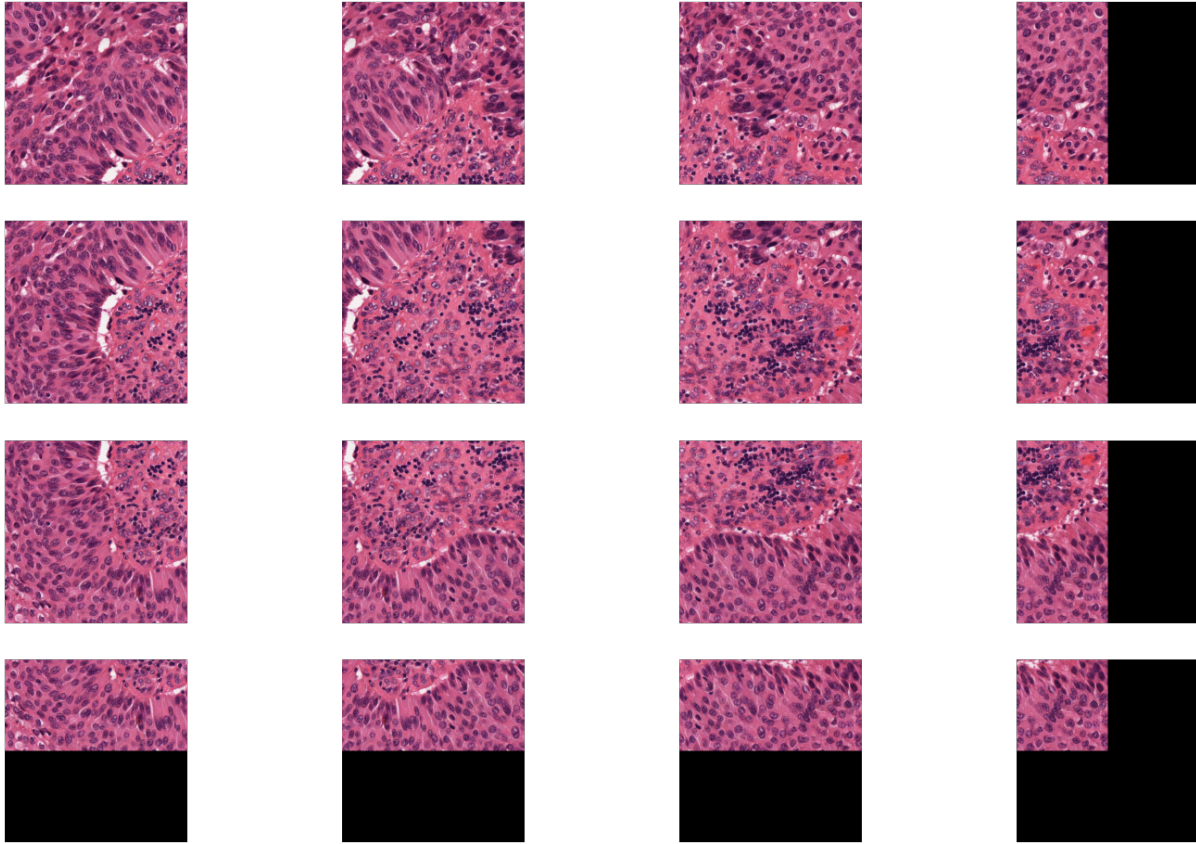
5- Patch prediction in whole slide images (05-patch-prediction)

In this notebook, we use TIAToolbox for patch-level prediction, using a range of deep learning models. TIAToolbox can be used to make predictions on pre-extracted image patches or on larger image tiles / whole-slide images (WSIs), where image patches are extracted on the fly. There are various state-of-the-art deep learning models implemented in TIAToolbox, pretrained on datasets related to different cancer types. With just two lines of Python code, any of these models can be used out of the box to predict the type of patches in a WSI. For example, in colorectal cancer, TIAToolbox can classify whole slide image regions into nine different categories (Empty glass, Lymphocytes, Normal colon mucosa, Debris, Smooth muscle, Cancer-associated stroma, Adipose, Mucus, Colorectal adenocarcinoma epithelium).
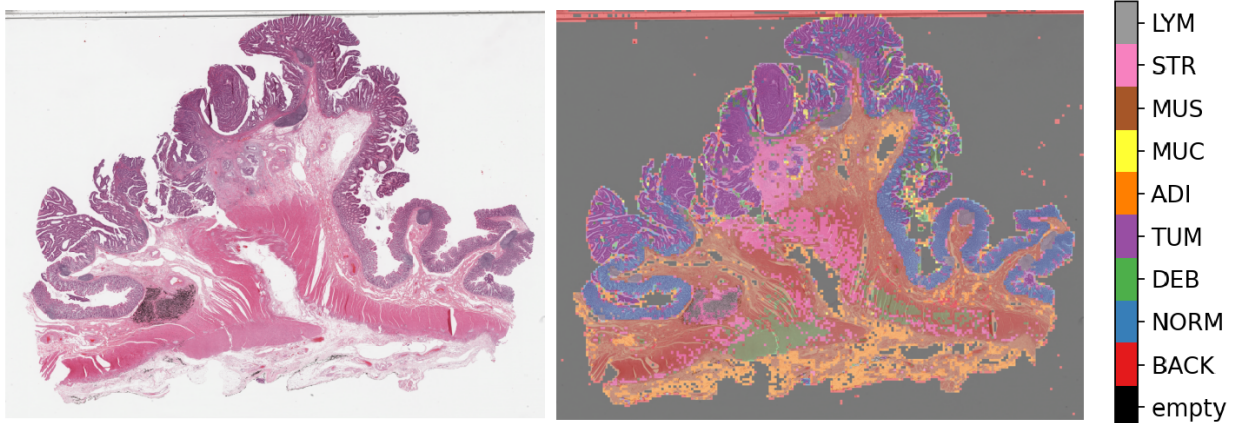
6- Semantic segmentation of whole slide images (06-semantic-segmentation)

*Semantic segmentation* groups together similar parts of an image that belong to the same class, as in the image immediately above and in the image below. Semantic segmentation of tissue regions plays an important role in developing algorithms for cancer diagnosis and prognosis, as it can help measure tissue attributes in an objective and reproducible fashion. In this notebook, we use pretrained models to automatically segment different tissue region types in a set of input images or WSIs. We first use a pretrained model to semantically annotate images of breast cancer, needing only two lines of codes to do so. After that, we explain how to use a pretrained TIAToolbox model inference pipeline to do prediction on a set of WSIs.
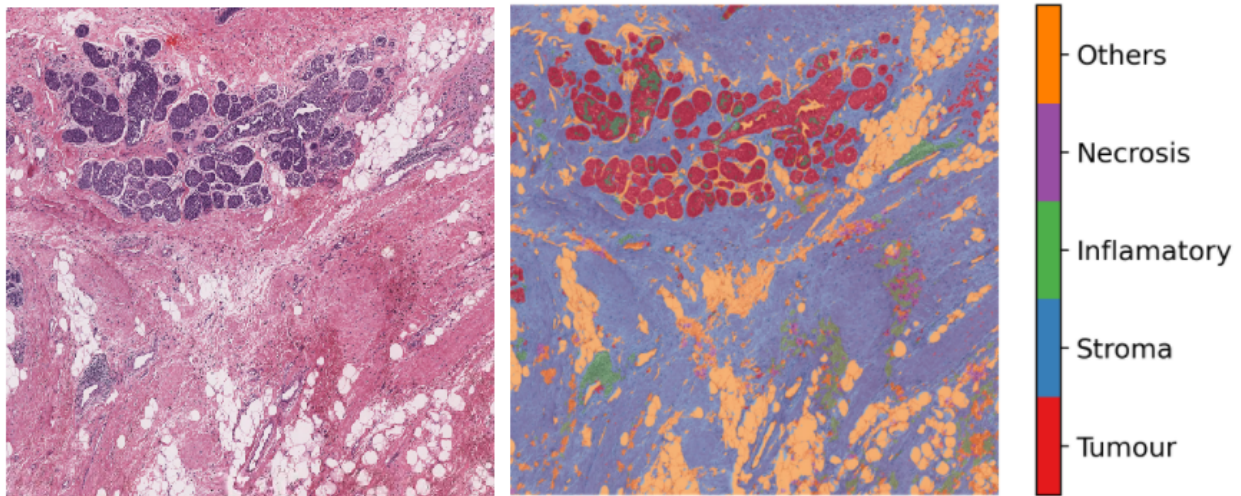
7- Advanced model techniques (07-advanced-modeling)

This notebook is aimed at advanced users of TIAToolbox, familiar with object-oriented programming concepts in Python and the TIAToolbox models framework. We demonstrate the use of TIAToolbox models with your current workflow and how you can integrate your solutions into the TIAToolbox model framework. By doing so, you will be able to utilize extensively tested TIAToolbox tools in your experiments and speed up your computational pathology research.

WSI thumbnail   Focus map
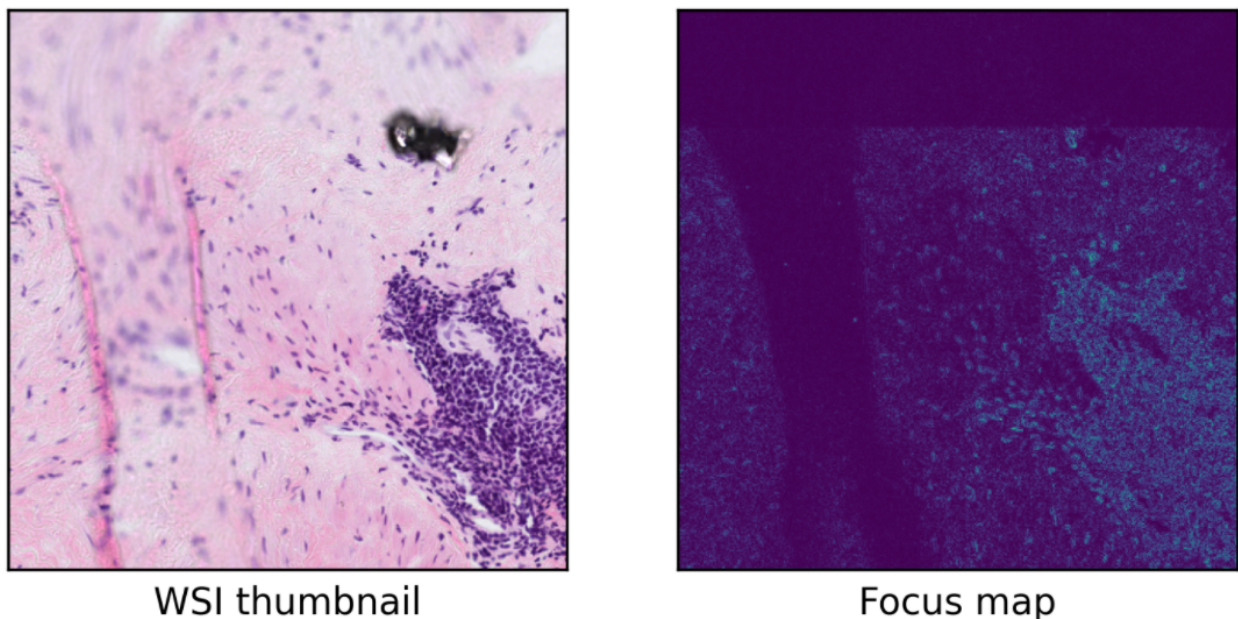
8- Nucleus instance segmentation in whole slide images using the HoVer-Net model (08-nucleus-instance-segmentation)

Each WSI can contain up to a million nuclei of various types. These can analysed systematically and used for predicting clinical outcomes. Nucleus segmentation and classification must be carried out before using nuclear features in downstream analysis. In this example, we will demonstrate the use of the TIAToolbox implementation of the HoVer-Net model to solve the problem of nucleus instance segmentation and classification.

■ Malignant/dysplastic epithelium ■ Normal epithelium ■ Fibroblast ■ Inflammatory ■ Muscle ■ Endothelial ■ Miscellaneous
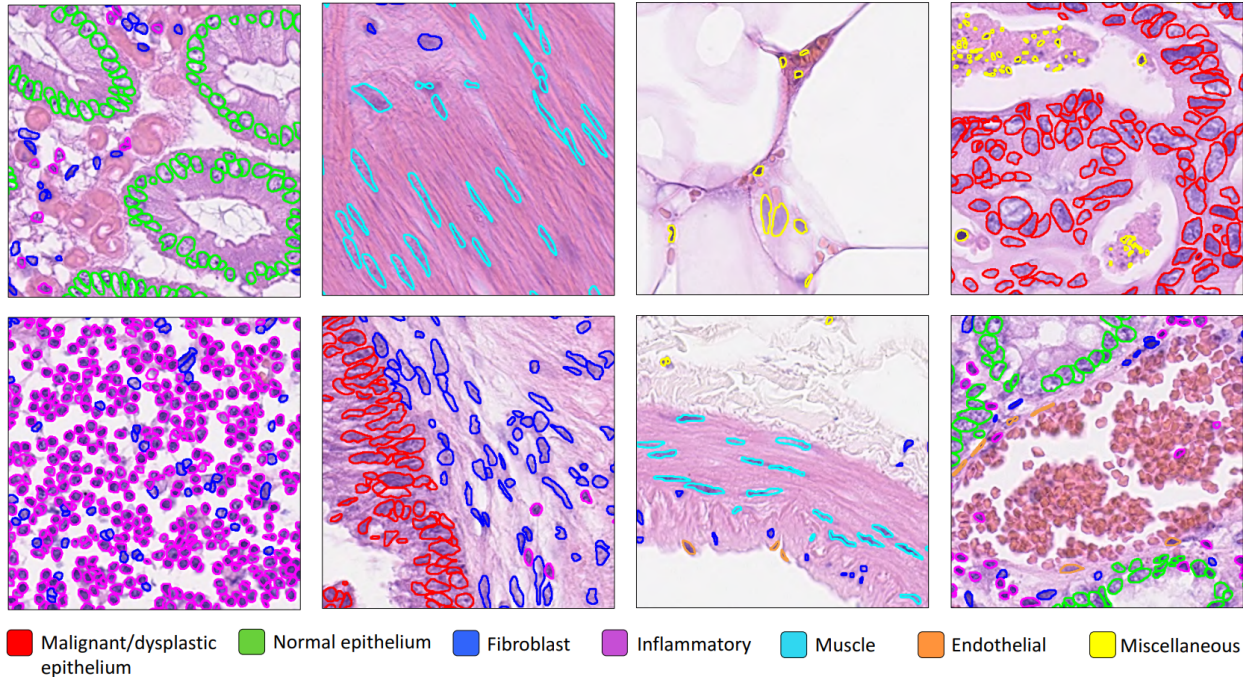
9- Multi-task segmentation in whole slide images using the HoVer-Net+ model (09-multi-task-segmentation)

Each WSI consists of a multitude of different tissue types, each containing many nuclei of varying types. In computational pathology, it is often important to generate tissue specific morphological features for downstream analyses. It can therefore be beneficial to perform multiple tasks such as semantic segmentation of tissue regions and nuclear instance segmentation/classification simultaneously in order to exploit useful information learnt from each task to further advance both tasks. If inflammatory cells are more common in connective tissue, and epithelial cells are more common in the epithelium, then it is logical that performing these tasks simultaneously may be beneficial to each task. In this example, we will demonstrate the use of the TIAToolbox implementation of the HoVer-Net+ model to solve the problem of nucleus instance segmentation/classification and the semantic segmentation of intra-epithelial layers.
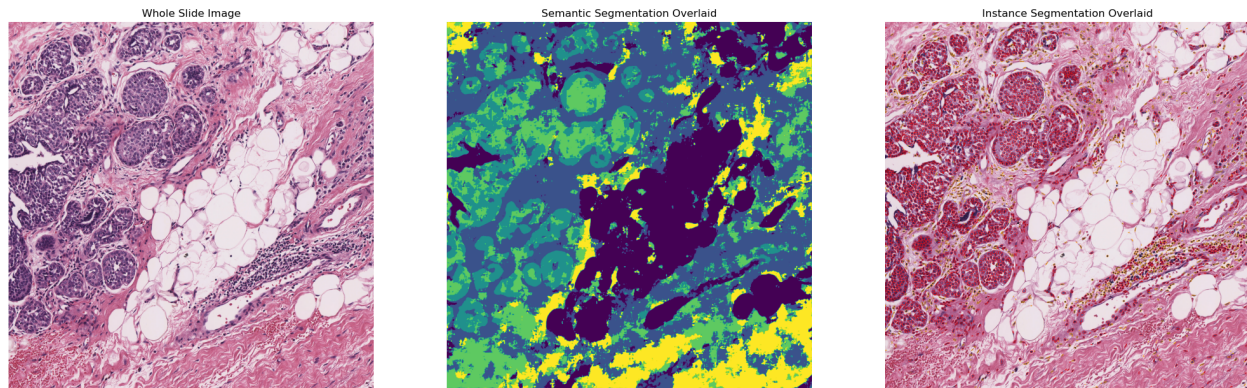
10- Image Alignment (10-wsi_registration)

This notebook presents an example to show how to use TIAToolbox for registration of an image pair using Deep Feature Based Registration (DFBR) [1], followed by non-rigid alignment using SimpleITK. The registration tool in the TIA-Toolbox also comprises a pre-alignment step, a pre-requisite to DFBR. In particular, we will introduce the use of our registration tool `wsi_registration`.

In this example, the affine transformation is computed using thumbnails of the fixed and moving images. The estimated transformation is then used to extract corresponding tiles from both fixed and moving images at a higher magnification level. The non-rigid deformation between the two tiles is then dealt with using the SimpleITK.

[1] Awan, Ruqayya, et al. "Deep Feature based Cross-slide Registration." arXiv preprint arXiv:2202.09971 (2022).
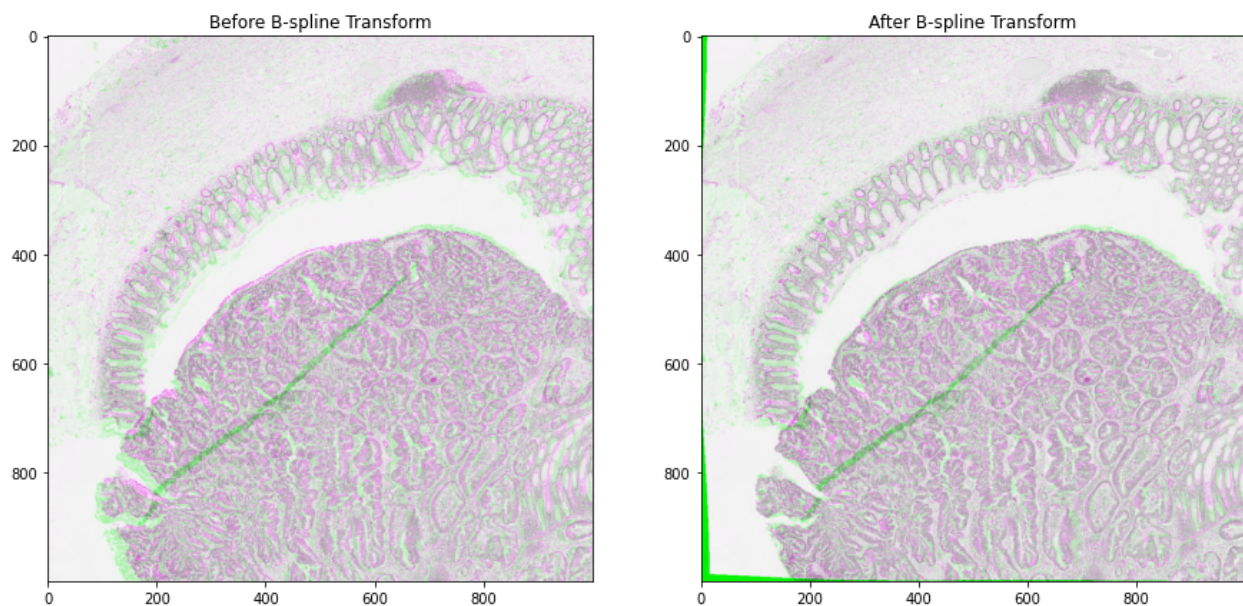
5.1.5 B) Examples of high-level analysis (pipelines) using TIAToolbox

List of Jupyter notebooks that demonstrate how you can use TIAToolbox to simplify high-level analysis in computational pathology.

1- Prediction of molecular pathways and key mutations in colorectal cancer from whole slide images (idars)

Prediction of molecular pathways and key mutations directly from Haematoxylin and Eosin stained histology images can help bypass additional genetic (e.g., polymerase chain reaction or PCR) or immunohistochemistry (IHC) testing, with a view to saving both money and time. In this notebook, we use TIAToolbox's pretrained models to reproduce the inference results obtained by the IDaRS pipeline due to Bilal et al. In TIAToolbox, we include models that are capable of predicting the following in whole slide images:

- Microsatellite instability (MSI)

- Hypermutation density

- Chromosomal instability

- CpG island methylator phenotype (CIMP)-high prediction

- BRAF mutation

- TP53 mutation

Probability Map Overlay for Each Task
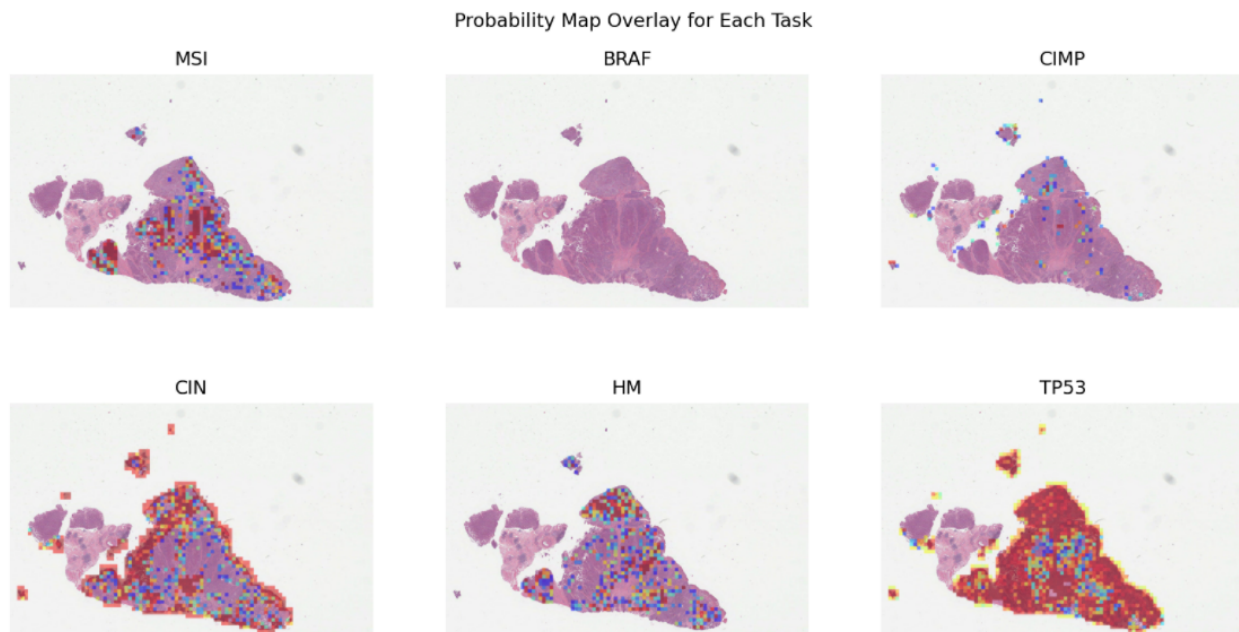
2- Prediction of HER2 status in breast cancer from H&E stained whole slide images

This notebook demonstrates how the functionalities available in TIAToolbox can be used to reproduce the "SlideGraph+ method" ("SlideGraph+: Whole Slide Image-Level Graphs to Predict HER2Status in Breast Cancer" by Lu et al. (2021)) to predict HER2 status of breast cancer samples from H&E stained whole slide images. As a brief overview, this method involves several steps generating a graph that represents a WSI. The graph is then fed into a special convolutional graph network, called SlideGraph, to predict whether that WSI is HER2 negative or positive.

- Example notebook on training the SlideGraph model is available here: slide-graph for training

- Example notebook on using SlideGraph model for WSI inference is available here: slide-graph for inference
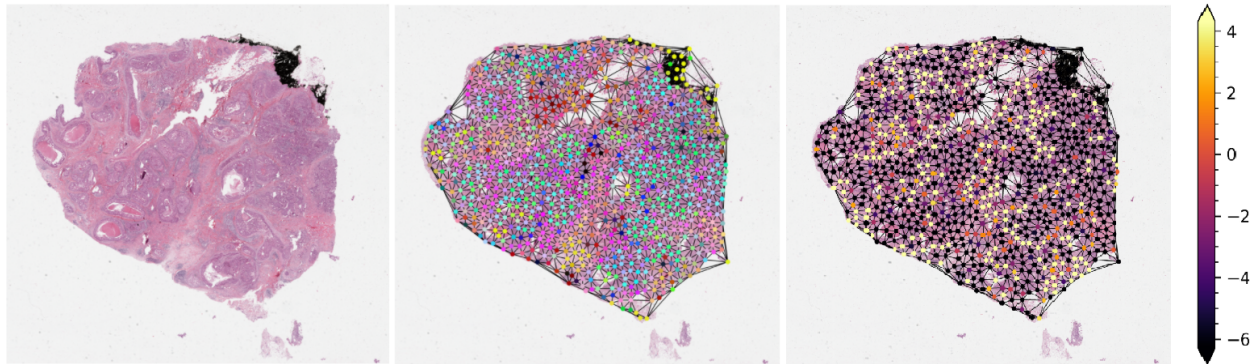
5.2 Basic Functionalities

5.2.1 Read and Visualize a WSI

Click to open in: [GitHub][Colab]

About this demo

This demo reads a whole slide image (WSI) using tiatoolbox. We load a sample WSI, gather some key information, and then extract some image patches. We demo our modules `wsireader` details and `slide_info` details.

Set Up Plotting

Here we import `matplotlib` and set some options for plotting results to make the output look nice.

```python
"""Import modules required to run the Jupyter notebook."""

# Clear logger to use tiatoolbox.logger
import logging

if logging.getLogger().hasHandlers():
    logging.getLogger().handlers.clear()

# Pretty print for nice dictionary printing
```

(continues on next page)

```python
from pprint import pprint

import matplotlib as mpl
import matplotlib.pyplot as plt

from tiatoolbox import logger
from tiatoolbox.data import small_svs
from tiatoolbox.wsicore.wsireader import WSIReader

mpl.rcParams["figure.dpi"] = 150  # for high resolution figure in notebook
mpl.rcParams["figure.facecolor"] = "white"  # To make sure text is visible in dark
→mode
plt.rcParams.update({"font.size": 5})
```

Reading in a WSI

We load a small WSI, specified with the help of the data module. Here we include a function to download a small sample SVS image from our server. This function then returns the path to the downloaded file which is stored in your system's temporary directory, e.g. `/tmp` on UNIX-like systems.

```python
file_path = small_svs()
logger.info(file_path)
```

```
|2023-07-27|09:01:29.461| [INFO] /tmp/CMU-1-Small-Region.svs
```

Our code shields the user from the incompatible formats produced by different models of scanners from different vendors. The function `WSIReader.open` has as input a particular WSI, with a particular image format, and outputs an object `reader`, whose base class is `WSIReader`, and whose derived class depends on the image format (see details). The reader `reader` provides important information about the WSI. Member functions obtain pixel- or patch-level information, using format-independent code, as we illustrate below.

```python
reader = WSIReader.open(file_path)
print(reader)  # noqa: T201
```

```
<tiatoolbox.wsicore.wsireader.OpenSlideWSIReader object at 0x7a54a3f5ddb0>
```

First, let's check the basic WSI information, such as magnification, dimension, etc. (`mpp` = microns per pixel).

```python
info_dict = reader.info.as_dict()
pprint(info_dict)  # noqa: T203
```

```
{'axes': 'YXS',
 'file_path': PosixPath('/tmp/CMU-1-Small-Region.svs'),
 'level_count': 1,
 'level_dimensions': ((2220, 2967),),
 'level_downsamples': [1.0],
 'mpp': (0.499, 0.499),
 'objective_power': 20.0,
 'slide_dimensions': (2220, 2967),
 'vendor': 'aperio'}
```

Thumbnail

To see a thumbnail of the WSI, we use the `slide_thumbnail` method of `reader`. We load the thumbnail at $\times1.25$ objective power as follows:

```python
thumbnail = reader.slide_thumbnail(resolution=1.25, units="power")
plt.imshow(thumbnail)
plt.axis("off")
plt.show()
```
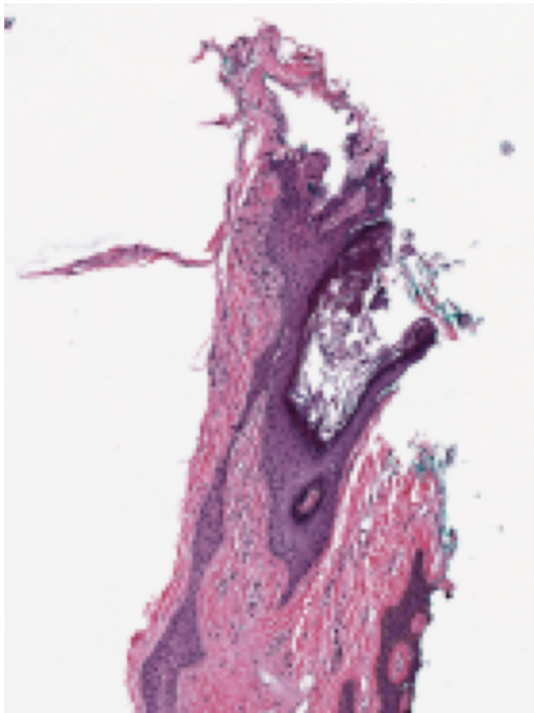

Reading WSI regions

i) Read Rect

We can read a region of the whole slide image at a given location and size using the `read_rect` method. Location can be stated as (x, y) tuple giving the top left pixel in the baseline (level 0) reference frame, and size as (width, height) tuple giving the desired output image size.

Reads can be performed at different resolutions by supplying a pair of arguments for the `resolution` and the `units` of resolution. `resolution` can be given as integer or float or tuple(float), default = 0. Either a single number or a sequence of two numbers for x and y as tuple are valid. This value is in terms of the corresponding units. For example: resolution=0.5 and units="mpp" will read the slide at 0.5 microns per-pixel, and resolution=3, units="level" will read at level at pyramid level / resolution layer 3. Supported units are: microns per pixel ("mpp"), objective power ("power"), pyramid / resolution level ("level"), pixels per baseline pixel ("baseline"), default ="level".

```python
# Location coordinates in (x,y)
location = (1000, 1000)

# Size of the region in (width, height)
```

```
size = (256, 256)

# read the region using wsi reader's read rect at 0.5 mpp
img = reader.read_rect(
    location,
    size,
    resolution=0.5,
    units="mpp",
)

plt.imshow(img)
plt.axis("off")
plt.show()
```
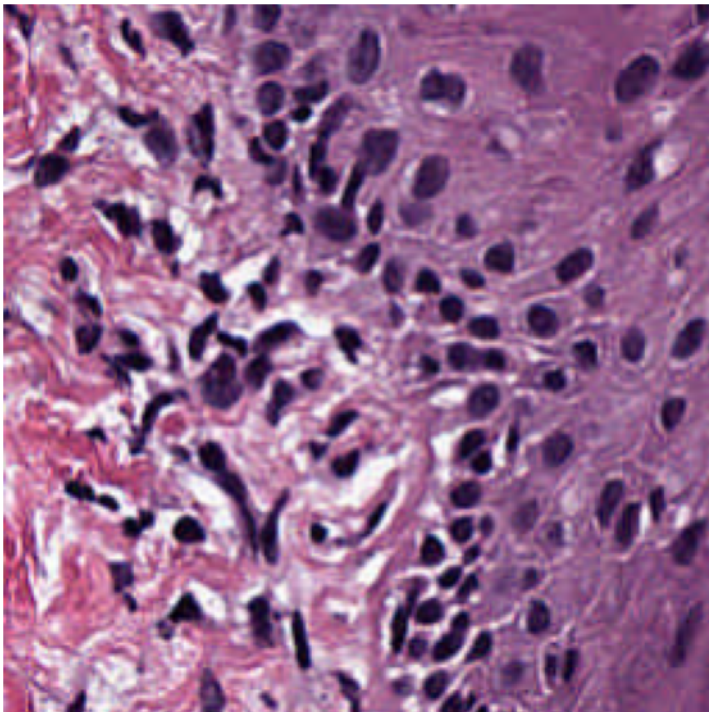

ii) Read bound

Read a region of the whole slide image within given bounds. Bounds is a tuple of (start_x, start_y, end_x, end_y) i.e., (left, top, right, bottom) of the region in baseline reference frame. However, with coord_space="resolution", the bound is expected to be at the requested `resolution` system.

Reads can be performed at different resolutions by supplying a pair of arguments for the resolution and the units of resolution. resolution can be given as integer or float or tuple(float), default = 0. Either a single number or a sequence of two numbers for x and y as tuple are valid. This value is in terms of the corresponding units. For example: resolution=0.5 and units="mpp" will read the slide at 0.5 microns per-pixel, and resolution=3, units="level" will read at level at pyramid level / resolution layer 3. Supported units are: microns per pixel ("mpp"), objective power ("power"), pyramid / resolution level ("level"), pixels per baseline pixel ("baseline"), default ="level".

coord_space = "baseline" by default, this is a flag to indicate if the input bounds is in the baseline coordinate system ("baseline") or is in the requested resolution system ("resolution").

```
# Specify the bounds in terms of rectangle (left, top, right, bottom)
bounds = [1000, 1000, 2000, 2000]

# Read the region using wsi reader's read bounds at level 0
img = reader.read_bounds(bounds, resolution=0, units="level")

plt.imshow(img)
plt.axis("off")
plt.show()
```
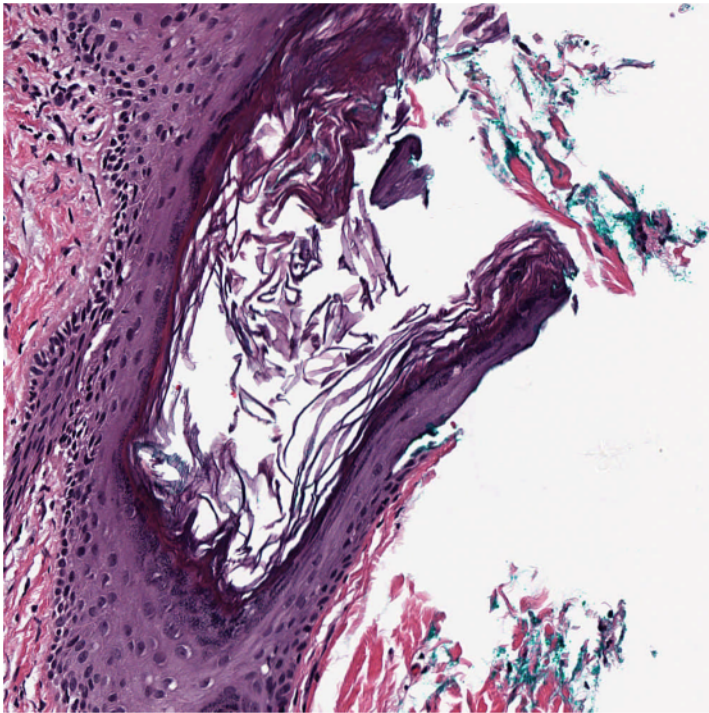

Tissue Masking

It is often useful to distinguish between tissue and glass (no tissue) in the image. For example, to avoid running computation expensive analysis for regions where is no tissue content. We compute a *mask*, by which we mean a binary colouring of the pixels to either black=glass or white=tissue. The white area is deliberately made a little larger than tissue area, as this will be appropriate for our task. We provide a function `tissue_mask` on a `WSIReader` binarises the thumbnail on the basis of pixel intensity, using the Otsu method. Morphological operations improve the result.

Note that the `tissue_mask` function returns a `VirtualWSIReader` object rather than a NumPy array (although this can be accessed via the `.image` attribute). The returned `VirtualWSIReader` object also has some metadata copied from the original WSI. This allows the lower resolution mask image to be read as it it were the full size WSI. This is particularly useful as it allows for using the same coordinates to read from the mask as from the original WSI.

```
mask_reader = reader.tissue_mask(resolution=4, units="mpp")
mask_thumbnail = mask_reader.slide_thumbnail(resolution=1.25, units="power")

plt.imshow(mask_thumbnail)
plt.show()
```
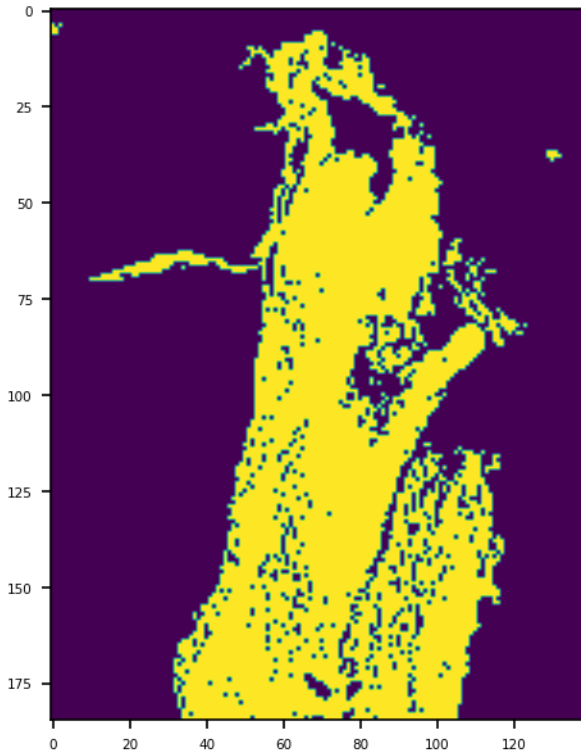
```
mask_reader = reader.tissue_mask("morphological", resolution=4, units="mpp")
mask_thumbnail = mask_reader.slide_thumbnail(resolution=1.25, units="power")

plt.imshow(mask_thumbnail)
plt.show()
```
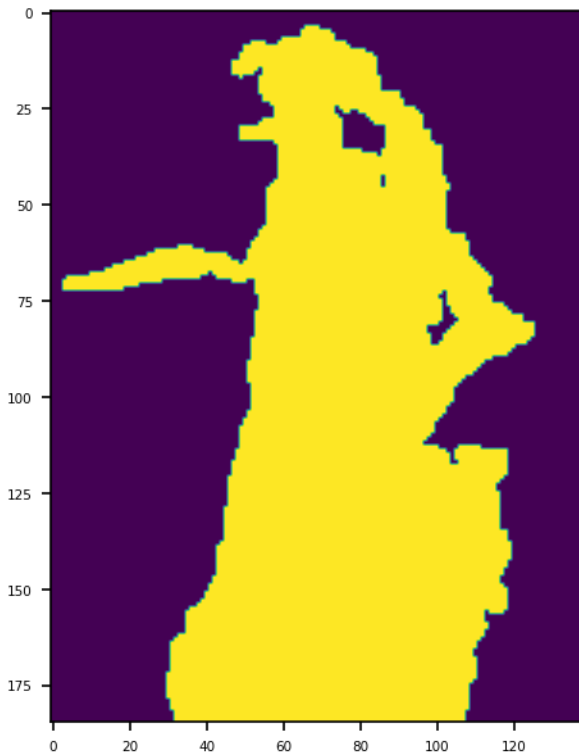
Here we show reading part of the tissue from `reader` and also the corresponding part of the mask.

```
tissue_region = reader.read_rect(
    location=(1500, 1500),
    size=(500, 500),
    resolution=0.5,
    units="mpp",
)
mask_region = mask_reader.read_rect(
    location=(1500, 1500),
    size=(500, 500),
    resolution=0.5,
    units="mpp",
)
_, axs = plt.subplots(1, 2)
axs[0].imshow(tissue_region)
axs[1].imshow(mask_region, vmin=0, vmax=1)
plt.show()
```
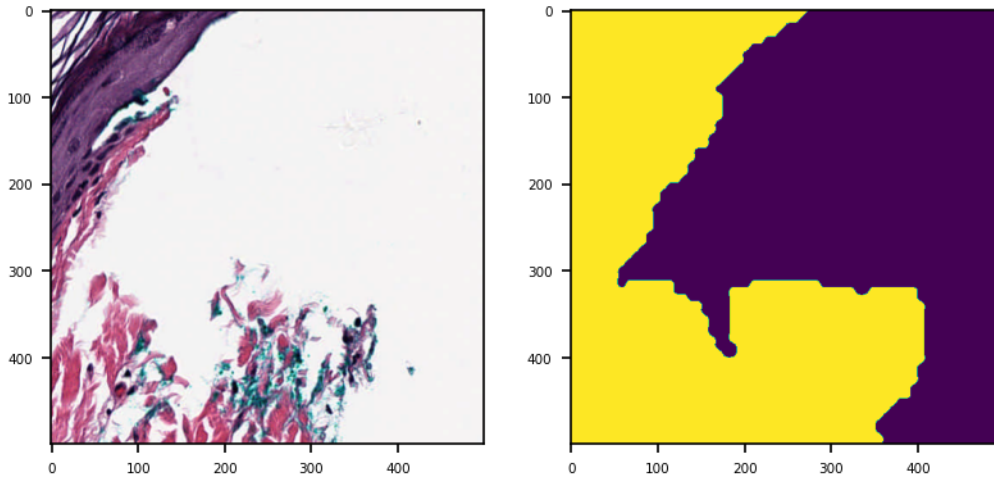
Notice that the above two function calls to the two reader objects have identical arguments. This could also be written more concisely as follows:

```python
# Try modifying the parameters and see how the mask changes
location, size = (1500, 1500), (500, 500)
tissue_region, mask_region = (
    r.read_rect(location, size, 0.5, "mpp") for r in (reader, mask_reader)
)
_, axs = plt.subplots(1, 2)
axs[0].imshow(tissue_region)
axs[1].imshow(mask_region, vmin=0, vmax=1)
plt.show()
```
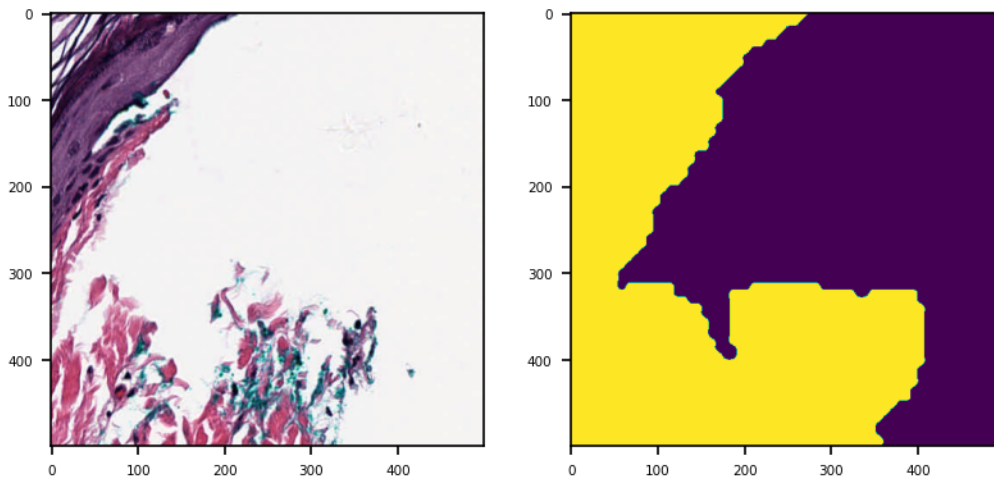
5.2.2 Stain Normalization

Click to open in: [GitHub][Colab]

Why normalize colour?

Pathologists usually find it easy to ignore features of a whole slide image (WSI) that are irrelevant from the point of view of diagnosis and treatment. However, this is not the case for computers. A standard hazard in digital pathology is that a computer program, developed using WSIs from one centre, gives much less impressive results when tried on WSIs from another centre. There are many factors contributing to such problems, among which are differences in colouring of WSIs from two different centres, even when the same standardised staining protocols are in force. These differences can be due to variation in slide scanners, the experience and skill of technicians, the quality and concentration of antigens, incubation time and temperature, *etc, etc*. Ideally, the same tissue specimens, stained in different laboratories, should give the same results, but this ideal appears to be unreachable. Stain normalization is a common pre-processing step, whose objective is to reduce to a minimum colour differences that have no significance in clinical practice. `tiatoolbox` makes a few different stain-normalization algorithms available to the user, and we demonstrate how to use them in this notebook.

About this demo

In this example, we will

1. Load a sample WSI.

2. Extract a square patch.

3. Stain-normalize the tile using various built-in methods.

4. Stain-normalize with a user-defined stain matrix.

During the above steps, we will be using functions from our `stainnorm` module here. This demo assumes some understanding of the functions in the `wsireader` module (for example by going through the demo here).

Importing related libraries

We start by importing some necessary modules.

```python
"""Import modules required to run the Jupyter notebook."""

from __future__ import annotations

# Clear logger to use tiatoolbox.logger
import logging

if logging.getLogger().hasHandlers():
    logging.getLogger().handlers.clear()

from pathlib import Path

import matplotlib as mpl
import matplotlib.pyplot as plt
import requests
import skimage.color

from tiatoolbox import data, logger
from tiatoolbox.tools import stainnorm
```

(continues on next page)

```python
from tiatoolbox.wsicore import wsireader

mpl.rcParams["figure.dpi"] = 150  # for high resolution figure in notebook
```

```
|2023-07-24|15:50:50.949| [INFO] NumExpr defaulting to 2 threads.
```

Downloading the required files

We load a small WSI, specified with the help of the path variable `user_sample_wsi_path` (default value `None`). Unless this None value is changed, the WSI is downloaded from the web, as seen in the code below, and saved with filename given by the variable `sample_file_name` in the directory given by `data_dir`. Data generated by the notebook is stored under data_dir, providing rapid local access.

```python
data_dir = "./tmp"
sample_file_name = "sample_wsi_small.svs"

user_sample_wsi_path = None


def download(url_path: str, save_path: str | Path) -> None:
    """Download url_path to save_path."""
    r = requests.get(url_path, timeout=60)
    with Path(save_path).open("wb") as f:
        f.write(r.content)


user_sample_wsi_path = None

if user_sample_wsi_path is None:
    sample_wsi_path = f"{data_dir}/{sample_file_name}"
else:
    sample_wsi_path = user_sample_wsi_path
if not Path(sample_wsi_path).exists():
    Path(sample_wsi_path).parent.mkdir(parents=True)
    url_path = (
        " https://tiatoolbox.dcs.warwick.ac.uk/sample_wsis/CMU-1-Small-Region.svs"
    )
    download(url_path, sample_wsi_path)

logger.info("Download is complete.")
```

```
|2023-07-24|15:51:21.059| [INFO] Download is complete.
```

Reading in a WSI

It's easy to read a WSI, and print important metadata. We plot a thumbnail version to find regions of interest.

```python
# create a file handler
wsi_reader = wsireader.WSIReader.open(input_img=sample_wsi_path)
wsi_info = wsi_reader.info.as_dict()
# we will print out each info line by line
print(*list(wsi_info.items()), sep="\n")  # noqa: T201
wsi_thumb = wsi_reader.slide_thumbnail(resolution=1.25, units="power")

plt.imshow(wsi_thumb)
plt.axis("off")
plt.show()
```

```
('objective_power', 20.0)
('slide_dimensions', (2220, 2967))
('level_count', 1)
('level_dimensions', ((2220, 2967),))
('level_downsamples', [1.0])
('vendor', 'aperio')
('mpp', (0.499, 0.499))
('file_path', PosixPath('tmp/sample_wsi_small.svs'))
('axes', 'YXS')
```
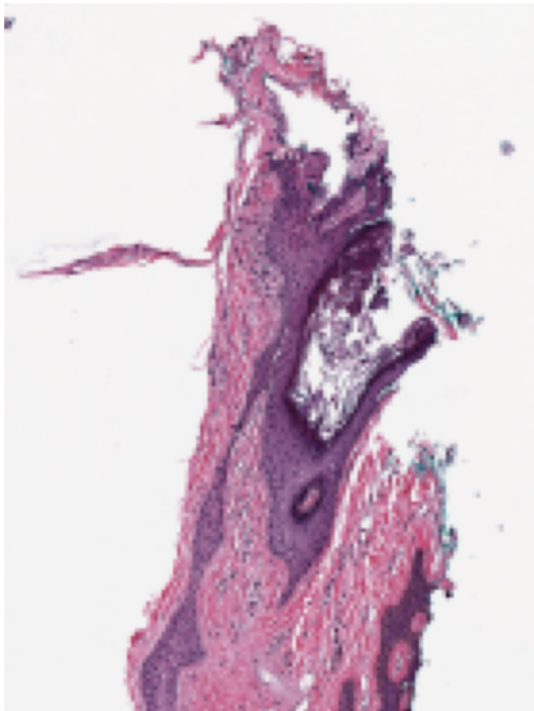
Extract a tile from the WSI

From the figure, a 50×50 patch with top-left at $[50,100]$ (XY-coordinate) in the thumbnail contains both stroma and gland tissue, and is therefore suitable for demonstrating different stainings. The thumbnail is loaded at $\times1.25$ objective power and the WSI at $\times20$. To convert to the highest resolution available, we multiply coordinates by $20/1.25 = 16$, obtaining a patch (named `sample`) with 800×800 pixels, and with the top-left corner of the patch at XY location $[800, 1600]$.

```python
sample = wsi_reader.read_region(
    location=[800, 1600],
    level=0,
    size=[800, 800],  # in X, Y
)
plt.imshow(sample)
plt.axis("off")
plt.show()
```
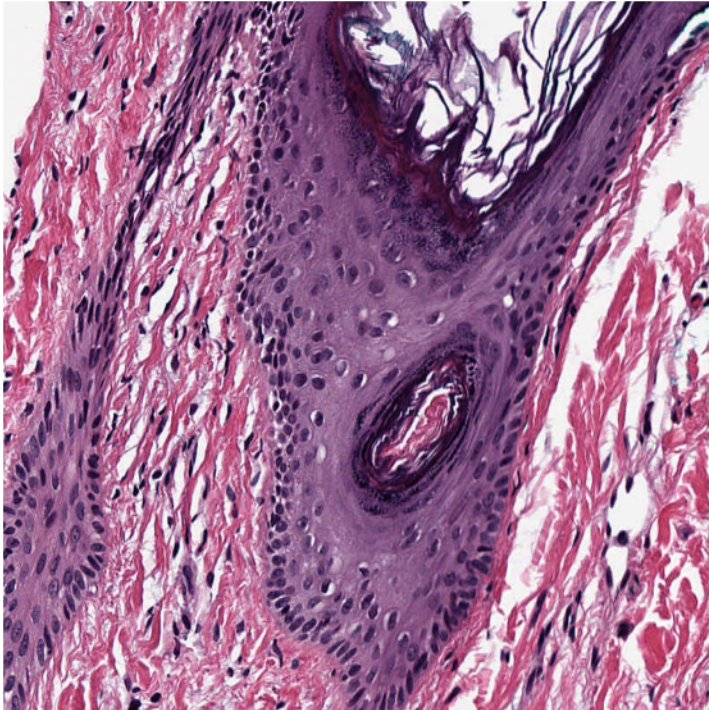

Stain normalizing a tile

We say that an image is a *target*, if we are trying to colour other images, of different tissue, consistently with the colouring of the target. We download a different image to act as target stain.

```python
target_image = data.stain_norm_target()
plt.imshow(target_image)
plt.axis("off")
plt.show()
```
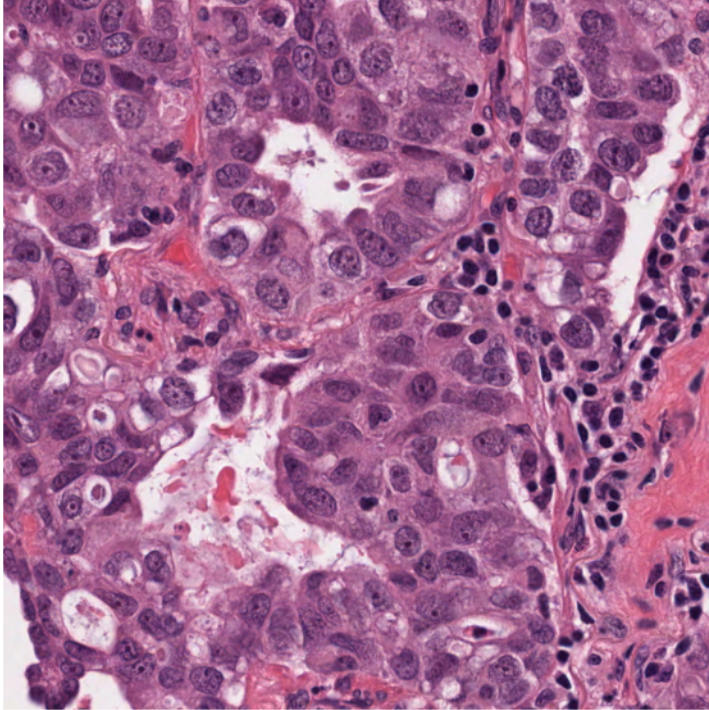
Vahadane method

We can stain-normalize the `sample` image to the target image using the widely known Vahadane method. The functionality of the normalizer is inspired by the `sklearn` calling style and is applied as follows:

```python
stain_normalizer = stainnorm.VahadaneNormalizer()
stain_normalizer.fit(target_image)

normed_sample = stain_normalizer.transform(sample.copy())

plt.figure(figsize=(10, 5))
plt.subplot(1, 3, 1)
plt.imshow(target_image)
plt.title("Target Image")
plt.axis("off")
plt.subplot(1, 3, 2)
plt.imshow(sample)
plt.title("Source Image")
plt.axis("off")
plt.subplot(1, 3, 3)
plt.imshow(normed_sample)
plt.title("Vahadane Stain Normed")
plt.axis("off")
plt.show()
```

Target Image   Source Image   Vahadane Stain Normed
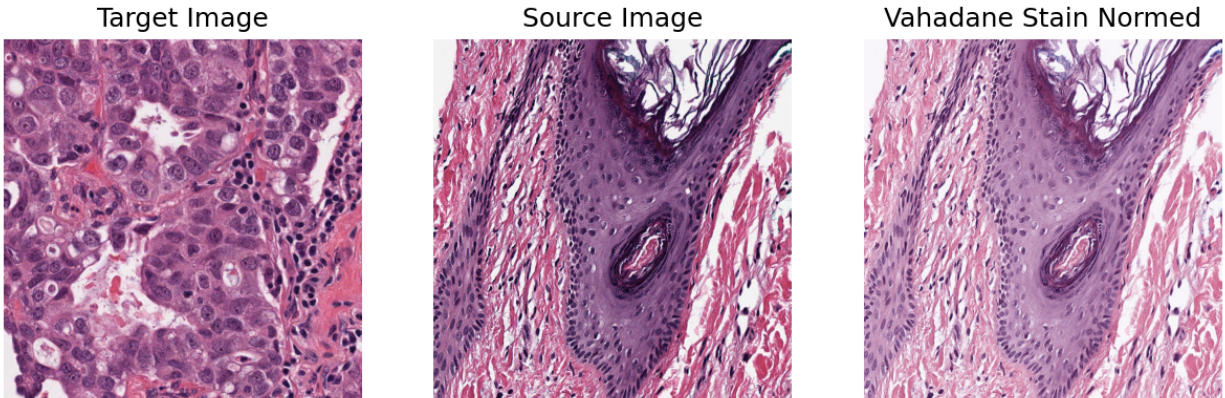
Other stain normalization methods

You can investigate one or more of the stain normalization methods we have implemented, by using either the class name as above, or our getter function `get_normalizer`. The getter function is applied to the corresponding method name. Below, we illustrate the latter approach. The stain normalization names are provided in the `method_name_list` variable. We sequentially apply each method on the `sample` image and plot them for visual comparison.

```python
method_name_list = ["Reinhard", "Ruifrok", "Macenko", "Vahadane"]

plt.subplot(2, 3, 1)
plt.imshow(sample)
plt.title("Source Image")
plt.axis("off")
plt.subplot(2, 3, 4)
plt.imshow(target_image)
plt.title("Target Image")
plt.axis("off")

pos = [2, 3, 5, 6]
for idx, method_name in enumerate(method_name_list):
    stain_normalizer = stainnorm.get_normalizer(method_name)
    stain_normalizer.fit(target_image)

    normed_sample = stain_normalizer.transform(sample.copy())
    plt.subplot(2, 3, pos[idx])
    plt.imshow(normed_sample)
    plt.title(method_name.capitalize())
    plt.axis("off")
plt.tight_layout()
plt.show()
```
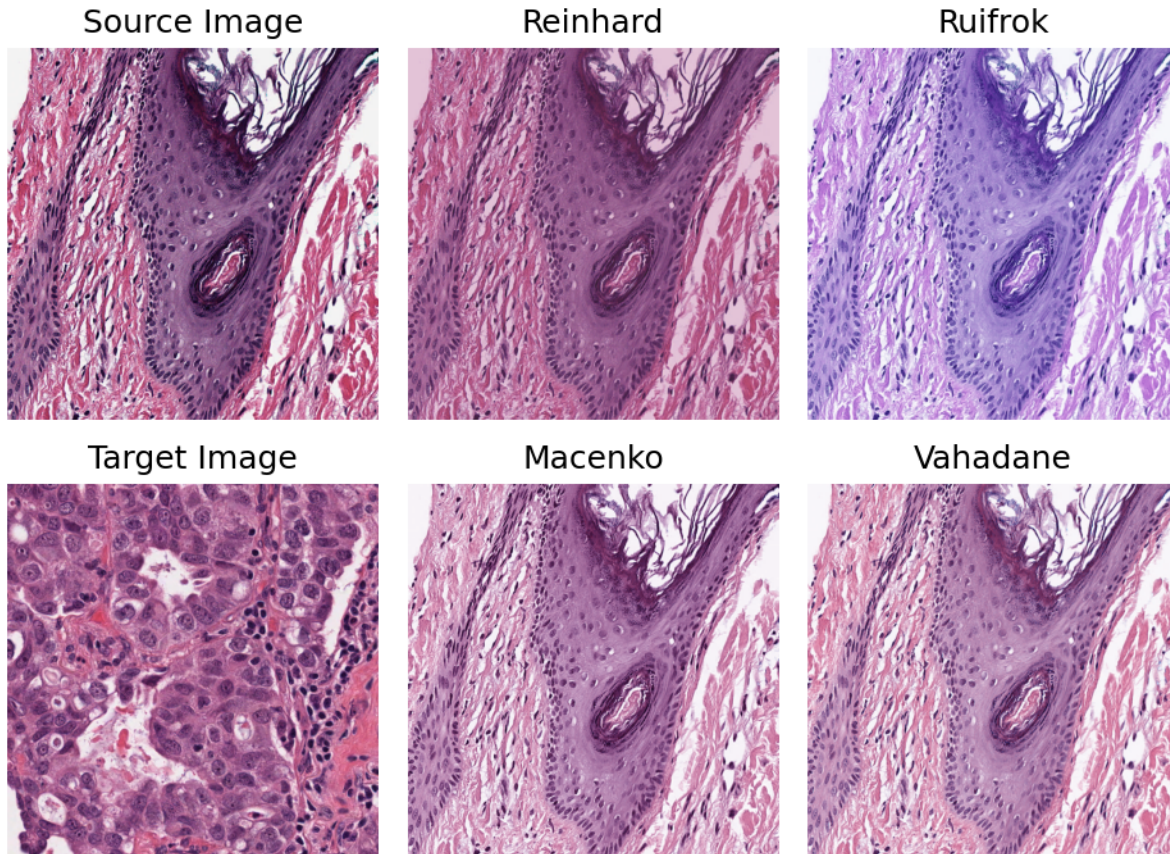
Custom staining

In addition to the four implemented methods, you can implement and use your own method. One way is to subclass the base class `stainnorm.StainNormalizer`. Another way is to provide your own custom stain conversion matrix as input to `stainnorm.StainNormalizer`. (**Note** the former method is for advanced users only! In this notebook, we will only explore the customisation of the input stain matrix.) As an example, we use a stain matrix available from the `skimage` library, namely *Feulgen + Light Green*, a colour model inspired by Robert Feulgen's method of staining DNA. We finally compare using a custom defined stain matrix with using the Vahadane method.

```
stain_matrix = skimage.color.fgx_from_rgb[:2]
custom_normalizer = stainnorm.CustomNormalizer(stain_matrix)
custom_normalizer.fit(target_image)

vahadane_normalizer = stainnorm.VahadaneNormalizer()
vahadane_normalizer.fit(target_image)

normed_sample1 = custom_normalizer.transform(sample.copy())
normed_sample2 = stain_normalizer.transform(sample.copy())

plt.subplot(2, 2, 1)
plt.imshow(sample)
plt.title("Source Image")
plt.axis("off")
plt.subplot(2, 2, 3)
plt.imshow(target_image)
```

(continues on next page)

```
plt.title("Target Image")
plt.axis("off")
plt.subplot(2, 2, 2)
plt.imshow(normed_sample1)
plt.title("Custom Stain Matrix")
plt.axis("off")
plt.subplot(2, 2, 4)
plt.imshow(normed_sample2)
plt.title("Vahadane")
plt.axis("off")
plt.show()
```


Source Image
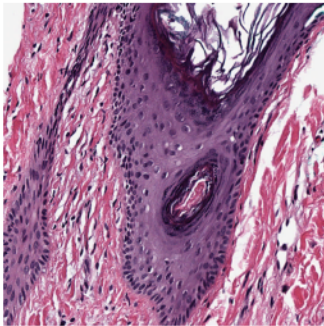
Custom Stain Matrix
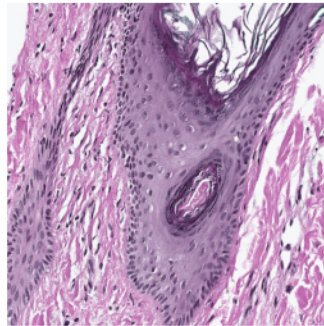
Target Image
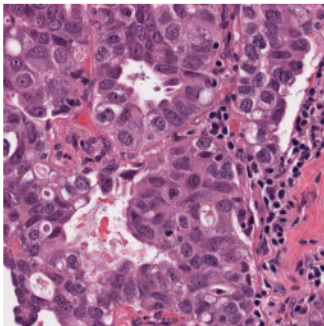
Vahadane
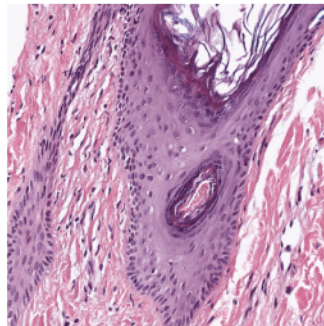
5.2.3 Masking tissue region in whole slide images

Click to open in: [GitHub][Colab]

About this demo

In this example, we will show how you can use tiatoolbox to easily find the tissue region in a whole slide image. Apart from tissue regions, WSIs usually show large blank (glass) background areas that contain no information. Therefore, it is essential to detect the informative (tissue) region in the WSI before any action (like patch extraction and classification). We call this step, "tissue masking". In particular, we introduce the use of our module tissuemask (details) which distinguishes tissue from glass, using an automatic image thresholding algorithm (Otsu's method) and some morphological operations.

Importing related libraries

We will start by importing some libraries required to run this notebook.

```python
"""Import modules required to run the Jupyter notebook."""

from __future__ import annotations

from pathlib import Path
from typing import TYPE_CHECKING

import matplotlib as mpl
import matplotlib.pyplot as plt
import requests

if TYPE_CHECKING:
    import numpy as np

from tiatoolbox.tools.tissuemask import MorphologicalMasker
from tiatoolbox.wsicore.wsireader import WSIReader

mpl.rcParams["figure.dpi"] = 150  # for high resolution figure in notebook
```

Downloading the required files

The next cell creates a temporary directory `tmp` and downloads to that directory, from the internet, an image file. The code illustrates a standard programming technique, designed to minimize the harmful effects of "hard-coding" choices that a user might like to change. Our choices are made explicitly only once, to minimize the amount of editing needed by a user with different choices. The choices are encoded in python variables, in this case `data_dir` and `sample_file_name`, which do not need to be changed when the choices change, and which are used when repetition is needed.

If the notebook is run a second time, the `tmp` directory will be deleted (see above). Cleaning up, after a program is run, is easier when all temporary data is collected at a single point, in this case in the directory `tmp`.

```python
data_dir = "./tmp"
sample_file_name = "sample_wsi_small.svs"

user_sample_wsi_path = None
if user_sample_wsi_path is None:
    sample_wsi_path = f"{data_dir}/{sample_file_name}"
else:
    sample_wsi_path = user_sample_wsi_path
if not Path(sample_wsi_path).exists():
    Path(data_dir).mkdir()
    r = requests.get(
        "https://tiatoolbox.dcs.warwick.ac.uk/sample_wsis/CMU-1-Small-Region.svs",
        timeout=60,  # 60s
    )
    with Path(sample_wsi_path).open("wb") as f:
        f.write(r.content)
```

Reading a WSI and its Thumbnail

The toolbox provides a common interface for different whole slide image file formats produced by different vendors. The functions `WSIReader.open` takes a file path to an image as input and returns an instance of the appropriate subclass of WSIReader. For more information about WSI reading in tiatoolbox, please refer to the documentation and the notebook example dedicated to this topic.

```python
wsi = WSIReader.open(input_img=sample_wsi_path)
print(type(wsi))  # noqa: T201
```

```
<class 'tiatoolbox.wsicore.wsireader.OpenSlideWSIReader'>
```

From the output of the cell above, note that the python variable `wsi` does not refer to an unadorned WSI, but to a more complex object possessing a number of very useful class methods, enabling it to conveniently read various aspects of the image. First, let's check the basic WSI information, such as magnification, dimension, etc. (mpp= microns per pixel).

```python
wsi_info = wsi.info.as_dict()
# Print one item per line
print(*list(wsi_info.items()), sep="\n")  # noqa: T201
```

```
('objective_power', 20.0)
('slide_dimensions', (2220, 2967))
('level_count', 1)
('level_dimensions', ((2220, 2967),))
('level_downsamples', [1.0])
('vendor', 'aperio')
('mpp', (0.499, 0.499))
('file_path', PosixPath('tmp/sample_wsi_small.svs'))
('axes', 'YXS')
```

Working with `tiatoolbox`, it is easy to load a WSI thumbnail using the `slide_thumbnail` method of the `wsi` object. The thumbnail can be loaded with a different magnification, using a convenient choice of coordinates to indicate the resolution. The following options are available for the `units` argument:

- `mpp`: microns per pixel

- `power`: objective power (magnification)

- `level`: the level in the WSI pyramidal file

- `baseline`: pixels per baseline pixel. A *baseline pixel* is a pixel in the level (zero) of the greatest available magnification in this WSI.

We load and show the thumbnail at $\times 1.25$ objective power as follows:

```python
wsi_thumb = wsi.slide_thumbnail(resolution=1.25, units="power")
plt.imshow(wsi_thumb)
plt.axis("off")
plt.show()
```
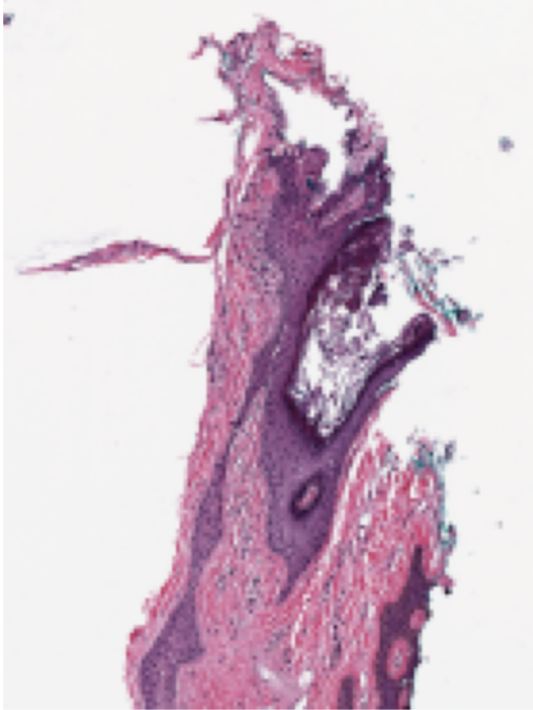
Generating tissue mask in 1 line of code

The task is to distinguish between tissue and glass (no tissue) in the WSI. We compute a mask, by which we mean a binary colouring of the pixels to either blue=glass or yellow=tissue. Generating the tissue mask for a WSI using tiatoolbox is as simple as the following line of code:

```python
mask = wsi.tissue_mask(resolution=1.25, units="power")
```

The two Python variables `mask` and `wsi` are both instances of the class `WSIReader`, and therefore have the same attributes, and can be treated in the same way. For example, we can visualize the original image and the mask next to each other at the same resolution and at the same size. Now, let's see the thumbnails of the original `wsi` and its `mask` at the same resolution.

```python
mask_thumb = mask.slide_thumbnail(
    resolution=1.25,
    units="power",
)  # extracting the mask_thumb at the same resolution as wsi_thumb


# showing the result
def show_side_by_side(image_1: np.ndarray, image_2: np.ndarray) -> None:
    """Helper function to shows images side-by-side."""
    plt.subplot(1, 2, 1)
    plt.imshow(image_1)
    plt.axis("off")
    plt.subplot(1, 2, 2)
    plt.imshow(image_2)
    plt.axis("off")
    plt.show()
```

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```
show_side_by_side(wsi_thumb, mask_thumb)
```
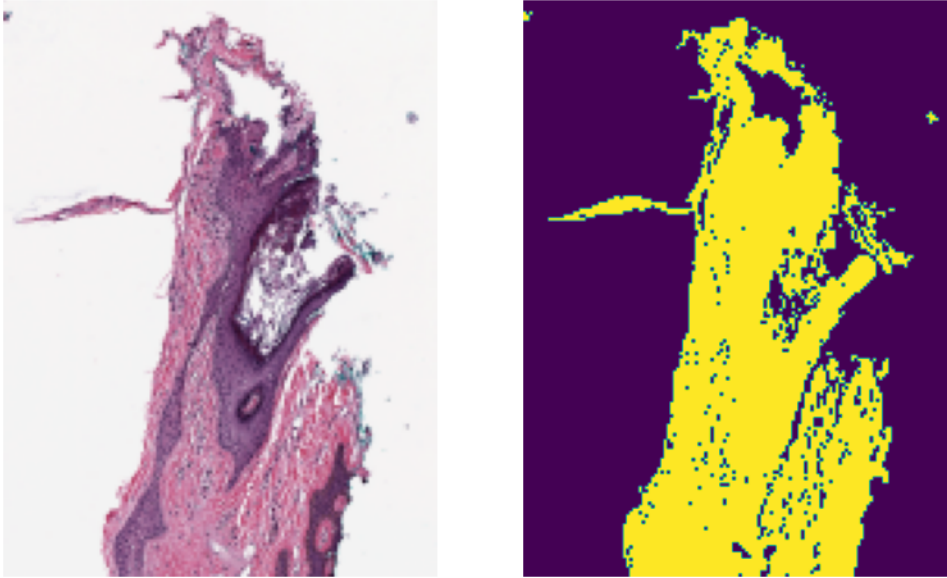

As you can see, the generated mask resembles the tissue area of the original WSI pretty closely. This kind of mask is usually used in digital pathology pipelines to specify the regions from which to extract patches at high resolution. Besides, extracting thumbnails, we can also extract regions from the `mask` object in the same way that we do for the `wsi` object:

```
wsi_region = wsi.read_region(location=(1024, 512), level=0, size=(512, 512))
mask_region = mask.read_region(location=(1024, 512), level=0, size=(512, 512))

show_side_by_side(wsi_region, mask_region)
```
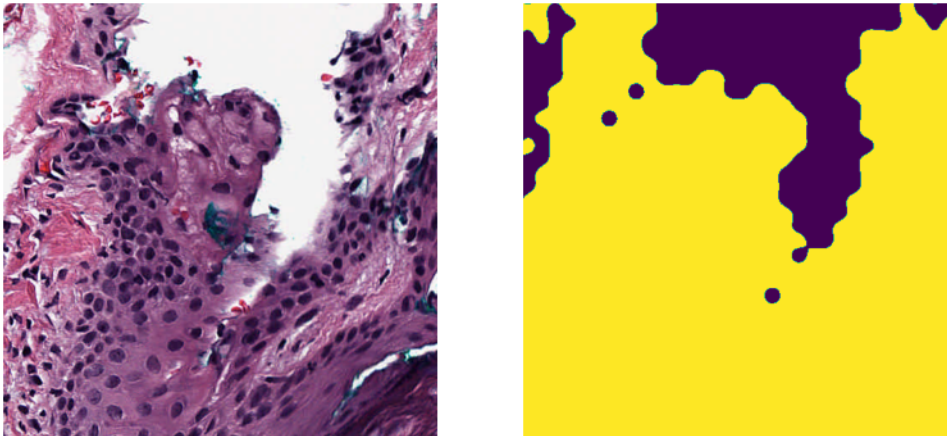

As expected, the coordinates of the original `wsi` and the `mask` line up precisely. This can be particularly useful if you want to calculate statistics of the tissue region in a patch (e.g., tissue area, intensity, and texture information).

There are some options (arguments) that can be used when calling `tissue_mask()` to achieve a more detailed tissue mask in high resolution or to remove small objects from the tissue mask. This will be explained in the next section.

Generating tissue masks for batch

Utilizing the functionalities in the `tissuemask` tool of the tiatoolbox, we can extract tissue masks for a batch of images. Here we use `MorphologicalMasker` to generate tissue masks for a list of input image regions.

First, we extract two different regions from the `wsi`. This is our batch of (only two) images to be processed using read_rect. We then instantiate a `MorphologicalMasker` object to be used in a later cell for extraction of masks from the batch:

```python
# extracting the regions
mag_power = 20  # magnification power to extract patches and calculate the kernel_size
region1 = wsi.read_rect(
    location=(1024, 256),
    size=(512, 512),
    resolution=mag_power,
    units="power",
)
region2 = wsi.read_rect(
    location=(1536, 2048),
    size=(512, 512),
    resolution=mag_power,
    units="power",
)

# instantiating a MorphologicalMasker
masker = MorphologicalMasker(power=mag_power)
```

Now, let's apply the `masker` on the extracted patches:

```python
masks = masker.fit_transform([region1, region2])

# showing the results
show_side_by_side(region1, masks[0])
show_side_by_side(region2, masks[1])
```
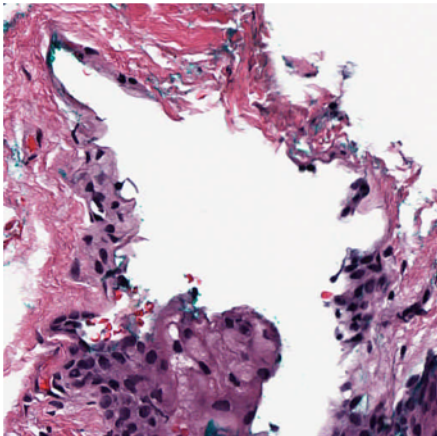
An optimal threshold is found by `fit_transform` using Otsu's method. This is followed by deleting small objects and applying morphological dilation. Dilation results in overflow of the true boundaries of tissue regions. The overflow is deliberate, because we prefer not to miss tissue information.

The `fit_transform` function expects inputs that are (lists of) `numpy` arrays. That is why the inputs are enclosed by square brackets, *eg* `masker.fit_transform([region1, region2])`. The `fit_transform` function accepts a list of RGB images or a numpy array in the expected shape of N$\times$H$\times$W$\times$C (number of images, height, width, channels). It outputs a list of tissue masks

`MorphologicalMasker` can be used with different **optional** arguments:

- `kernel_size`: Size of the elliptical kernel to be used for morphological operations in mask post-processing.
- `mpp`: The microns per pixel of the image to be masked. Used to calculate `kernel_size`.
- `power`: The objective power of the image to be masked. Used to calculate `kernel_size`.
- `min_region_size`: Minimum region size in pixels to consider as foreground.

Note that only one of the named arguments `kernel_size`, `mpp`, or `power` should be used. Only the `kernel_size` is needed in morphological operations; the other two possible arguments are used only to calculate a suitable `kernel_size`. More information can be found in the definition of tissuemask.

Next we compute the mask of `wsi_thumb` using `MorphologicalMasker` and investigate the effect of changing parameters on the outputs:

```python
def make_subplot(image: np.ndarray, title: str, k: int) -> None:
    """Make a 1x5 subplot."""
    plt.subplot(1, 5, k)
    plt.imshow(image)
    plt.axis("off")
    plt.title(title, fontdict={"fontsize": 5})


# default: kernel_size=1, min_region_size=1
masker = MorphologicalMasker()
masks_default = masker.fit_transform([wsi_thumb])

# meaning deleting objects smaller than 30 pixels in area
masker = MorphologicalMasker(min_region_size=30)
masks_small = masker.fit_transform([wsi_thumb])

# applying morphological dilation with a elliptical kernel (r=5) and
```

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```python
# deleting objects smaller than pi*5^2=78 pixels in area
masker = MorphologicalMasker(kernel_size=5)
masks_opt = masker.fit_transform([wsi_thumb])

# resulting to a over estimated kernel_size, hence bigger mask
masker = MorphologicalMasker(power=20)
masks_big = masker.fit_transform([wsi_thumb])

# showing the result
make_subplot(wsi_thumb, "Thumbnail", 1)
make_subplot(masks_default[0], "Default mask", 2)
make_subplot(masks_small[0], "Setting min_region_size=30", 3)
make_subplot(masks_opt[0], "Setting kernel_size=5", 4)
make_subplot(masks_big[0], "Setting power=20", 5)

plt.show()
```
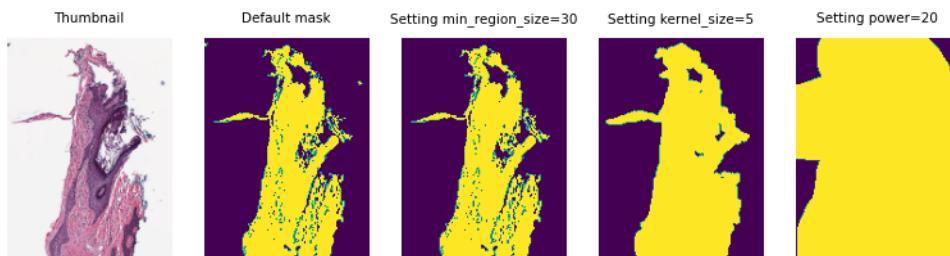

As you can see, changing the parameters can change the resulting mask considerably. But don't worry! Normally you don't need to change or set anything when you are working with WSIs in `tiatoolbox`. Use the default arguments of functions—the toolbox will try to find the best parameters for your input WSI (as we did when we called `mask = wsi.tissue_mask()`).

Feel free to try these functionalities on your own data, or change the parameters to see how they can affect the output mask.

5.2.4 Patch extraction from Histology Images

Click to open in: [GitHub][Colab]

About this demo

In this example we will show how you can use tiatoolbox to extract patches from a large histology image. Tiatoolbox can extract patches in different ways, such as point-based, fixed-window, and variable-window patch extraction. One practical use of these tools is when using deep learning models that cannot accept large images in the input. In particular, we will introduce the use of our module `patchextraction` (details).

Importing related libraries

We will start by importing some libraries required to run this notebook.

```python
"""Import modules required to run the Jupyter notebook."""

# Clear logger to use tiatoolbox.logger
import logging

if logging.getLogger().hasHandlers():
    logging.getLogger().handlers.clear()


from pathlib import Path

import matplotlib as mpl
import matplotlib.pyplot as plt
import numpy as np
import requests

from tiatoolbox import logger
from tiatoolbox.tools import patchextraction
from tiatoolbox.utils.misc import imread, read_locations

mpl.rcParams["figure.dpi"] = 300  # for high resolution figure in notebook
mpl.rcParams["figure.facecolor"] = "white"  # To make sure text is visible in dark
↪mode
```

```
![ -d tmp ] && ( echo "deleting tmp directory"; rm -rf tmp )
```

Downloading the required files

We download, over the internet, a couple of files (a histology image and a csv file containing the positions of nuclei in that image). Download is needed once in each Colab session.

```python
img_file_name = "sample_img.png"
csv_file_name = "sample_coordinates.csv"

# Downloading sample image from MoNuSeg
r = requests.get(
    "https://tiatoolbox.dcs.warwick.ac.uk/testdata/patchextraction/TCGA-HE-7130-01Z-
↪00-DX1.png",
    timeout=10,  # 10s
)
with Path(img_file_name).open("wb") as f:
    f.write(r.content)

# Downloading points list
r = requests.get(
    "https://tiatoolbox.dcs.warwick.ac.uk/testdata/patchextraction/sample_patch_
↪extraction.csv",
    timeout=10,  # 10s
)
with Path(csv_file_name).open("wb") as f:
    f.write(r.content)

logger.info("Download is complete.")
```

```
|2023-07-25|15:45:43.486| [INFO] Download is complete.
```

Reading image and annotation file

We use a sample image from the MoNuSeg dataset, for which nuclei have already been located (manually) and centroids computed. The sample image and list of points are loaded from the internet. The function `read_locations` returns a dataFrame, in which a typical row has the form $(x, y, class)$. Here (x,y) are coordinates for a particular centroid, and *class* is the type of that patch. For this example, "class" can indicate the type of the nucleus, such as "epithelial" or "inflammatory". In the simple situation we are illustrating here, biological information has not been provided, and is replaced by a meaningless number 0.0, which is just a place-holder. Dataframes in Python are handled using `pandas`. You don't need to learn the details to understand this demo, but, if you want to use dataframes in your own code, or to replace data in this notebook by your own data, you will need to find out more about pandas.

```
input_img = imread(img_file_name)
centroids_list = read_locations(csv_file_name)

logger.info(
    "Image size: (%d, %d, %d)",
    input_img.shape[0],
    input_img.shape[1],
    input_img.shape[2],
)
logger.info("This image has %d point annotations", centroids_list.shape[0])
logger.info("\t" + centroids_list.head().to_string().replace("\n", "\n\t"))
```

```
|2023-07-25|15:45:43.628| [INFO] Image size: (1000, 1000, 3)
|2023-07-25|15:45:43.631| [INFO] This image has 1860 point annotations
|2023-07-25|15:45:43.640| [INFO]                   x     y  class
          0  14.0   3.0    0.0
          1   3.0  15.0    0.0
          2  13.0  13.0    0.0
          3  58.0   8.0    0.0
          4  69.0   8.0    0.0
```

To see better what we are dealing with here, we show the image, first in its original form, and then with the desired centroids overlaid.

```
input_img = imread(img_file_name)
plt.imshow(input_img)
plt.axis("off")
plt.show()

# overlay nuclei centroids on image and plot
plt.imshow(input_img)
plt.scatter(np.array(centroids_list)[:, 0], np.array(centroids_list)[:, 1], s=1)
plt.axis("off")
plt.show()
```
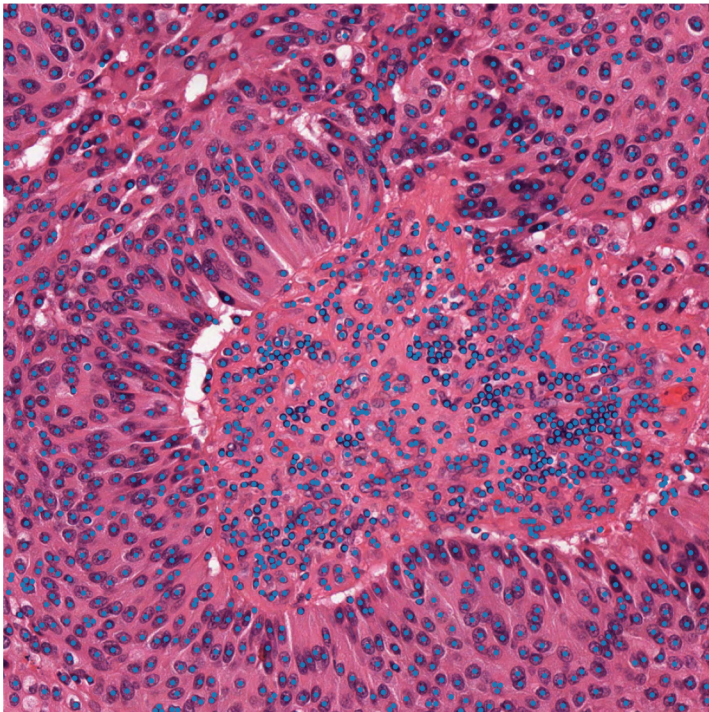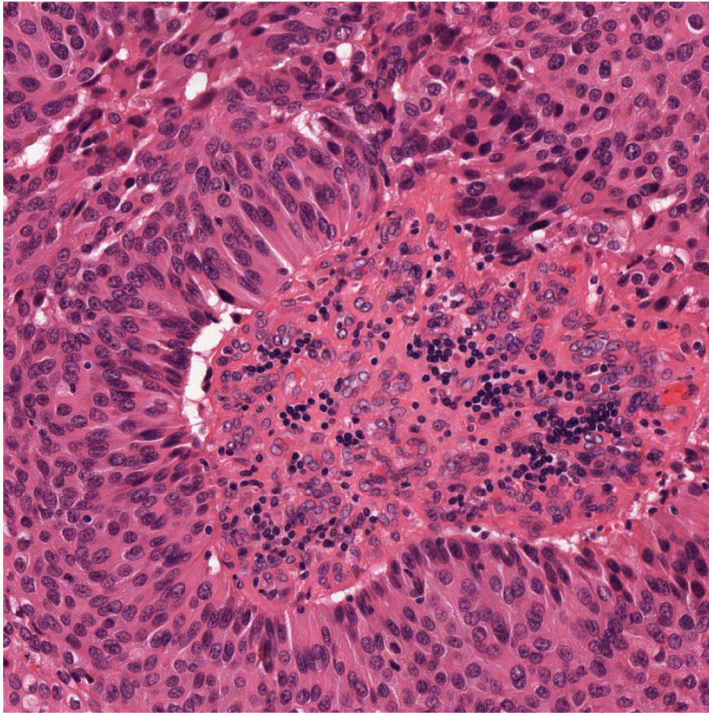
Patches based on point annotations

As you can see in the above figure, each nucleus is marked with a blue dot. To train a nucleus classifier computer program (or a beginning pathologist), it is helpful to see a nucleus in context, that is, within a surrounding patch. Therefore, we extract, for each nucleus, a patch centred on that nucleus. If the third column of our dataframe has been completed meaningfully (which is not the case in our example), it is then easy to save patches in different folders based on their biological significance or class=classification. This can be done using functions from the Python classes defined in our module `patchextraction` . (We are using both class=biological classification and class=Python class for coding.) The `patch_extractor` yields patches from the image, `input_img`, based on the `centroids_list` in a one-by-one manner. In the next code cell, we show how to use the function `get_patch_extractor` to obtain a suitable `patch_extractor`

```
patch_extractor = patchextraction.get_patch_extractor(
    input_img=input_img,  # input image path, numpy array, or WSI object
    locations_list=np.array(centroids_list)[
        500:600,
        :,
    ],  # path to list of points (csv, json), numpy list, panda DF
    method_name="point",  # also supports "slidingwindow"
    patch_size=(
        32,
        32,
    ),  # size of the patch to extract around the centroids from centroids_list
    resolution=0,
    units="level",
)
```

As you can see, `patchextraction.get_patch_extractor` accepts several arguments:

- `input_img`: The image from which we want to extract patches. We can read the image and pass it to the function as a numpy array or instead, you can pass the path of the image file to the function.

- `locations_list`: The list of points at which the required patches will be centred. We load the points list as a panda data frame and pass it to the function or instead, you can pass to the function the path to a csv, npy or json file.

- `method_name`: This important argument specifies the type of patch extractor that we want to build. As we are looking to extract patches around centroid points, we use here the `point` option. Another option of `sliding-window` is also supported. Please refer to the documentation for more information.

- `patch_size`: Size of the patches.

- `resolution` and `unit`: These arguments specify the level or micron-per-pixel resolution of the WSI. Here we specify the WSI's level 0. In general, this is the level of the greatest resolution, although, in this particular case, the image has only one level. More information can be found in the documentation.

The `patch_extractor` yields information in small chunks, to avoid potential memory problems when the list of centroids is very long. To extract patches using the `patch_extractor` we use *for loop*s as below, where we extract the first 16 patches specified by `centroids_list`.

```
i = 1
# show only first 16 patches
num_patches_to_show = 16

for patch in patch_extractor:
    plt.subplot(4, 4, i)
    plt.imshow(patch)
    plt.axis("off")
```

```
    if i >= num_patches_to_show:
        break
    i += 1
plt.show()
```

```
|2023-07-25|15:45:47.496| [WARNING] Raw data is None.
|2023-07-25|15:45:47.499| [WARNING] Unknown scale (no objective_power or mpp)
```
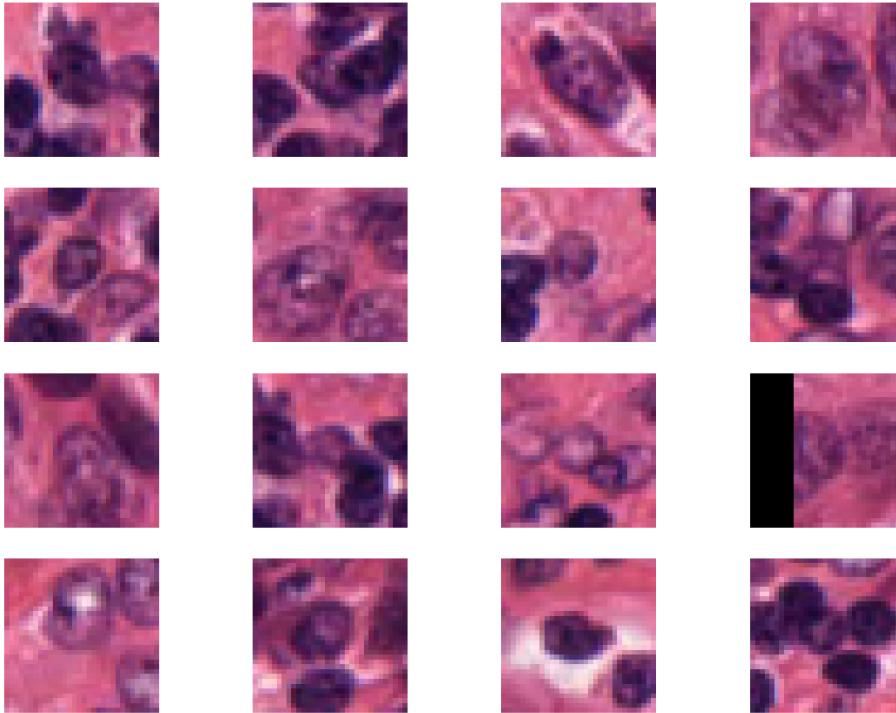

Using the defined point `patch_extractor` we can extract a patch around a particular point in the dataFrame. For that, you just simply specify the index of the desired point for the `patch_extractor`. For example, if we want to extract the patch around the 66th point in the dataFrame, we can do as below:

```
desired_patch = patch_extractor[66]

plt.subplot(4, 4, 1)
plt.imshow(desired_patch)
plt.axis("off")
```

```
(-0.5, 31.5, 31.5, -0.5)
```

Generate fixed-size patches

A very common practice in computational pathology, when analysing large histology images or WSIs, is to extract overlapping patches from that image and analyse them one by one. Deep Learning models often cannot accept large images due to memory limitations. We designed a tool in Tiatoolbox to ease the process of overlapping patch extraction for such goals.

The same `patchextraction` class supports another method that allows the user to extract all the patches from the input image in an efficient way, using just one line of code. In order to do that, one changes the method name in the `patchextraction` to `"slidingwindow"` as below:

```
fixed_patch_extractor = patchextraction.get_patch_extractor(
    input_img=input_img,  # input image path, numpy array, or WSI object
    method_name="slidingwindow",  # also supports "point" and "slidingwindow"
    patch_size=(
        500,
        500,
    ),  # size of the patch to extract around the centroids from centroids_list
    stride=(500, 500),  # stride of extracting patches, default is equal to patch_size
)
```

```
|2023-07-25|15:45:48.854| [WARNING] Raw data is None.
|2023-07-25|15:45:48.856| [WARNING] Unknown scale (no objective_power or mpp)
```

The `patchextraction` splits the input image into patches of size 500x500 without any overlap, because the `stride` of patch extraction is the same as `patch_size`. The `fixed_patch_extractor` is an iterator that yields a patch each time it is called. As in the example above, we can use a **for** loop to access these patches:

```
i = 1
for patch in fixed_patch_extractor:
    plt.subplot(2, 2, i)
    plt.imshow(patch)
    plt.axis("off")
    i += 1
plt.show()
```
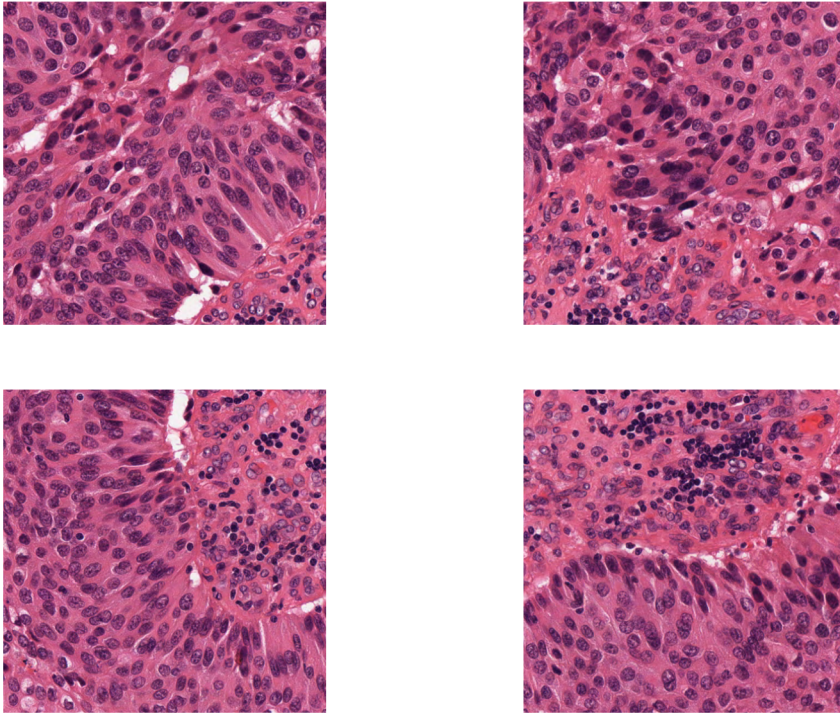
Otherwise, by setting the `stride` smaller than the 'patch_size`, we can extract overlapping patches. Below we extract 500x500 patches that have 250 pixels overlap in both axes.

```python
fixed_patch_extractor = patchextraction.get_patch_extractor(
    input_img=input_img,  # input image path, numpy array, or WSI object
    method_name="slidingwindow",  # also supports "point" and "slidingwindow"
    patch_size=(
        500,
        500,
    ),  # size of the patch to extract around the centroids from centroids_list
    stride=(250, 250),  # 250 pixels overlap in both axes
)


i = 1
for patch in fixed_patch_extractor:
    plt.subplot(4, 4, i)
    plt.imshow(patch)
    plt.axis("off")
    i += 1
plt.show()
```

```
|2023-07-25|15:45:50.499| [WARNING] Raw data is None.
|2023-07-25|15:45:50.503| [WARNING] Unknown scale (no objective_power or mpp)
```
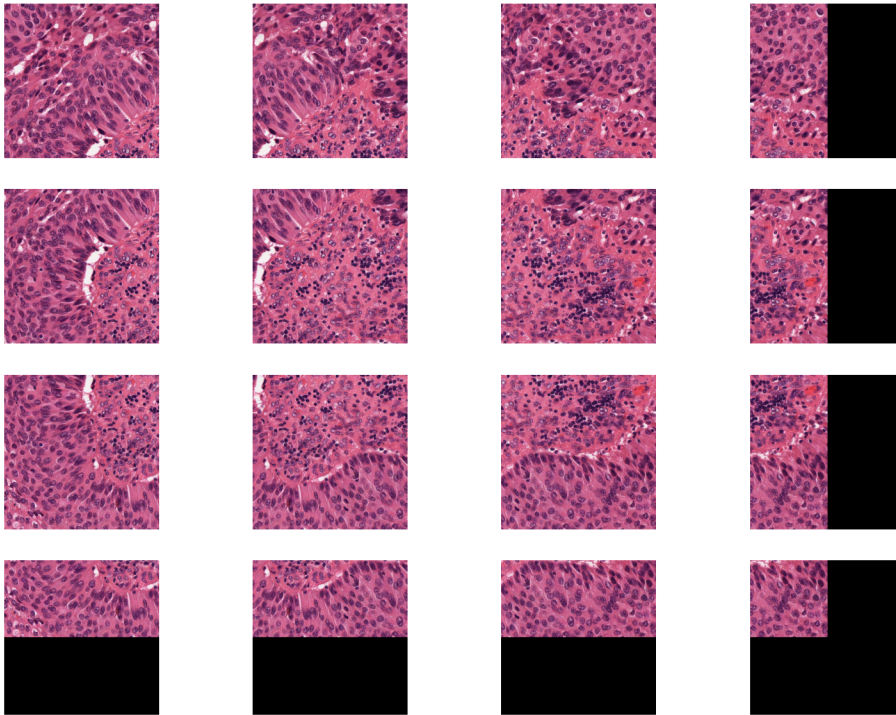
Remember, you can always access a specific patch in your patch extractor using its index, as below:

```
patch_idx = 4  # setting the patch index to point the fifth (middle) patch
this_path = fixed_patch_extractor[patch_idx]  # extracting the desired patch

# displaying the patch
plt.subplot(3, 3, 1)
plt.imshow(this_path)
plt.axis("off")
plt.show()
```
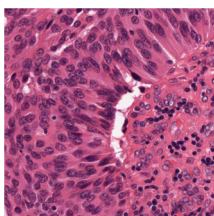

As you can see, the extracted patch is the same as the middle one in the above example.

5.2.5 Patch Prediction Models

Click to open in: [GitHub][Colab]

About this demo

In this example, we will show how to use TIAToolbox for patch-level prediction using a range of deep learning models. TIAToolbox can be used to make predictions on pre-extracted image patches or on larger image tiles / whole-slide images (WSIs), where image patches are extracted on the fly. WSI patch-level predictions can subsequently be aggregated to obtain a segmentation map. In particular, we will introduce the use of our module `patch_predictor` (details). A full list of the available models trained and provided in TIAToolbox for patch-level prediction is given below.

- Models trained on the Kather 100k dataset (details):

    - `alexnet-kather100k`

    - `resnet18-kather100k`

    - `resnet34-kather100k`

    - `resnet50-kather100k`

    - `resnet101-kather100k`

    - `resnext50_32x4d-kather100k`

    - `resnext101_32x8d-kather100k`

    - `wide_resnet50_2-kather100k`

    - `wide_resnet101_2-kather100k`

    - `densenet121-kather100k`

    - `densenet161-kather100k`

    - `densenet169-kather100k`

    - `densenet201-kather100k`

    - `mobilenet_v2-kather100k`

    - `mobilenet_v3_large-kather100k`

    - `mobilenet_v3_small-kather100k`

    - `googlenet-kather100k`

Importing related libraries

We import some standard Python modules, and also the TIAToolbox Python modules for the patch classification task, written by the TIA Centre team.

```python
"""Import modules required to run the Jupyter notebook."""

from __future__ import annotations

# Clear logger to use tiatoolbox.logger
import logging

if logging.getLogger().hasHandlers():
```

(continues on next page)

```python
    logging.getLogger().handlers.clear()

import shutil
import warnings
from pathlib import Path
from zipfile import ZipFile

import matplotlib as mpl
import matplotlib.pyplot as plt
import numpy as np
import pandas as pd
import seaborn as sns
from matplotlib import cm
from sklearn.metrics import accuracy_score, confusion_matrix

from tiatoolbox import logger
from tiatoolbox.models.engine.patch_predictor import (
    IOPatchPredictorConfig,
    PatchPredictor,
)
from tiatoolbox.utils.misc import download_data, grab_files_from_dir, imread
from tiatoolbox.utils.visualization import overlay_prediction_mask
from tiatoolbox.wsicore.wsireader import WSIReader

mpl.rcParams["figure.dpi"] = 160  # for high resolution figure in notebook
mpl.rcParams["figure.facecolor"] = "white"  # To make sure text is visible in dark
 →mode
```

Downloading the required files

We download, over the internet, image files used for the purpose of this notebook. In particular, we download a sample
subset of validation patches that were used when training models on the Kather 100k dataset, a sample image tile and
a sample whole-slide image. Downloading is needed once in each Colab session and it should take less than 1 minute.
In Colab, if you click the file's icon (see below) in the vertical toolbar on the left-hand side then you can see all the files
which the code in this notebook can access. The data will appear here when it is downloaded.

```python
img_file_name = global_save_dir / "sample_tile.png"
wsi_file_name = global_save_dir / "sample_wsi.svs"
patches_file_name = global_save_dir / "kather100k-validation-sample.zip"
imagenet_samples_name = global_save_dir / "imagenet_samples.zip"

logger.info("Download has started. Please wait...")

# Downloading sample image tile
download_data(
    "https://tiatoolbox.dcs.warwick.ac.uk/sample_imgs/CRC-Prim-HE-05_APPLICATION.tif",
    img_file_name,
)

# Downloading sample whole-slide image
download_data(
    "https://tiatoolbox.dcs.warwick.ac.uk/sample_wsis/TCGA-3L-AA1B-01Z-00-DX1.
 →8923A151-A690-40B7-9E5A-FCBEDFC2394F.svs",
```

```
    wsi_file_name,
)

# Download a sample of the validation set used to train the Kather 100K dataset
download_data(
    "https://tiatoolbox.dcs.warwick.ac.uk/datasets/kather100k-validation-sample.zip",
    patches_file_name,
)
# Unzip it!
with ZipFile(patches_file_name, "r") as zipfile:
    zipfile.extractall(path=global_save_dir)

# Download some samples of imagenet to test the external models
download_data(
    "https://tiatoolbox.dcs.warwick.ac.uk/sample_imgs/imagenet_samples.zip",
    imagenet_samples_name,
)
# Unzip it!
with ZipFile(imagenet_samples_name, "r") as zipfile:
    zipfile.extractall(path=global_save_dir)

logger.info("Download is complete.")
```

```
|2023-11-08|10:31:21.808| [INFO] Download has started. Please wait...
|2023-11-08|10:36:11.073| [INFO] Download is complete.
```

Get predictions for a set of patches

Below we use `tiatoolbox` to obtain the model predictions for a set of patches with a pretrained model.

We use patches from the validation subset of Kather 100k dataset. This dataset has already been downloaded in the download section above. We first read the data and convert it to a suitable format. In particular, we create a list of patches and a list of corresponding labels. For example, the first label in `label_list` will indicate the class of the first image patch in `patch_list`.

```
# read the patch data and create a list of patches and a list of corresponding labels

dataset_path = global_save_dir / "kather100k-validation-sample"

# set the path to the dataset
image_ext = ".tif"  # file extension of each image

# obtain the mapping between the label ID and the class name
label_dict = {
    "BACK": 0,
    "NORM": 1,
    "DEB": 2,
    "TUM": 3,
    "ADI": 4,
    "MUC": 5,
    "MUS": 6,
    "STR": 7,
    "LYM": 8,
}
class_names = list(label_dict.keys())
```

```python
class_labels = list(label_dict.values())

# generate a list of patches and generate the label from the filename
patch_list = []
label_list = []
for class_name, label in label_dict.items():
    dataset_class_path = dataset_path / class_name
    patch_list_single_class = grab_files_from_dir(
        dataset_class_path,
        file_types="*" + image_ext,
    )
    patch_list.extend(patch_list_single_class)
    label_list.extend([label] * len(patch_list_single_class))


# show some dataset statistics
plt.bar(class_names, [label_list.count(label) for label in class_labels])
plt.xlabel("Patch types")
plt.ylabel("Number of patches")

# count the number of examples per class
for class_name, label in label_dict.items():
    logger.info(
        "Class ID: %d -- Class Name: %s -- Number of images: %d",
        label,
        class_name,
        label_list.count(label),
    )


# overall dataset statistics
logger.info("Total number of patches: %d", (len(patch_list)))
```

```
|2023-11-08|10:36:11.158| [INFO] Class ID: 0 -- Class Name: BACK -- Number of images:␣
→211
|2023-11-08|10:36:11.159| [INFO] Class ID: 1 -- Class Name: NORM -- Number of images:␣
→176
|2023-11-08|10:36:11.166| [INFO] Class ID: 2 -- Class Name: DEB -- Number of images:␣
→230
|2023-11-08|10:36:11.167| [INFO] Class ID: 3 -- Class Name: TUM -- Number of images:␣
→286
|2023-11-08|10:36:11.168| [INFO] Class ID: 4 -- Class Name: ADI -- Number of images:␣
→208
|2023-11-08|10:36:11.169| [INFO] Class ID: 5 -- Class Name: MUC -- Number of images:␣
→178
|2023-11-08|10:36:11.170| [INFO] Class ID: 6 -- Class Name: MUS -- Number of images:␣
→270
|2023-11-08|10:36:11.173| [INFO] Class ID: 7 -- Class Name: STR -- Number of images:␣
→209
|2023-11-08|10:36:11.175| [INFO] Class ID: 8 -- Class Name: LYM -- Number of images:␣
→232
|2023-11-08|10:36:11.176| [INFO] Total number of patches: 2000
```
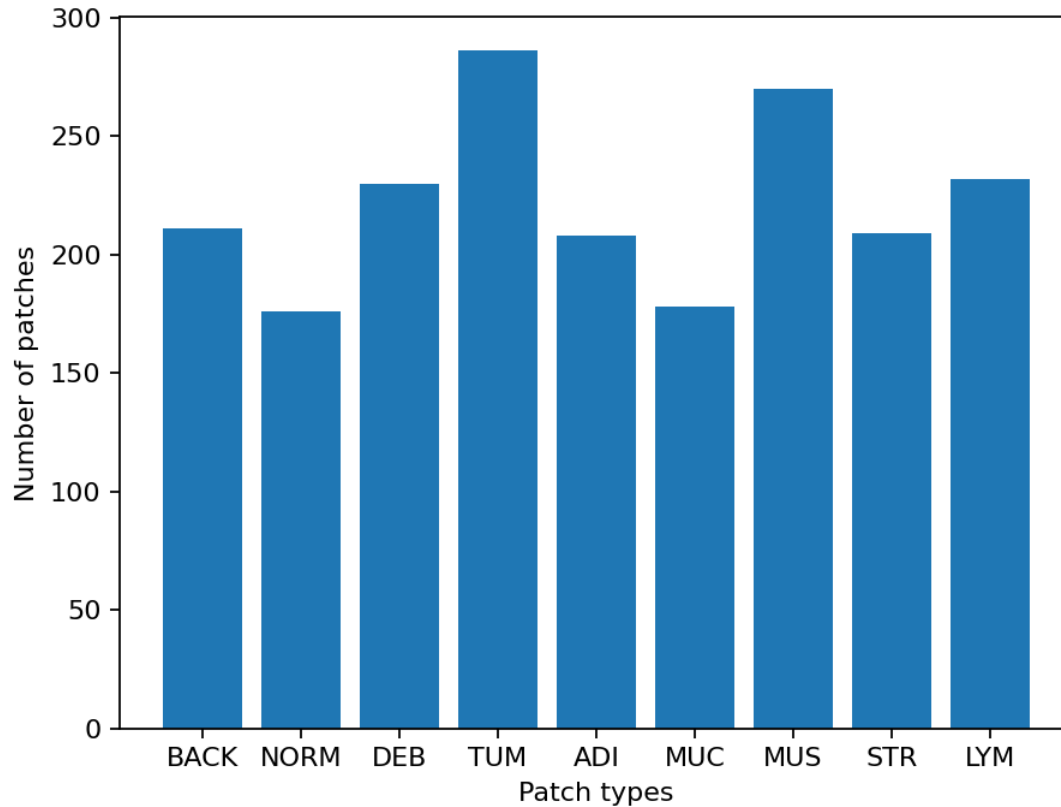
As you can see for this patch dataset, we have 9 classes/labels with IDs 0-8 and associated class names. describing the dominant tissue type in the patch:

- BACK → Background (empty glass region)

- LYM → Lymphocytes

- NORM → Normal colon mucosa

- DEB → Debris

- MUS → Smooth muscle

- STR → Cancer-associated stroma

- ADI → Adipose

- MUC → Mucus

- TUM → Colorectal adenocarcinoma epithelium

It is easy to use this code for your dataset - just ensure that your dataset is arranged like this example (images of different classes are placed into different subfolders), and set the right image extension in the `image_ext` variable.

Predict patch labels in 2 lines of code

Now that we have the list of images, we can use TIAToolbox's `PatchPredictor` to predict their category. First, we instantiate a predictor object and then we call the `predict` method to get the results.

```
predictor = PatchPredictor(pretrained_model="resnet18-kather100k", batch_size=32)
output = predictor.predict(imgs=patch_list, mode="patch", on_gpu=ON_GPU)
```

```
Downloading: "https://download.pytorch.org/models/resnet18-f37072fd.pth" to /root/.
→cache/torch/hub/checkpoints/resnet18-f37072fd.pth
100%|██████████| 44.7M/44.7M [00:00<00:00, 146MB/s]
100%|################################################| 63/63 [00:18<00:00,  3.40it/s]
```

Patch Prediction is Done!

The first line creates a CNN-based patch classifier instance based on the arguments and prepares a CNN model (generates the network, downloads pretrained weights, etc.). The CNN model used in this predictor can be defined using the `pretrained_model` argument. A complete list of supported pretrained classification models, that have been trained on the Kather 100K dataset, is reported in the first section of this notebook. `PatchPredictor` also enables you to use your own pretrained models for your specific classification application. In order to do that, you might need to change some input arguments for `PatchPredictor`, as we now explain:

- `model`: Use an externally defined PyTorch model for prediction, with weights already loaded. This is useful when you want to use your own pretrained model on your own data. The only constraint is that the input model should follow `tiatoolbox.models.abc.ModelABC` class structure. For more information on this matter, please refer to our example notebook on advanced model techniques.

- `pretrained_model` : This argument has already been discussed above. With it, you can tell tiatoolbox to use one of its pretrained models for the prediction task. A complete list of pretrained models can be found here. If both `model` and `pretrained_model` arguments are used, then `pretrained_model` is ignored. In this example, we used `resnet18-kather100K`, which means that the model architecture is an 18 layer ResNet, trained on the Kather100k dataset.

- `pretrained_weight`: When using a `pretrained_model`, the corresponding pretrained weights will also be downloaded by default. You can override the default with your own set of weights via the `pretrained_weight` argument.

- `batch_size`: Number of images fed into the model each time. Higher values for this parameter require a larger (GPU) memory capacity.

The second line in the snippet above calls the `predict` method to apply the CNN on the input patches and get the results. Here are some important `predict` input arguments and their descriptions:

- `mode`: Type of input to be processed. Choose from `patch`, `tile` or `wsi` according to your application. In this first example, we predict the tissue type of histology patches, so we use the `patch` option. The use of `tile` and `wsi` options are explained below.

- `imgs`: List of inputs. When using `patch` mode, the input must be a list of images OR a list of image file paths, OR a Numpy array corresponding to an image list. However, for the `tile` and `wsi` modes, the `imgs` argument should be a list of paths to the input tiles or WSIs.

- `return_probabilities`: set to *True* to get per class probabilities alongside predicted labels of input patches. If you wish to merge the predictions to generate prediction maps for `tile` or `wsi` modes, you can set `return_probabilities=True`.

In the `patch` prediction mode, the `predict` method returns an output dictionary that contains the `predictions` (predicted labels) and `probabilities` (probability that a certain patch belongs to a certain class).

The cell below uses common python tools to visualize the patch classification results in terms of classification accuracy and confusion matrix.

```
acc = accuracy_score(label_list, output["predictions"])
logger.info("Classification accuracy: %f", acc)

# Creating and visualizing the confusion matrix for patch classification results
conf = confusion_matrix(label_list, output["predictions"], normalize="true")
df_cm = pd.DataFrame(conf, index=class_names, columns=class_names)

# show confusion matrix
sns.heatmap(df_cm, cmap="Blues", annot=True, fmt=".0%")
plt.show()
```

```
|2023-11-08|10:36:34.474| [INFO] Classification accuracy: 0.993000
```
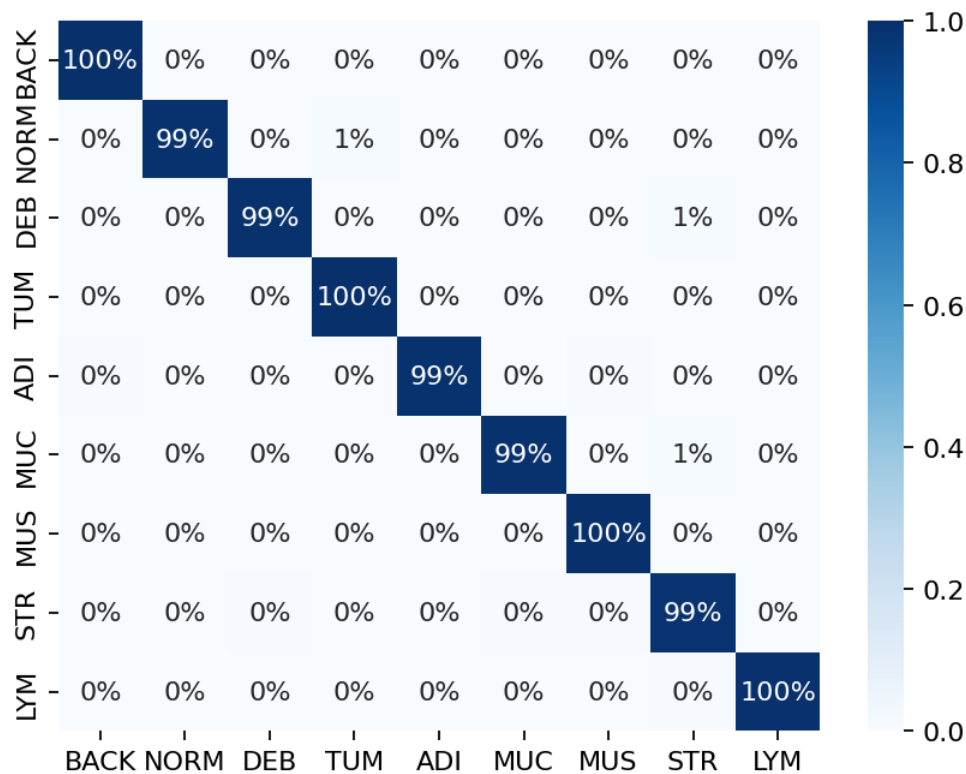

Try changing the `pretrained_model` argument when making `PatchPredictor` instant and see how it can affect the classification output accuracy.

Get predictions for patches within an image tile

We now demonstrate how to obtain patch-level predictions for a large image tile. It is quite a common practice in computational pathology to divide a large image into several patches (often overlapping) and then aggregate the results to generate a prediction map for different regions of the large image. As we are making a prediction per patch again, there is no need to instantiate a new `PatchPredictor` class. However, we should tune the `predict` input arguments to make them suitable for tile prediction. The `predict` function then automatically extracts patches from the large image tile and predicts the label for each of them. As the `predict` function can accept multiple tiles in the input to be processed and each input tile has potentially many patches, we save results in a file when more than one image is provided. This is done to avoid any problems with limited computer memory. However, if only one image is provided, the results will be returned as in `patch` mode.

Now, we try this function on a sample image tile. For this example, we use a tile that was released with the Kather et al. 2016 paper. It has been already downloaded in the Download section of this notebook.

Let's take a look.

```
# reading and displaying a tile image
input_tile = imread(img_file_name)

plt.imshow(input_tile)
plt.axis("off")
plt.show()

logger.info(
    "Tile size is: (%d, %d, %d)",
    input_tile.shape[0],
    input_tile.shape[1],
    input_tile.shape[2],
)
```
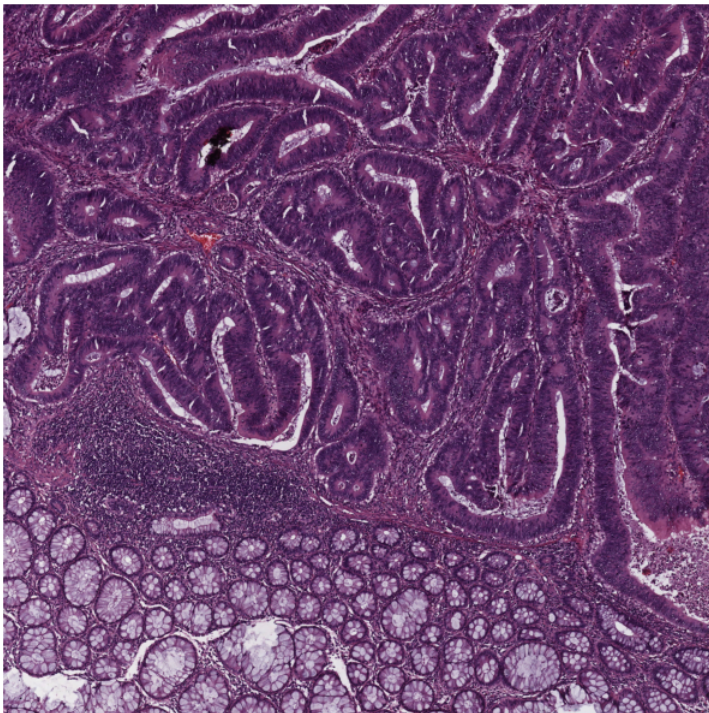


```
|2023-11-08|10:36:40.768| [INFO] Tile size is: (5000, 5000, 3)
```

Patch-level prediction in 2 lines of code for big histology tiles

As you can see, the size of the tile image is 5000x5000 pixels. This is quite big and might result in computer memory problems if fed directly into a deep learning model. However, the `predict` method of `PatchPredictor` handles this big tile seamlessly by processing small patches independently. You only need to change the `mode` argument to `tile` and a couple of other arguments, as explained below.

```
rmdir(global_save_dir / "tile_predictions")
img_file_name = Path(img_file_name)

predictor = PatchPredictor(pretrained_model="resnet18-kather100k", batch_size=32)
tile_output = predictor.predict(
    imgs=[img_file_name],
    mode="tile",
    merge_predictions=True,
    patch_input_shape=[224, 224],
    stride_shape=[224, 224],
    resolution=1,
    units="baseline",
    return_probabilities=True,
    save_dir=global_save_dir / "tile_predictions",
    on_gpu=ON_GPU,
)
```

```
|2023-11-08|10:36:41.188| [WARNING] WSIPatchDataset only reads image tile at `units=
→"baseline"`. Resolutions will be converted to baseline value.
|2023-11-08|10:36:41.191| [WARNING] WSIPatchDataset only reads image tile at `units=
→"baseline"` and `resolution=1.0`.
|2023-11-08|10:36:42.083| [WARNING] Raw data is None.
100%|#########################################| 17/17 [00:02<00:00,  6.49it/s]
|2023-11-08|10:36:45.458| [WARNING] Image is not pyramidal hence read is forced to be↵
→at `units='baseline'` and `resolution=1.0`.
|2023-11-08|10:36:45.459| [WARNING] Raw data is None.
|2023-11-08|10:36:45.464| [WARNING] Unknown scale (no objective_power or mpp)
```

The new arguments in the input of `predict` method are:

- `mode='tile'`: the type of image input. We use `tile` since our input is a large image tile.

- `imgs`: in tile mode, the input is *required* to be a list of file paths.

- `save_dir`: Output directory when processing multiple tiles. We explained before why this is necessary when we are working with multiple big tiles.

- `patch_size`: This parameter sets the size of patches (in [W, H] format) to be extracted from the input files, and for which labels will be predicted.

- `stride_size`: The stride (in [W, H] format) to consider when extracting patches from the tile. Using a stride smaller than the patch size results in overlapping between consecutive patches.

- `labels` (optional): List of labels with the same size as `imgs` that refers to the label of each input tile (not to be confused with the prediction of each patch).

In this example, we input only one tile. Therefore the toolbox does not save the output as files and instead returns a list that contains an output dictionary with the following keys:

- `coordinates`: List of coordinates of extracted patches in the following format: `[x_min, y_min, x_max, y_max]`. These coordinates can be used to later extract the same region from the input tile/WSI or regenerate a prediction map based on the `prediction` labels for each patch

- `predictions`: List of predicted labels for each of the tile's patches.

- `label`: Label of the tile generalized to each patch.

Keep in mind that if we had several items in the `imgs` input, then the result would be saved in JSON format to the specified `save_dir` and the returned output will be a list of paths to each of the saved JSON files

Now, we visualize some patch-level results.

Visualisation of tile results

Below we will show some of the results generated by our patch-level predictor on the input image tile. First, we will show some individual patch predictions and then we will show the merged patch level results on the entire image tile.

```python
# individual patch predictions sampled from the image tile

# extract the information from output dictionary
coordinates = tile_output[0]["coordinates"]
predictions = tile_output[0]["predictions"]

# select 4 random indices (patches)
rng = np.random.default_rng()  # Numpy Random Generator
random_idx = rng.integers(0, len(predictions), (4,))

for i, idx in enumerate(random_idx):
    this_coord = coordinates[idx]
    this_prediction = predictions[idx]
    this_class = class_names[this_prediction]

    this_patch = input_tile[
        this_coord[1] : this_coord[3],
        this_coord[0] : this_coord[2],
    ]
    plt.subplot(2, 2, i + 1), plt.imshow(this_patch)
    plt.axis("off")
    plt.title(this_class)
```

TUM

TUM

TUM

TUM
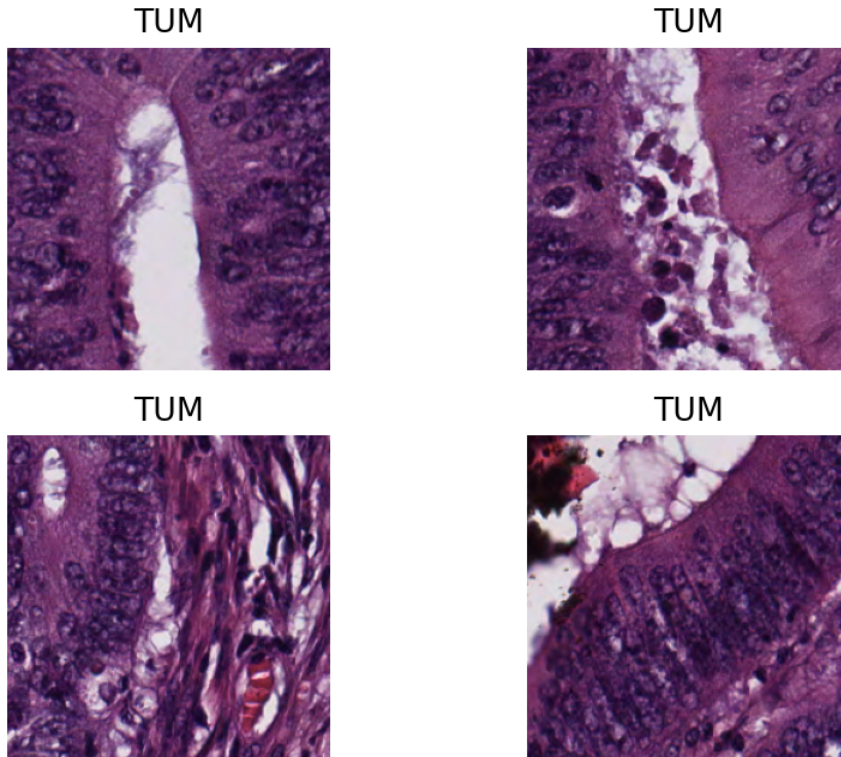
Here, we show a prediction map where each colour denotes a different predicted category. We overlay the prediction map on the original image. To generate this prediction map, we utilize the `merge_predictions` method from the `PatchPredictor` class which accepts as arguments the path of the original image, `predictor` outputs, `mode` (set to `tile` or `wsi`), `tile_resolution` (at which tiles were originally extracted) and `resolution` (at which the prediction map is generated), and outputs the "Prediction map", in which regions have indexed values based on their classes.

To visualize the prediction map as an overlay on the input image, we use the `overlay_prediction_mask` function from the `tiatoolbox.utils.visualization` module. It accepts as arguments the original image, the prediction map, the `alpha` parameter which specifies the blending ratio of overlay and original image, and the `label_info` dictionary which contains names and desired colours for different classes. Below we generate an example of an acceptable `label_info` dictionary and show how it can be used with `overlay_patch_prediction`.

```
# visualization of merged image tile patch-level prediction.

tile_output[0]["resolution"] = 1.0
tile_output[0]["units"] = "baseline"

label_color_dict = {}
label_color_dict[0] = ("empty", (0, 0, 0))
colors = cm.get_cmap("Set1").colors
for class_name, label in label_dict.items():
    label_color_dict[label + 1] = (class_name, 255 * np.array(colors[label]))
pred_map = predictor.merge_predictions(
    img_file_name,
    tile_output[0],
    resolution=1,
    units="baseline",
)
overlay = overlay_prediction_mask(
```

```
    input_tile,
    pred_map,
    alpha=0.5,
    label_info=label_color_dict,
    return_ax=True,
)
plt.show()
```

```
|2023-11-08|10:36:51.889| [WARNING] Image is not pyramidal hence read is forced to be␣
↪at `units='baseline'` and `resolution=1.0`.
|2023-11-08|10:36:51.891| [WARNING] Raw data is None.
|2023-11-08|10:36:51.893| [WARNING] Unknown scale (no objective_power or mpp)
```
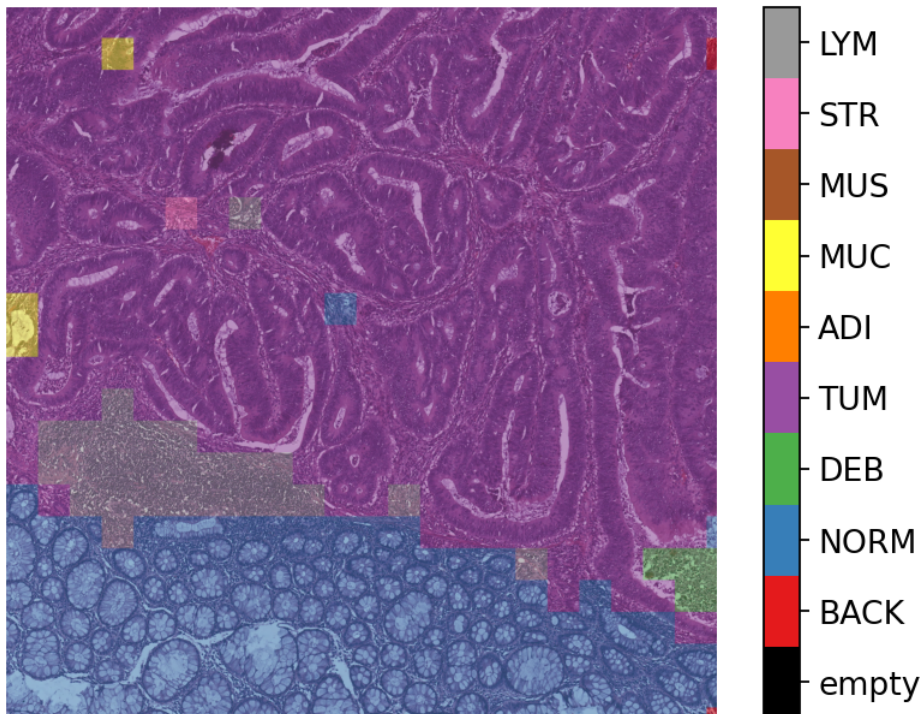

Note that `overlay_prediction_mask` returns a figure handler, so that `plt.show()` or `plt.savefig()` shows or, respectively, saves the overlay figure generated. Now go back and predict with a different `stride_size` or `pretrained_model` to see what effect this has on the output.

Get predictions for patches within a WSI

We demonstrate how to obtain predictions for all patches within a whole-slide image. As in previous sections, we will use `PatchPredictor` and its `predict` method, but this time we set the `mode` to `'wsi'`. We also introduce `IOPatchPredictorConfig`, a class that specifies the configuration of image reading and prediction writing for the model prediction engine.

```
wsi_ioconfig = IOPatchPredictorConfig(
    input_resolutions=[{"units": "mpp", "resolution": 0.5}],
    patch_input_shape=[224, 224],
    stride_shape=[224, 224],
)
```

Parameters of `IOPatchPredictorConfig` have self-explanatory names, but let's have look at their definition:

- `input_resolutions`: a list specifying the resolution of each input head of model in the form of a dictionary. List elements must be in the same order as target `model.forward()`. Of course, if your model accepts only one input, you just need to put one dictionary specifying `'units'` and `'resolution'`. But it's good to know that TIAToolbox supports a model with more than one input.

- `patch_input_shape`: Shape of the largest input in (height, width) format.

- `stride_shape`: the size of stride (steps) between two consecutive patches, used in the patch extraction process. If the user sets `stride_shape` equal to `patch_input_shape`, patches will be extracted and processed without any overlap.

Now that we have set everything, we try our patch predictor on a WSI. Here, we use a large WSI and therefore the patch extraction and prediction processes may take some time (make sure to set the `ON_GPU=True` if you have access to Cuda enabled GPU and Pytorch+Cuda).

```
predictor = PatchPredictor(pretrained_model="resnet18-kather100k", batch_size=64)
wsi_output = predictor.predict(
    imgs=[wsi_file_name],
    masks=None,
    mode="wsi",
    merge_predictions=False,
    ioconfig=wsi_ioconfig,
    return_probabilities=True,
    save_dir=global_save_dir / "wsi_predictions",
    on_gpu=ON_GPU,
)
```

```
|2023-11-08|10:37:01.460| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
100%|################################| 315/315 [05:18<00:00,  1.01s/it]
```

We introduce some new arguments for `predict` method:

- `mode`: set to 'wsi' when analysing whole slide images.

- `ioconfig`: set the IO configuration information using the `IOPatchPredictorConfig` class.

- `resolution` and `unit` (not shown above): These arguments specify the level or micron-per-pixel resolution of the WSI levels from which we plan to extract patches and can be used instead of `ioconfig`. Here we specify the WSI's level as `'baseline'`, which is equivalent to level 0. In general, this is the level of greatest resolution. In this particular case, the image has only one level. More information can be found in the documentation.

- `masks`: A list of paths corresponding to the masks of WSIs in the `imgs` list. These masks specify the regions in the original WSIs from which we want to extract patches. If the mask of a particular WSI is specified as `None`, then the labels for all patches of that WSI (even background regions) would be predicted. This could cause unnecessary computation.

- `merge_predictions`: You can set this parameter to `True` if you wish to generate a 2D map of patch classification results. However, for big WSIs you might need a large amount of memory available to do this on the file. An alternative (default) solution is to set `merge_predictions=False`, and then generate the 2D prediction maps using `merge_predictions` function as you will see later on.

We see how the prediction model works on our whole-slide images by visualizing the `wsi_output`. We first need to merge patch prediction outputs and then visualize them as an overlay on the original image. As before, the `merge_predictions` method is used to merge the patch predictions. Here we set the parameters `resolution=1.25, units='power'` to generate the prediction map at 1.25x magnification. If you would like to have higher/lower resolution (bigger/smaller) prediction maps, you need to change these parameters accordingly. When the predictions

are merged, use the `overlay_patch_prediction` function to overlay the prediction map on the WSI thumbnail, which should be extracted at the same resolution used for prediction merging. Below you can see the result:

```python
# visualization of whole-slide image patch-level prediction
overview_resolution = (
    4   # the resolution in which we desire to merge and visualize the patch
→predictions
)

# the unit of the `resolution` parameter. Can be "power", "level", "mpp", or "baseline
→"
overview_unit = "mpp"
wsi = WSIReader.open(wsi_file_name)
wsi_overview = wsi.slide_thumbnail(resolution=overview_resolution, units=overview_
→unit)
plt.figure(), plt.imshow(wsi_overview)
plt.axis("off")

pred_map = predictor.merge_predictions(
    wsi_file_name,
    wsi_output[0],
    resolution=overview_resolution,
    units=overview_unit,
)
overlay = overlay_prediction_mask(
    wsi_overview,
    pred_map,
    alpha=0.5,
    label_info=label_color_dict,
    return_ax=True,
)
plt.show()
```
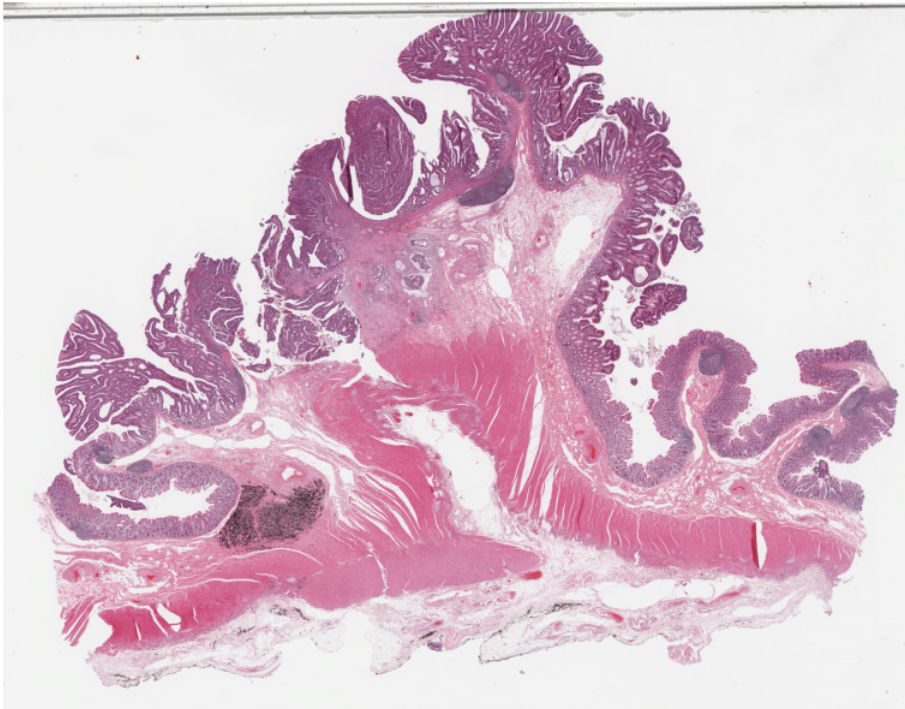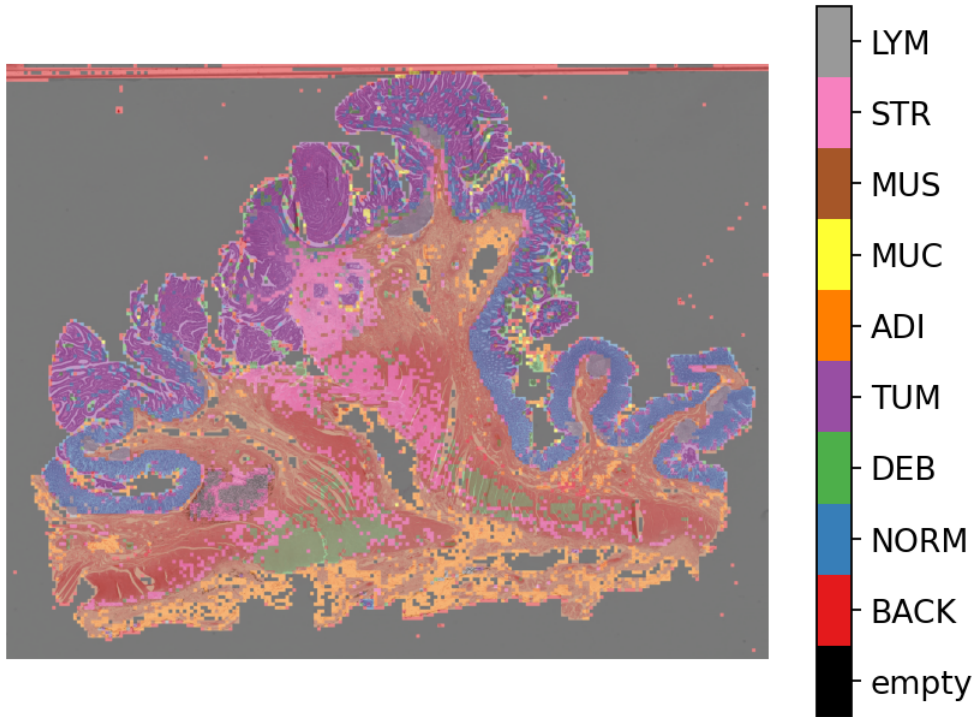
In this notebook, we show how we can use the `PatchPredictor` class and its `predict` method to predict the label for patches of big tiles and WSIs. We introduce `merge_predictions` and `overlay_prediction_mask` helper functions that merge the patch prediction outputs and visualize the resulting prediction map as an overlay on the input image/WSI.

All the processes take place within TIAToolbox and you can easily put the pieces together, following our example code. Just make sure to set inputs and options correctly. We encourage you to further investigate the effect on the prediction output of changing `predict` function parameters. Furthermore, if you want to use your own pretrained model for patch classification in the TIAToolbox framework (even if the model structure is not defined in the TIAToolbox model class), you can follow the instructions in our example notebook on advanced model techniques to gain some insights and guidance.

5.2.6 Semantic Segmentation Models

Click to open in: [GitHub][Colab]

About this demo

Semantic segmentation in image processing means partitioning the image into its constructing segments so that each segment corresponds to a specific category of an object present in the image. In other words, semantic segmentation can be considered as classifying each pixel in the image into a pre-defined category. Note that semantic segmentation does not differentiate instances of the same object, like the figure below which shows three examples of road images with their semantic segmentation. You can see how all objects of the same class have the same colour (please refer to here and here to find more information on the semantic segmentation task).
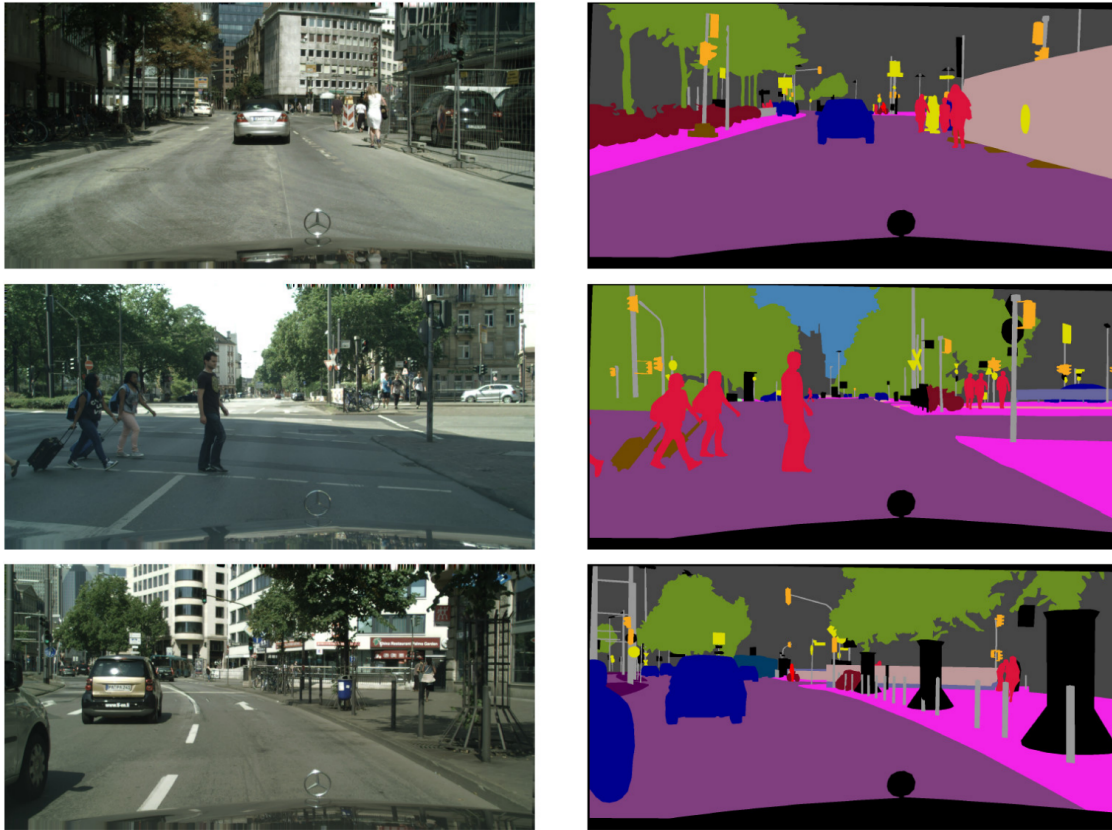
Image courtesy of: Chen, Liang-Chieh, et al. "Deeplab: Semantic image segmentation with deep convolutional nets, atrous convolution, and fully connected crfs." IEEE transactions on pattern analysis and machine intelligence 40.4 (2017): 834-848.

Similar to natural images, semantic segmentation of histology images is the task of identifying the class of each pixel in the image based on the object or tissue type of the region encompassing that pixel. Semantic segmentation of tissue regions in histology images plays an important role in developing algorithms for cancer diagnosis and prognosis as it can help measure tissue attributes in an objective and reproducible fashion.
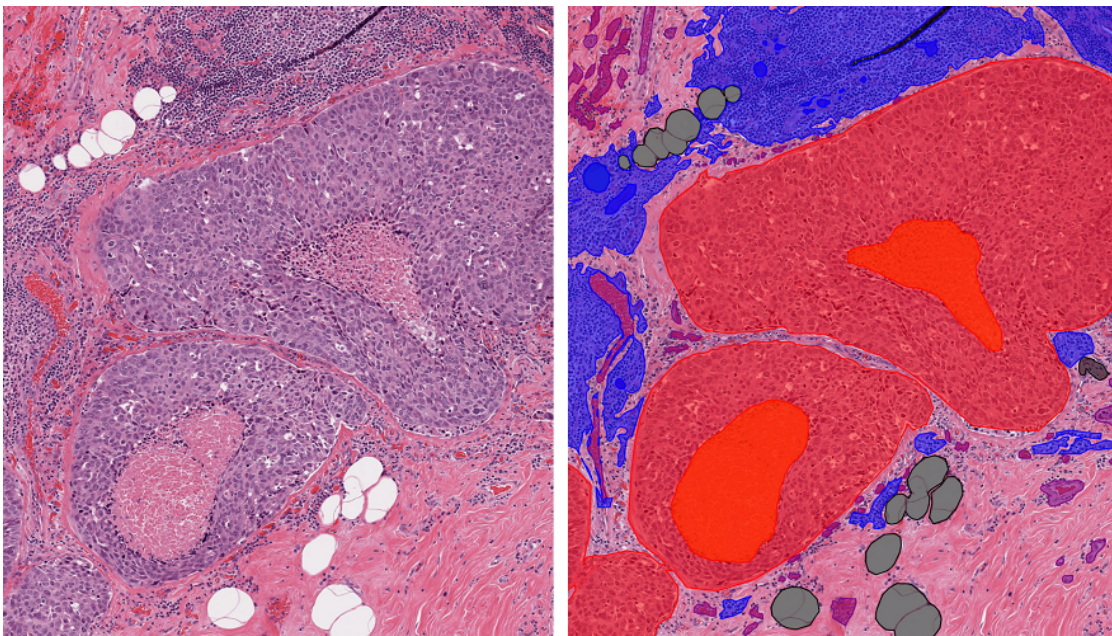
Example of semantic segmentation in histology images where pixels are classified based on different region types including tumour, fat, inflammatory, necrosis etc.

In this example notebook, we are showing how you can use pretrained models to do automatically segment different tissue region types in a set of input images or WSIs. We first focus on a pretrained model incorporated in the TIAToolbox to achieve semantic annotation of tissue region in histology images of breast cancer. After that, we will explain how you can use your pretrained model in the TIAToolbox model inference pipeline to do prediction on a set WSIs.

Importing related libraries

We import some standard Python modules, and also the Python module `wsireader` (see details) written by the TIA Centre team.

```python
"""Import modules required to run the Jupyter notebook."""

# Clear logger to use tiatoolbox.logger
import logging
import warnings

if logging.getLogger().hasHandlers():
    logging.getLogger().handlers.clear()

import matplotlib as mpl
import matplotlib.pyplot as plt
import numpy as np
import torch
from matplotlib import cm

from tiatoolbox import logger
from tiatoolbox.models.architecture.unet import UNetModel
from tiatoolbox.models.engine.semantic_segmentor import (
    IOSegmentorConfig,
    SemanticSegmentor,
)
from tiatoolbox.utils.misc import download_data, imread
from tiatoolbox.utils.visualization import overlay_prediction_mask
from tiatoolbox.wsicore.wsireader import WSIReader

mpl.rcParams["figure.dpi"] = 300  # for high resolution figure in notebook
mpl.rcParams["figure.facecolor"] = "white"  # To make sure text is visible in dark
↪mode
warnings.filterwarnings("ignore")
```

Downloading the required files

We download, over the internet, image files used for the purpose of this notebook. In particular, we download a histology tile and a whole slide image of cancerous breast tissue samples to show how semantic segmentation models work. Also, pretrained weights of a Pytorch model and a small WSI are downloaded to illustrate how you can incorporate your own models in the existing TIAToolbox segmentation tool.

In Colab, if you click the files icon (see below) in the vertical toolbar on the left hand side then you can see all the files which the code in this notebook can access. The data will appear here when it is downloaded.

```python
# These file name are used for
img_file_name = "sample_tile.jpg"
wsi_file_name = "sample_wsi.svs"
mini_wsi_file_name = "mini_wsi.svs"
model_file_name = "tissue_mask_model.pth"

logger.info("Download has started. Please wait...")

# Downloading sample image tile
download_data(
    "https://tiatoolbox.dcs.warwick.ac.uk/sample_imgs/breast_tissue.jpg",
    img_file_name,
)

# Downloading sample whole-slide image
download_data(
    "https://tiatoolbox.dcs.warwick.ac.uk/sample_wsis/wsi4_12k_12k.svs",
    wsi_file_name,
)

# Downloading mini whole-slide image
download_data(
    "https://tiatoolbox.dcs.warwick.ac.uk/sample_wsis/CMU-1.ndpi",
    mini_wsi_file_name,
)

# Download external model
download_data(
    "https://tiatoolbox.dcs.warwick.ac.uk//models/seg/fcn-tissue_mask.pth",
    model_file_name,
)

logger.info("Download is complete.")
```

```
|2023-12-15|15:51:05.649| [INFO] Download has started. Please wait...
|2023-12-15|15:54:21.662| [INFO] Download is complete.
```

Semantic segmentation using TIAToolbox pretrained models

In this section, we will investigate the use of semantic segmentation models that have been already trained on a specific task and incorporated in the TIAToolbox. Particularly, the model we demonstrate can estimate the probability of each pixel in an image (tile or whole slide images) of breast cancer sample belonging to one of the following classes:

- Tumour

- Stroma

- Inflammatory

- Necrosis

- Others (nerves, vessels, blood cells, adipose, etc.)

  More information on the model and the dataset used for training can be found here (*Amgad et al., "Structured crowdsourcing enables convolutional segmentation of histology image"*) and the data is available for download using this link.

Inference on tiles

Much similar to the patch classifier functionality of the tiatoolbox, the semantic segmentation module works both on image tiles and structured WSIs. First, we need to create an instance of the `SemanticSegmentor` class which controls the whole process of semantic segmentation task and then use it to do prediction on the input image(s):

```python
# Tile prediction
bcc_segmentor = SemanticSegmentor(
    pretrained_model="fcn_resnet50_unet-bcss",
    num_loader_workers=4,
    batch_size=4,
)

output = bcc_segmentor.predict(
    [img_file_name],
    save_dir="sample_tile_results/",
    mode="tile",
    resolution=1.0,
    units="baseline",
    patch_input_shape=[1024, 1024],
    patch_output_shape=[512, 512],
    stride_shape=[512, 512],
    on_gpu=ON_GPU,
    crash_on_exception=True,
)
```

```
|2023-12-15|15:55:36.815| [WARNING] WSIPatchDataset only reads image tile at `units=
↪"baseline"`. Resolutions will be converted to baseline value.
|2023-12-15|15:55:37.332| [WARNING] WSIPatchDataset only reads image tile at `units=
↪"baseline"`. Resolutions will be converted to baseline value.
|2023-12-15|15:55:37.800| [WARNING] Raw data is None.
|2023-12-15|15:55:37.805| [WARNING] Unknown scale (no objective_power or mpp)
Process Batch:   0%|                                          | 0/16 [00:00<?, ?it/s]|2023-
↪12-15|15:55:38.881| [WARNING] Raw data is None.
|2023-12-15|15:55:39.031| [WARNING] Raw data is None.
|2023-12-15|15:55:39.061| [WARNING] Raw data is None.
|2023-12-15|15:55:39.108| [WARNING] Raw data is None.
Process Batch: 100%|############################| 16/16 [00:12<00:00,  1.28it/s]
```

```
|2023-12-15|15:55:50.367| [INFO] Finish: 0
|2023-12-15|15:55:50.374| [INFO] --Input: sample_tile.jpg
|2023-12-15|15:55:50.375| [INFO] --Output: /content/sample_tile_results/0
```

There we go! With only two lines of code, thousands of images can be processed automatically. There are many parameters associated with `SemanticSegmentor`. We explain these as we meet them, while proceeding through the notebook. Here we explain only the ones mentioned above:

- `pretrain_model`: specifies the name of the pretrained model included in the TIAToolbox (case-sensitive). We are expanding our library of models pretrained on various segmentation tasks. You can find a complete list of available pretrained models here. In this example, we use the `"fcn_resnet50_unet-bcss"` pretrained model, which is a fully convolutional network that follows UNet network architecture and benefits from a ResNet50 model as its encoder part.

- `num_loader_workers`: as the name suggests, this parameter controls the number of CPU cores (workers) that are responsible for the "loading of network input" process, which consists of patch extraction, preprocessing, etc.

- `batch_size`: controls the batch size, or the number of input instances to the network in each iteration. If you use a GPU, be careful not to set the `batch_size` larger than the GPU memory limit would allow.

After the `bcc_segmentor` has been instantiated as a semantic segmentation engine with our desired pretrained model, one can call the `predict` method to do inference on a list of input images (or WSIs). The `predict` function automatically processes all the images on the input list and saves the results on the disk. The process usually comprises patch extraction (because the whole tile or WSI won't fit into limited GPU memory), preprocessing, model inference, post-processing and prediction assembly. There some important parameters that should be set to use the `predict` method properly:

- `imgs`: List of inputs to be processed. Note that items in the list should be paths to the inputs stored on the disk.

- `save_dir`: Path to the main folder in which prediction results for each input will be stored separately.

- `mode`: the mode of inference which can be set to either `'tile'` or `'wsi'` for plain histology images or structured whole slides images, respectively.

- `resolution` and `unit`: specify the resolution on which we want to process the input. Because plain images only have a baseline layer, the options in this case should always be the defaults `units="baseline"` and `resolution=1.0` and, as defaults, can be omitted.

- `patch_input_shape`: the shape of the patches extracted from the input image (WSI) to be fed into the model. The bigger the patch size the more GPU memory is needed.

- `patch_output_shape`: The expected shape of output prediction maps for patches. This should be set based on the knowledge we have from the model design. For example, we know that the shape of output maps from `"fcn_resnet50_unet-bcss"` model is half of the input shape in each dimension. Therefore, as we set the `patch_input_shape=[1024, 1024])`, we need to set the `patch_output_shape=[512, 512]`.

- `stride_shape`: Stride of output patches during tile and WSI processing. This parameter is used to set the amount of overlap between neighbouring prediction patches. Based on this parameter, the toolbox automatically calculates the patch extraction stride.

- `on_gpu`: can be either `True` or `False` to dictate running the computations on GPU or CPU.

- `crash_on_exception`: If set to `True`, the running loop will crash if there is an error during processing a WSI. Otherwise, the loop will move on to the next image (wsi) for processing. We suggest that you first make sure that prediction is working as expected by testing it on a couple of inputs and then set this flag to `False` to process large cohorts of inputs.

We should mention that when you are using TIAToolbox pretrained models, you don't need to worry about setting the input/output shape parameters as their optimal values will be loaded by default.

In the `output`, the `prediction` method returns a list of the paths to its inputs and to the processed outputs saved on the disk. This can be used for loading the results for processing and visualisation.

```
logger.info(
    "Prediction method output is: %s, %s",
    output[0][0],
    output[0][1],
)
tile_prediction_raw = np.load(
    output[0][1] + ".raw.0.npy",
)  # Loading the first prediction [0] based on the output address [1]
logger.info(
    "Raw prediction dimensions: (%d, %d, %d)",
    tile_prediction_raw.shape[0],
    tile_prediction_raw.shape[1],
    tile_prediction_raw.shape[2],
)
```

(continues on next page)

```python
# Simple processing of the raw prediction to generate semantic segmentation task
tile_prediction = np.argmax(
    tile_prediction_raw,
    axis=-1,
)  # select the class with highest probability
logger.info(
    "Processed prediction dimensions: (%d, %d)",
    tile_prediction.shape[0],
    tile_prediction.shape[1],
)

# showing the predicted semantic segmentation
tile = imread(img_file_name)
logger.info(
    "Input image dimensions: (%d, %d, %d)",
    tile.shape[0],
    tile.shape[1],
    tile.shape[2],
)

fig = plt.figure()
label_names_dict = {
    0: "Tumour",
    1: "Stroma",
    2: "Inflamatory",
    3: "Necrosis",
    4: "Others",
}
for i in range(5):
    ax = plt.subplot(1, 5, i + 1)
    (
        plt.imshow(tile_prediction_raw[:, :, i]),
        plt.xlabel(
            label_names_dict[i],
        ),
        ax.axes.xaxis.set_ticks([]),
        ax.axes.yaxis.set_ticks([]),
    )
fig.suptitle("Row prediction maps for different classes", y=0.65)

# showing processed results
fig2 = plt.figure()
ax1 = plt.subplot(1, 2, 1), plt.imshow(tile), plt.axis("off")
ax2 = plt.subplot(1, 2, 2), plt.imshow(tile_prediction), plt.axis("off")
fig2.suptitle("Processed prediction map", y=0.82)
```

```
|2023-12-15|15:55:50.547| [INFO] Prediction method output is: sample_tile.jpg, /
↪content/sample_tile_results/0
|2023-12-15|15:55:50.670| [INFO] Raw prediction dimensions: (4000, 4000, 5)
|2023-12-15|15:55:50.993| [INFO] Processed prediction dimensions: (4000, 4000)
|2023-12-15|15:55:51.345| [INFO] Input image dimensions: (4000, 4000, 3)
```

```
Text(0.5, 0.82, 'Processed prediction map')
```

Row prediction maps for different classes

Tumour   Stroma   Inflamatory   Necrosis   Others
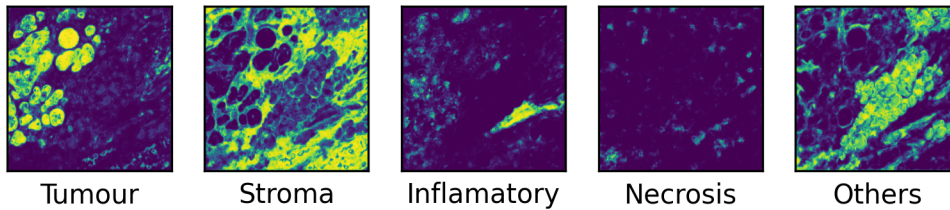
Processed prediction map
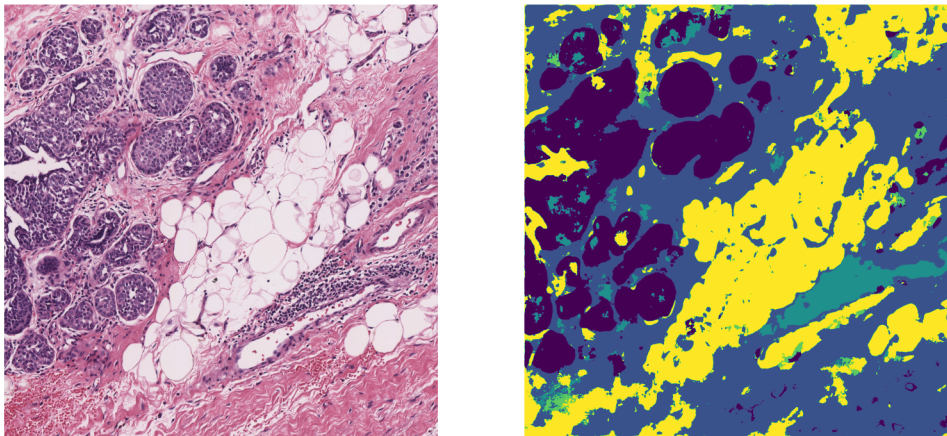
As printed above, the raw prediction array has 5 channels (size 4000x4000x**5**) which indicate the 5 categories that our segmentation model can distinguish. These prediction channels are illustrated in the first row, one-by-one, where each prediction map stands for a specific tissue region class. However, the idea is to have a single prediction map that contains specific values for each class. Therefore, we use a very simple post-processing technique to acquire the semantic segmentation map:

```
tile_prediction = np.argmax(tile_prediction_raw, axis=-1)
```

that finds, for each pixel, the class index that has the highest estimated probability. In the processed prediction map dark blue, light blue, dark green, light green, and yellow colours stand for tumour, stroma, inflamatory, necrosis, and other region types, respectively.

Inference on WSIs

The next step is to use the TIAToolbox's embedded model for region segmentation in a whole slide image. The process is quite similar to what we have done for tiles. Here we just introduce a some important parameters that should be considered when configuring the segmentor for WSI inference.

```
bcc_segmentor = SemanticSegmentor(
    pretrained_model="fcn_resnet50_unet-bcss",
    num_loader_workers=4,
    batch_size=4,
    auto_generate_mask=False,
)

bcc_wsi_ioconfig = IOSegmentorConfig(
```

(continues on next page)

```
    input_resolutions=[{"units": "mpp", "resolution": 0.25}],
    output_resolutions=[{"units": "mpp", "resolution": 0.25}],
    patch_input_shape=[1024, 1024],
    patch_output_shape=[512, 512],
    stride_shape=[512, 512],
    save_resolution={"units": "mpp", "resolution": 2},
)
```

Here we re-defined the `bcc_segmentor` just to show the use of `auto_generate_mask` parameter. By setting this parameter to `True`, we are telling the TIAToolbox to automatically extract the tissue masks of the input WSIs if they are not provided in the `predict` function parameters. In this example, we leave `auto_generate_mask=False` because we are using a WSI that only contains tissue region (there is no background region) and therefore there is no need for tissue mask extraction.

When doing inference on WSIs, it is important to set the data stream configurations (such as input resolution, output resolution, size of merged predictions, etc.) appropriately for each model and application. In TIAToolbox, `IOSegmentorConfig` class is used to set these configurations as we have done in the above cell. Parameters of `IOSegmentorConfig` have self-explanatory names, but let's have look at their definition:

- `input_resolutions`: a list specifying the resolution of each input head of model in the form of a dictionary. List elements must be in the same order as target `model.forward()`. Of course, if your model accepts only one input, you just need to put one dictionary specifying `'units'` and `'resolution'`. But it's good to know that TIAToolbox supports a model with more than one input!

- `output_resolutions`: a list specifying the resolution of each output head from model in the form of a dictionary. List elements must be in the same order as target `model.infer_batch()`.

- `patch_input_shape`: Shape of the largest input in (height, width) format.

- `patch_output_shape`: Shape of the largest output in (height, width) format.

- `save_resolution`: specifies the resolution in which processed (merged) output will be saved. Commonly, we desire the resolution (size) of the output segmentation map to be smaller than the input map. For example, we don't need the tissue segmentation results to be as high-resolution as input WSI. Therefore, this parameter can be set based on the model, task, and desired output size.

```
# WSI prediction
wsi_output = bcc_segmentor.predict(
    imgs=[wsi_file_name],
    masks=None,
    save_dir="sample_wsi_results/",
    mode="wsi",
    ioconfig=bcc_wsi_ioconfig,
    on_gpu=ON_GPU,
    crash_on_exception=True,
)
```

```
|2023-12-15|15:56:03.376| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:   0%|                                      | 0/144 [00:00<?, ?it/s]|2023-
↪12-15|15:56:03.670| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:03.678| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
```

```
|2023-12-15|15:56:03.700| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:03.696| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:03.713| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:03.723| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:03.746| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:03.749| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:04.227| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:04.243| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:04.376| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:04.382| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:04.394| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:04.405| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:04.530| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:04.541| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:04.665| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:04.688| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:04.810| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:04.828| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:04.859| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
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|2023-12-15|15:56:04.856| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:04.868| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:04.879| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:05.067| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:05.072| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:05.194| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:05.219| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:05.264| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:05.280| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:05.308| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:05.319| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:05.531| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:05.551| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:05.618| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:05.622| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:05.670| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:05.678| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:05.795| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:05.811| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
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|2023-12-15|15:56:05.897| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:05.916| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:06.030| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:06.039| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:06.117| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:06.136| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:06.174| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:06.192| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:06.210| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:06.287| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:06.304| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
Process Batch:   1%|1                              | 1/144 [00:02<06:59,  2.93s/it]|2023-
→12-15|15:56:06.415| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:06.432| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:06.481| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:06.491| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:06.546| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:06.548| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:06.563| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:06.561| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
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↪Interpolation of read regions may occur.
|2023-12-15|15:56:06.673| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:06.697| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:06.839| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:06.845| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:06.888| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:06.905| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:06.950| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:   1%|3                             | 2/144 [00:03<03:52,  1.64s/it]|2023-
↪12-15|15:56:07.060| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:07.082| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:07.160| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:07.169| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:07.262| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:07.276| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:07.345| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:07.364| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:07.470| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:07.468| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:07.472| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:07.492| [WARNING] Read: Scale > 1.This means that the desired␣
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↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:07.642| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:   2%|5                            | 3/144 [00:04<02:48,  1.19s/it]|2023-
↪12-15|15:56:07.759| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:07.767| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:07.786| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:07.805| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:07.875| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:07.884| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:07.935| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:07.951| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:08.160| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:08.189| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:08.182| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:08.198| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:08.252| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:08.264| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:08.334| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:   3%|7                            | 4/144 [00:05<02:18,  1.01it/s]|2023-
↪12-15|15:56:08.421| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:08.432| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
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↪Interpolation of read regions may occur.
|2023-12-15|15:56:08.544| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:08.556| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:08.635| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:08.648| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:08.777| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:08.793| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:08.885| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:08.898| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:08.954| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:   3%|9                               | 5/144 [00:05<01:58,  1.17it/s]|2023-
↪12-15|15:56:09.026| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:09.028| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:09.045| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:09.036| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:09.289| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:09.291| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:09.339| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:09.352| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:09.490| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:   4%|#1                              | 6/144 [00:06<01:42,  1.35it/s]|2023-
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↪12-15|15:56:09.556| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:09.553| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:09.567| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:09.570| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:09.828| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:09.841| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:09.924| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:09.931| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:10.060| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:   5%|#3                            | 7/144 [00:06<01:34,  1.45it/s]|2023-
↪12-15|15:56:10.131| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:10.141| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:10.182| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:10.199| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:10.413| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:10.426| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:10.517| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:10.532| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:10.609| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:   6%|#5                            | 8/144 [00:07<01:26,  1.57it/s]|2023-
↪12-15|15:56:10.667| [WARNING] Read: Scale > 1.This means that the desired␣
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↪resolution is higher than the WSI baseline (maximum encoded resolution)._
↪Interpolation of read regions may occur.
|2023-12-15|15:56:10.676| [WARNING] Read: Scale > 1.This means that the desired_
↪resolution is higher than the WSI baseline (maximum encoded resolution)._
↪Interpolation of read regions may occur.
|2023-12-15|15:56:10.805| [WARNING] Read: Scale > 1.This means that the desired_
↪resolution is higher than the WSI baseline (maximum encoded resolution)._
↪Interpolation of read regions may occur.
|2023-12-15|15:56:10.821| [WARNING] Read: Scale > 1.This means that the desired_
↪resolution is higher than the WSI baseline (maximum encoded resolution)._
↪Interpolation of read regions may occur.
|2023-12-15|15:56:11.068| [WARNING] Read: Scale > 1.This means that the desired_
↪resolution is higher than the WSI baseline (maximum encoded resolution)._
↪Interpolation of read regions may occur.
|2023-12-15|15:56:11.080| [WARNING] Read: Scale > 1.This means that the desired_
↪resolution is higher than the WSI baseline (maximum encoded resolution)._
↪Interpolation of read regions may occur.
|2023-12-15|15:56:11.100| [WARNING] Read: Scale > 1.This means that the desired_
↪resolution is higher than the WSI baseline (maximum encoded resolution)._
↪Interpolation of read regions may occur.
|2023-12-15|15:56:11.116| [WARNING] Read: Scale > 1.This means that the desired_
↪resolution is higher than the WSI baseline (maximum encoded resolution)._
↪Interpolation of read regions may occur.
|2023-12-15|15:56:11.142| [WARNING] Read: Scale > 1.This means that the desired_
↪resolution is higher than the WSI baseline (maximum encoded resolution)._
↪Interpolation of read regions may occur.
Process Batch:   6%|#7                              | 9/144 [00:07<01:22,  1.64it/s]|2023-
↪12-15|15:56:11.216| [WARNING] Read: Scale > 1.This means that the desired_
↪resolution is higher than the WSI baseline (maximum encoded resolution)._
↪Interpolation of read regions may occur.
|2023-12-15|15:56:11.224| [WARNING] Read: Scale > 1.This means that the desired_
↪resolution is higher than the WSI baseline (maximum encoded resolution)._
↪Interpolation of read regions may occur.
|2023-12-15|15:56:11.305| [WARNING] Read: Scale > 1.This means that the desired_
↪resolution is higher than the WSI baseline (maximum encoded resolution)._
↪Interpolation of read regions may occur.
|2023-12-15|15:56:11.321| [WARNING] Read: Scale > 1.This means that the desired_
↪resolution is higher than the WSI baseline (maximum encoded resolution)._
↪Interpolation of read regions may occur.
|2023-12-15|15:56:11.602| [WARNING] Read: Scale > 1.This means that the desired_
↪resolution is higher than the WSI baseline (maximum encoded resolution)._
↪Interpolation of read regions may occur.
|2023-12-15|15:56:11.613| [WARNING] Read: Scale > 1.This means that the desired_
↪resolution is higher than the WSI baseline (maximum encoded resolution)._
↪Interpolation of read regions may occur.
|2023-12-15|15:56:11.625| [WARNING] Read: Scale > 1.This means that the desired_
↪resolution is higher than the WSI baseline (maximum encoded resolution)._
↪Interpolation of read regions may occur.
|2023-12-15|15:56:11.634| [WARNING] Read: Scale > 1.This means that the desired_
↪resolution is higher than the WSI baseline (maximum encoded resolution)._
↪Interpolation of read regions may occur.
|2023-12-15|15:56:11.678| [WARNING] Read: Scale > 1.This means that the desired_
↪resolution is higher than the WSI baseline (maximum encoded resolution)._
↪Interpolation of read regions may occur.
Process Batch:   7%|#8                              | 10/144 [00:08<01:17,  1.72it/s]|2023-
↪12-15|15:56:11.727| [WARNING] Read: Scale > 1.This means that the desired_
↪resolution is higher than the WSI baseline (maximum encoded resolution)._
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↪Interpolation of read regions may occur.
|2023-12-15|15:56:11.737| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:12.010| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:12.024| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:12.103| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:12.116| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:12.212| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:   8%|##                          | 11/144 [00:08<01:15,  1.76it/s]|2023-
↪12-15|15:56:12.264| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:12.271| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:12.297| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:12.304| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:12.437| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:12.453| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:12.620| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:12.631| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:12.758| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:12.770| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:12.831| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:   8%|##2                         | 12/144 [00:09<01:17,  1.70it/s]|2023-
↪12-15|15:56:12.917| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
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|2023-12-15|15:56:12.937| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:13.003| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:13.015| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:13.370| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:13.375| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:13.442| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:13.444| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:13.458| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:   9%|##4                        | 13/144 [00:10<01:17,  1.69it/s]|2023-
↪12-15|15:56:13.507| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:13.513| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:13.741| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:13.755| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:13.927| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:13.934| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:13.941| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:13.965| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:13.987| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  10%|##6                        | 14/144 [00:10<01:15,  1.71it/s]|2023-
↪12-15|15:56:14.067| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:14.080| [WARNING] Read: Scale > 1.This means that the desired␣
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↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:14.142| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:14.149| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:14.372| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:14.379| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:14.459| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:14.472| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:14.553| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  10%|##8                         | 15/144 [00:11<01:13,  1.75it/s]|2023-
↪12-15|15:56:14.608| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:14.615| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:14.698| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:14.712| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:14.888| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:14.902| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:14.950| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:14.964| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:15.083| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  11%|###                         | 16/144 [00:11<01:11,  1.80it/s]|2023-
↪12-15|15:56:15.126| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:15.138| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
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↪Interpolation of read regions may occur.
|2023-12-15|15:56:15.221| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:15.239| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:15.434| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:15.446| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:15.471| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:15.477| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:15.608| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  12%|###1                          | 17/144 [00:12<01:10,  1.79it/s]|2023-
↪12-15|15:56:15.695| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:15.710| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:15.765| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:15.772| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:16.156| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:16.170| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:16.183| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  12%|###3                          | 18/144 [00:12<01:09,  1.80it/s]|2023-
↪12-15|15:56:16.223| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:16.229| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:16.251| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:16.267| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
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|2023-12-15|15:56:16.751| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:16.797| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:16.811| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  13%|###5                        | 19/144 [00:13<01:11,  1.75it/s]|2023-
↪12-15|15:56:16.849| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:16.863| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:16.972| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:16.992| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:17.349| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:17.364| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:17.418| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:17.520| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:17.537| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  14%|###7                        | 20/144 [00:14<01:16,  1.63it/s]|2023-
↪12-15|15:56:17.566| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:17.582| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:17.732| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:17.756| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:18.061| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:18.080| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:18.146| [WARNING] Read: Scale > 1.This means that the desired␣
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↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  15%|###9                          | 21/144 [00:14<01:18,  1.56it/s]|2023-
↪12-15|15:56:18.275| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:18.287| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:18.367| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:18.366| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:18.376| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:18.378| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:18.840| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  15%|####1                         | 22/144 [00:15<01:21,  1.51it/s]|2023-
↪12-15|15:56:19.002| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:19.022| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:19.052| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:19.062| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:19.070| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:19.075| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:19.239| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:19.267| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:19.532| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:19.580| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:19.602| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
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↪Interpolation of read regions may occur.
Process Batch:  16%|####3                        | 23/144 [00:16<01:21,  1.49it/s]|2023-
↪12-15|15:56:19.669| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:19.684| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:19.727| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:19.742| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:19.858| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:19.882| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:20.139| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:20.143| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:20.218| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  17%|####5                        | 24/144 [00:16<01:18,  1.53it/s]|2023-
↪12-15|15:56:20.360| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:20.376| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:20.394| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:20.419| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:20.464| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:20.486| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:20.554| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:20.569| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:20.785| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
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|2023-12-15|15:56:20.829| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:20.836| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
Process Batch:  17%|####6                        | 25/144 [00:17<01:15,  1.58it/s]|2023-
→12-15|15:56:20.863| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:20.867| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:20.937| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:20.950| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:21.141| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:21.153| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:21.252| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:21.268| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:21.334| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:21.324| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:21.342| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
Process Batch:  18%|####8                        | 26/144 [00:18<01:12,  1.64it/s]|2023-
→12-15|15:56:21.427| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:21.457| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:21.452| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:21.476| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:21.705| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:21.725| [WARNING] Read: Scale > 1.This means that the desired␣
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↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:21.896| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:21.901| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:21.902| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  19%|#####                        | 27/144 [00:18<01:08,  1.71it/s]|2023-
↪12-15|15:56:21.957| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:21.968| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:22.033| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:22.049| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:22.269| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:22.281| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:22.284| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:22.305| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:22.446| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  19%|#####2                       | 28/144 [00:19<01:07,  1.72it/s]|2023-
↪12-15|15:56:22.526| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:22.524| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:22.532| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:22.534| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:22.590| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:22.608| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
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→Interpolation of read regions may occur.
|2023-12-15|15:56:22.883| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:22.885| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:22.890| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:22.892| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:23.001| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
Process Batch:  20%|#####4                    | 29/144 [00:19<01:04,  1.78it/s]|2023-
→12-15|15:56:23.053| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:23.066| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:23.116| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:23.133| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:23.338| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:23.342| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:23.368| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:23.379| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:23.513| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
Process Batch:  21%|#####6                    | 30/144 [00:20<01:03,  1.80it/s]|2023-
→12-15|15:56:23.596| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:23.604| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:23.641| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:23.651| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
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|2023-12-15|15:56:23.836| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:23.850| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:23.904| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:23.915| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:24.074| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:24.065| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:24.076| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
Process Batch:  22%|#####8                        | 31/144 [00:20<01:03,  1.78it/s]|2023-
→12-15|15:56:24.153| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:24.168| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:24.282| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:24.296| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:24.491| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:24.503| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:24.623| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
Process Batch:  22%|######                        | 32/144 [00:21<01:01,  1.82it/s]|2023-
→12-15|15:56:24.667| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:24.684| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:24.679| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:24.683| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:24.936| [WARNING] Read: Scale > 1.This means that the desired␣
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↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:24.940| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:24.966| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:24.976| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:25.121| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:25.125| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:25.175| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  23%|######1                      | 33/144 [00:21<01:01,  1.82it/s]|2023-
↪12-15|15:56:25.229| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:25.238| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:25.342| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:25.357| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:25.514| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:25.529| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:25.699| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:25.710| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:25.713| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  24%|######3                      | 34/144 [00:22<00:59,  1.84it/s]|2023-
↪12-15|15:56:25.756| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:25.766| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:25.884| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
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↪Interpolation of read regions may occur.
|2023-12-15|15:56:25.899| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:25.981| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:25.985| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:26.143| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:26.146| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:26.230| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  24%|######5                    | 35/144 [00:22<00:58,  1.86it/s]|2023-
↪12-15|15:56:26.286| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:26.299| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:26.337| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:26.350| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:26.554| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:26.569| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:26.733| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:26.745| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:26.743| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  25%|######7                    | 36/144 [00:23<00:57,  1.89it/s]|2023-
↪12-15|15:56:26.793| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:26.800| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:27.013| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
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|2023-12-15|15:56:27.027| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:27.048| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:27.060| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:27.271| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:27.273| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:27.286| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  26%|######9                      | 37/144 [00:23<00:57,  1.87it/s]|2023-
↪12-15|15:56:27.330| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:27.345| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:27.462| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:27.464| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:27.729| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:27.742| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:27.804| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  26%|#######1                     | 38/144 [00:24<00:56,  1.89it/s]|2023-
↪12-15|15:56:27.844| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:27.855| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:27.924| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:27.939| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:28.122| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:28.139| [WARNING] Read: Scale > 1.This means that the desired␣
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↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:28.165| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:28.174| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:28.326| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  27%|#######3                    | 39/144 [00:24<00:55,  1.90it/s]|2023-
↪12-15|15:56:28.379| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:28.394| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:28.412| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:28.429| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:28.633| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:28.646| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:28.819| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:28.834| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:28.858| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  28%|#######5                    | 40/144 [00:25<00:55,  1.87it/s]|2023-
↪12-15|15:56:28.931| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:28.942| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:29.090| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:29.096| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:29.120| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:29.130| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
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↪Interpolation of read regions may occur.
|2023-12-15|15:56:29.335| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:29.348| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:29.377| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:29.391| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:29.410| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  28%|#######6                       | 41/144 [00:26<00:55,  1.85it/s]|2023-
↪12-15|15:56:29.497| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:29.511| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:29.637| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:29.647| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:29.768| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:29.781| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:29.965| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:29.982| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:29.986| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  29%|#######8                       | 42/144 [00:26<00:55,  1.84it/s]|2023-
↪12-15|15:56:30.031| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:30.044| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:30.259| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:30.269| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
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|2023-12-15|15:56:30.470| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:30.478| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:30.527| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  30%|########                     | 43/144 [00:27<00:56,  1.78it/s]|2023-
↪12-15|15:56:30.646| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:30.654| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:30.878| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:30.886| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:31.176| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  31%|#########2                   | 44/144 [00:27<00:58,  1.72it/s]|2023-
↪12-15|15:56:31.255| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:31.263| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:31.267| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:31.273| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:31.375| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:31.389| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:31.807| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:31.866| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:31.880| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  31%|#########4                   | 45/144 [00:28<01:00,  1.64it/s]|2023-
↪12-15|15:56:32.001| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
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|2023-12-15|15:56:32.009| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:32.115| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:32.138| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:32.350| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:32.363| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:32.500| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:32.562| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:32.575| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  32%|########6                 | 46/144 [00:29<01:01,  1.58it/s]|2023-
↪12-15|15:56:32.629| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:32.641| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:32.821| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:32.845| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:33.163| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:33.170| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:33.182| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  33%|########8                 | 47/144 [00:29<01:02,  1.55it/s]|2023-
↪12-15|15:56:33.274| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:33.296| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:33.298| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:33.325| [WARNING] Read: Scale > 1.This means that the desired␣
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→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:33.466| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:33.482| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:33.871| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:33.882| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:33.901| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
Process Batch:  33%|#########                | 48/144 [00:30<01:03,  1.51it/s]|2023-
→12-15|15:56:34.001| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:34.013| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:34.031| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:34.039| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:34.248| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:34.265| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:34.393| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:34.405| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:34.537| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
Process Batch:  34%|#########1               | 49/144 [00:31<01:02,  1.53it/s]|2023-
→12-15|15:56:34.640| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:34.656| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:34.755| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:34.757| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
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↪Interpolation of read regions may occur.
|2023-12-15|15:56:34.769| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:34.772| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:34.963| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:34.975| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:35.115| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:35.132| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:35.146| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  35%|#########3                  | 50/144 [00:31<00:59,  1.59it/s]|2023-
↪12-15|15:56:35.204| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:35.221| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:35.271| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:35.284| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:35.448| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:35.461| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:35.623| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:35.638| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:35.669| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:35.680| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:35.716| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  35%|#########5                  | 51/144 [00:32<00:57,  1.62it/s]|2023-
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↪12-15|15:56:35.784| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:35.799| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:36.020| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:36.030| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:36.090| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:36.106| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:36.273| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:36.295| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:36.288| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  36%|#########7                    | 52/144 [00:32<00:55,  1.65it/s]|2023-
↪12-15|15:56:36.374| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:36.384| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:36.459| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:36.476| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:36.504| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:36.520| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:36.746| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:36.765| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:36.794| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:36.812| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
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↪Interpolation of read regions may occur.
|2023-12-15|15:56:36.873| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  37%|#########9                    | 53/144 [00:33<00:53,  1.69it/s]|2023-
↪12-15|15:56:36.939| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:36.959| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:37.027| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:37.043| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:37.239| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:37.251| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:37.328| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:37.340| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:37.421| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:37.454| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  38%|##########1                   | 54/144 [00:34<00:52,  1.72it/s]|2023-
↪12-15|15:56:37.467| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:37.492| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:37.508| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:37.737| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:37.750| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:37.862| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:37.871| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
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|2023-12-15|15:56:38.003| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  38%|##########3                | 55/144 [00:34<00:51,  1.72it/s]|2023-
↪12-15|15:56:38.078| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:38.085| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:38.135| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:38.151| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:38.375| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:38.377| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:38.444| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:38.462| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:38.574| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  39%|##########5                | 56/144 [00:35<00:51,  1.71it/s]|2023-
↪12-15|15:56:38.635| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:38.654| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:38.666| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:38.681| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:38.822| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:38.824| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:39.060| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:39.075| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:39.134| [WARNING] Read: Scale > 1.This means that the desired␣
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→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
Process Batch:  40%|##########6                | 57/144 [00:35<00:49,  1.76it/s]|2023-
→12-15|15:56:39.191| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:39.207| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:39.334| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:39.348| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:39.535| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:39.538| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:39.635| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:39.647| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:39.696| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:39.696| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:39.701| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
Process Batch:  40%|##########8                | 58/144 [00:36<00:49,  1.74it/s]|2023-
→12-15|15:56:39.781| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:39.788| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:39.949| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:39.966| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:40.099| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:40.107| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:40.252| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
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↪Interpolation of read regions may occur.
|2023-12-15|15:56:40.265| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:40.277| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  41%|###########                    | 59/144 [00:36<00:48,  1.77it/s]|2023-
↪12-15|15:56:40.331| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:40.344| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:40.468| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:40.477| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:40.604| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:40.617| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:40.800| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  42%|###########2                   | 60/144 [00:37<00:46,  1.80it/s]|2023-
↪12-15|15:56:40.864| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:40.866| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:40.868| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:40.875| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:41.127| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:41.143| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:41.143| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:41.174| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:41.300| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
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|2023-12-15|15:56:41.311| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:41.340| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  42%|###########4                 | 61/144 [00:37<00:46,  1.79it/s]|2023-
↪12-15|15:56:41.419| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:41.433| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:41.539| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:41.548| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:41.810| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:41.819| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:41.910| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  43%|###########6                 | 62/144 [00:38<00:45,  1.81it/s]|2023-
↪12-15|15:56:41.958| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:41.970| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:41.996| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:42.009| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:42.253| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:42.258| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:42.303| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:42.317| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:42.422| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  44%|###########8                 | 63/144 [00:39<00:43,  1.85it/s]|2023-
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→12-15|15:56:42.478| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:42.487| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:42.566| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:42.574| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:42.826| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:42.838| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:42.874| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:42.893| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:42.985| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
Process Batch:  44%|############              | 64/144 [00:39<00:43,  1.83it/s]|2023-
→12-15|15:56:43.041| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:43.038| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:43.049| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:43.047| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:43.285| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:43.297| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:43.355| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:43.365| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:43.560| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:43.564| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
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↪Interpolation of read regions may occur.
|2023-12-15|15:56:43.566| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  45%|############1             | 65/144 [00:40<00:44,  1.79it/s]|2023-
↪12-15|15:56:43.620| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:43.634| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:43.837| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:43.858| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:43.850| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:43.864| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:44.070| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:44.077| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:44.101| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  46%|############3             | 66/144 [00:40<00:43,  1.81it/s]|2023-
↪12-15|15:56:44.171| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:44.181| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:44.311| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:44.323| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:44.421| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:44.431| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:44.656| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  47%|############5             | 67/144 [00:41<00:43,  1.79it/s]|2023-
↪12-15|15:56:44.721| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
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↪Interpolation of read regions may occur.
|2023-12-15|15:56:44.738| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:44.740| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:44.749| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:45.126| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:45.140| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:45.258| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:45.264| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:45.267| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  47%|#############7             | 68/144 [00:41<00:44,  1.71it/s]|2023-
↪12-15|15:56:45.412| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:45.429| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:45.736| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:45.751| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:45.920| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  48%|#############9             | 69/144 [00:42<00:45,  1.66it/s]|2023-
↪12-15|15:56:46.010| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:46.031| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:46.050| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:46.065| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:46.155| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
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|2023-12-15|15:56:46.170| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:46.541| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:46.565| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:46.617| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  49%|#############1             | 70/144 [00:43<00:46,  1.60it/s]|2023-
↪12-15|15:56:46.710| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:46.736| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:46.846| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:46.863| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:47.044| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:47.063| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:47.233| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:47.250| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:47.279| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:47.367| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  49%|#############3             | 71/144 [00:43<00:47,  1.54it/s]|2023-
↪12-15|15:56:47.382| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:47.405| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:47.412| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:47.912| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:47.934| [WARNING] Read: Scale > 1.This means that the desired␣
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↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:47.976| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:47.984| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:48.011| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  50%|#############5              | 72/144 [00:44<00:47,  1.50it/s]|2023-
↪12-15|15:56:48.120| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:48.151| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:48.245| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:48.264| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:48.490| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:48.517| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:48.668| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:48.750| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  51%|#############6              | 73/144 [00:45<00:47,  1.50it/s]|2023-
↪12-15|15:56:48.762| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:48.778| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:48.819| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:48.981| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:48.995| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:49.329| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:49.356| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
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↪Interpolation of read regions may occur.
|2023-12-15|15:56:49.375| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  51%|#############8              | 74/144 [00:45<00:45,  1.52it/s]|2023-
↪12-15|15:56:49.415| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:49.427| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:49.499| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:49.509| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:49.565| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:49.585| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:49.871| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:49.891| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:49.925| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:49.933| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:49.964| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  52%|##############              | 75/144 [00:46<00:44,  1.55it/s]|2023-
↪12-15|15:56:50.001| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:50.022| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:50.023| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:50.030| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:50.278| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:50.301| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
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|2023-12-15|15:56:50.435| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:50.452| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:50.466| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:50.487| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:50.553| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  53%|##############2            | 76/144 [00:47<00:42,  1.58it/s]|2023-
↪12-15|15:56:50.637| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:50.651| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:50.697| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:50.706| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:50.837| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:50.852| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:51.025| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:51.037| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:51.132| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:51.131| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:51.150| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  53%|##############4            | 77/144 [00:47<00:41,  1.63it/s]|2023-
↪12-15|15:56:51.206| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:51.226| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:51.268| [WARNING] Read: Scale > 1.This means that the desired␣
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→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:51.289| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:51.594| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:51.599| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:51.608| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:51.610| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:51.702| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
Process Batch:  54%|##############6              | 78/144 [00:48<00:39,  1.66it/s]|2023-
→12-15|15:56:51.783| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:51.794| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:51.863| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:51.871| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:52.145| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:52.154| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:52.210| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:52.225| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:52.294| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
Process Batch:  55%|##############8              | 79/144 [00:48<00:38,  1.69it/s]|2023-
→12-15|15:56:52.340| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:52.357| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:52.503| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
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↪Interpolation of read regions may occur.
|2023-12-15|15:56:52.515| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:52.701| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:52.713| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:52.811| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:52.821| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:52.829| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  56%|###############          | 80/144 [00:49<00:37,  1.72it/s]|2023-
↪12-15|15:56:52.895| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:52.918| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:53.034| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:53.050| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:53.267| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:53.280| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:53.368| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:53.381| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:53.379| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  56%|###############1         | 81/144 [00:50<00:35,  1.76it/s]|2023-
↪12-15|15:56:53.442| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:53.454| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:53.642| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
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|2023-12-15|15:56:53.661| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:53.852| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:53.873| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:53.900| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:53.912| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:53.942| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  57%|###############3         | 82/144 [00:50<00:35,  1.76it/s]|2023-
↪12-15|15:56:54.010| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:54.025| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:54.209| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:54.224| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:54.340| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:54.358| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:54.501| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:54.526| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:54.515| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  58%|###############5         | 83/144 [00:51<00:35,  1.74it/s]|2023-
↪12-15|15:56:54.600| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:54.625| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:54.644| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:54.662| [WARNING] Read: Scale > 1.This means that the desired␣
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↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:54.933| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:54.954| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:55.035| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:55.049| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:55.088| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  58%|###############7          | 84/144 [00:51<00:33,  1.77it/s]|2023-
↪12-15|15:56:55.136| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:55.139| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:55.277| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:55.295| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:55.529| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:55.531| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:55.577| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:55.587| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:55.628| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  59%|###############9          | 85/144 [00:52<00:33,  1.78it/s]|2023-
↪12-15|15:56:55.691| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:55.703| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:55.802| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:55.810| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
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↪Interpolation of read regions may occur.
|2023-12-15|15:56:56.060| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:56.069| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:56.114| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:56.128| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:56.176| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  60%|################1       | 86/144 [00:52<00:32,  1.79it/s]|2023-
↪12-15|15:56:56.251| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:56.265| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:56.334| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:56.350| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:56.545| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:56.561| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:56.713| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:56.728| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:56.763| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  60%|################3       | 87/144 [00:53<00:32,  1.76it/s]|2023-
↪12-15|15:56:56.840| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:56.849| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:57.008| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:57.024| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
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|2023-12-15|15:56:57.113| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:57.116| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:57.306| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:57.321| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:57.343| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
Process Batch:  61%|################5         | 88/144 [00:53<00:31,  1.75it/s]|2023-
→12-15|15:56:57.389| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:57.404| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:57.424| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:57.433| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:57.688| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:57.691| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:57.751| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:57.768| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:57.887| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
Process Batch:  62%|################6         | 89/144 [00:54<00:30,  1.80it/s]|2023-
→12-15|15:56:57.932| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:57.947| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:57.995| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:58.008| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:58.233| [WARNING] Read: Scale > 1.This means that the desired␣
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↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:58.245| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:58.307| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:58.316| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:58.447| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  62%|################8          | 90/144 [00:55<00:30,  1.77it/s]|2023-
↪12-15|15:56:58.527| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:58.538| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:58.560| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:58.572| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:58.851| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:58.853| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:58.859| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:58.865| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:59.033| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:59.078| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  63%|#################          | 91/144 [00:55<00:30,  1.75it/s]|2023-
↪12-15|15:56:59.102| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:59.113| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:59.123| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:56:59.454| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
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→Interpolation of read regions may occur.
|2023-12-15|15:56:59.456| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:59.465| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:59.468| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:59.611| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
Process Batch:  64%|#################2         | 92/144 [00:56<00:30,  1.72it/s]|2023-
→12-15|15:56:59.727| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:59.743| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:59.827| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:56:59.843| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:00.251| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:00.273| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:00.283| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:00.329| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
Process Batch:  65%|#################4         | 93/144 [00:56<00:30,  1.67it/s]|2023-
→12-15|15:57:00.331| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:00.374| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:00.393| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:00.906| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:00.925| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:00.947| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
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Process Batch:  65%|################6            | 94/144 [00:57<00:31,  1.60it/s]|2023-
→12-15|15:57:01.047| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:01.060| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:01.188| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:01.202| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:01.467| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:01.478| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:01.589| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:01.584| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:01.598| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:01.664| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:01.677| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
Process Batch:  66%|################8            | 95/144 [00:58<00:31,  1.55it/s]|2023-
→12-15|15:57:01.736| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:01.756| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:02.112| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:02.136| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:02.273| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:02.304| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:02.298| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
Process Batch:  67%|################            | 96/144 [00:59<00:31,  1.51it/s]|2023-
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↪12-15|15:57:02.437| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:02.458| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:02.554| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:02.569| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:02.741| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:02.765| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:02.987| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  67%|##################1       | 97/144 [00:59<00:31,  1.49it/s]|2023-
↪12-15|15:57:03.157| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:03.167| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:03.194| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:03.211| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:03.402| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:03.422| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:03.684| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:03.764| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:03.780| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  68%|##################3       | 98/144 [01:00<00:31,  1.48it/s]|2023-
↪12-15|15:57:03.824| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:03.839| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:03.987| [WARNING] Read: Scale > 1.This means that the desired␣
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↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:04.004| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:04.038| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:04.055| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:04.213| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:04.223| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:04.384| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  69%|#################5        | 99/144 [01:01<00:30,  1.50it/s]|2023-
↪12-15|15:57:04.499| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:04.497| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:04.507| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:04.513| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:04.539| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:04.555| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:04.561| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:04.577| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:04.864| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:04.886| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:05.009| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:05.030| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
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|2023-12-15|15:57:05.043| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
Process Batch:  69%|##################      | 100/144 [01:01<00:29,  1.51it/s]|2023-
→12-15|15:57:05.124| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:05.144| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:05.178| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:05.198| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:05.516| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:05.525| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:05.574| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:05.590| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:05.626| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
Process Batch:  70%|##################2     | 101/144 [01:02<00:27,  1.58it/s]|2023-
→12-15|15:57:05.688| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:05.696| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:05.876| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:05.893| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:05.981| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:05.998| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:06.093| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:06.113| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:06.196| [WARNING] Read: Scale > 1.This means that the desired␣
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↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:06.207| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:06.218| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  71%|##################4       | 102/144 [01:02<00:26,  1.60it/s]|2023-
↪12-15|15:57:06.287| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:06.301| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:06.420| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:06.437| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:06.707| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:06.724| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:06.721| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:06.732| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:06.802| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  72%|##################5       | 103/144 [01:03<00:25,  1.63it/s]|2023-
↪12-15|15:57:06.888| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:06.905| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:07.063| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:07.086| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:07.232| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:07.245| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:07.395| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
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↪Interpolation of read regions may occur.
|2023-12-15|15:57:07.397| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:07.421| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  72%|##################7      | 104/144 [01:04<00:24,  1.64it/s]|2023-
↪12-15|15:57:07.488| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:07.496| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:07.498| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:07.516| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:07.762| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:07.776| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:07.933| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:07.946| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:07.976| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  73%|##################9      | 105/144 [01:04<00:23,  1.69it/s]|2023-
↪12-15|15:57:08.037| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:08.058| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:08.284| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:08.301| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:08.346| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:08.361| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:08.499| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
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|2023-12-15|15:57:08.512| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:08.552| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:08.584| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
Process Batch:  74%|###################1      | 106/144 [01:05<00:22,  1.69it/s]|2023-
→12-15|15:57:08.599| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:08.620| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:08.626| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:08.871| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:08.879| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:08.926| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:08.940| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:09.124| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:09.141| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:09.153| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
Process Batch:  74%|###################3      | 107/144 [01:05<00:21,  1.72it/s]|2023-
→12-15|15:57:09.186| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:09.191| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:09.415| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:09.428| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:09.522| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:09.540| [WARNING] Read: Scale > 1.This means that the desired␣
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→resolution is higher than the WSI baseline (maximum encoded resolution)._
→Interpolation of read regions may occur.
|2023-12-15|15:57:09.659| [WARNING] Read: Scale > 1.This means that the desired_
→resolution is higher than the WSI baseline (maximum encoded resolution)._
→Interpolation of read regions may occur.
Process Batch:  75%|##################5      | 108/144 [01:06<00:20,  1.74it/s]|2023-
→12-15|15:57:09.745| [WARNING] Read: Scale > 1.This means that the desired_
→resolution is higher than the WSI baseline (maximum encoded resolution)._
→Interpolation of read regions may occur.
|2023-12-15|15:57:09.757| [WARNING] Read: Scale > 1.This means that the desired_
→resolution is higher than the WSI baseline (maximum encoded resolution)._
→Interpolation of read regions may occur.
|2023-12-15|15:57:09.819| [WARNING] Read: Scale > 1.This means that the desired_
→resolution is higher than the WSI baseline (maximum encoded resolution)._
→Interpolation of read regions may occur.
|2023-12-15|15:57:09.827| [WARNING] Read: Scale > 1.This means that the desired_
→resolution is higher than the WSI baseline (maximum encoded resolution)._
→Interpolation of read regions may occur.
|2023-12-15|15:57:10.061| [WARNING] Read: Scale > 1.This means that the desired_
→resolution is higher than the WSI baseline (maximum encoded resolution)._
→Interpolation of read regions may occur.
|2023-12-15|15:57:10.062| [WARNING] Read: Scale > 1.This means that the desired_
→resolution is higher than the WSI baseline (maximum encoded resolution)._
→Interpolation of read regions may occur.
|2023-12-15|15:57:10.071| [WARNING] Read: Scale > 1.This means that the desired_
→resolution is higher than the WSI baseline (maximum encoded resolution)._
→Interpolation of read regions may occur.
|2023-12-15|15:57:10.075| [WARNING] Read: Scale > 1.This means that the desired_
→resolution is higher than the WSI baseline (maximum encoded resolution)._
→Interpolation of read regions may occur.
|2023-12-15|15:57:10.256| [WARNING] Read: Scale > 1.This means that the desired_
→resolution is higher than the WSI baseline (maximum encoded resolution)._
→Interpolation of read regions may occur.
Process Batch:  76%|##################6      | 109/144 [01:06<00:20,  1.73it/s]|2023-
→12-15|15:57:10.298| [WARNING] Read: Scale > 1.This means that the desired_
→resolution is higher than the WSI baseline (maximum encoded resolution)._
→Interpolation of read regions may occur.
|2023-12-15|15:57:10.320| [WARNING] Read: Scale > 1.This means that the desired_
→resolution is higher than the WSI baseline (maximum encoded resolution)._
→Interpolation of read regions may occur.
|2023-12-15|15:57:10.339| [WARNING] Read: Scale > 1.This means that the desired_
→resolution is higher than the WSI baseline (maximum encoded resolution)._
→Interpolation of read regions may occur.
|2023-12-15|15:57:10.343| [WARNING] Read: Scale > 1.This means that the desired_
→resolution is higher than the WSI baseline (maximum encoded resolution)._
→Interpolation of read regions may occur.
|2023-12-15|15:57:10.494| [WARNING] Read: Scale > 1.This means that the desired_
→resolution is higher than the WSI baseline (maximum encoded resolution)._
→Interpolation of read regions may occur.
|2023-12-15|15:57:10.512| [WARNING] Read: Scale > 1.This means that the desired_
→resolution is higher than the WSI baseline (maximum encoded resolution)._
→Interpolation of read regions may occur.
|2023-12-15|15:57:10.731| [WARNING] Read: Scale > 1.This means that the desired_
→resolution is higher than the WSI baseline (maximum encoded resolution)._
→Interpolation of read regions may occur.
|2023-12-15|15:57:10.747| [WARNING] Read: Scale > 1.This means that the desired_
→resolution is higher than the WSI baseline (maximum encoded resolution)._
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↪Interpolation of read regions may occur.
|2023-12-15|15:57:10.853| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  76%|###################8     | 110/144 [01:07<00:19,  1.73it/s]|2023-
↪12-15|15:57:10.898| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:10.915| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:10.986| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:11.002| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:11.186| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:11.200| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:11.363| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:11.373| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:11.384| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  77%|####################     | 111/144 [01:08<00:18,  1.76it/s]|2023-
↪12-15|15:57:11.433| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:11.457| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:11.586| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:11.601| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:11.796| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:11.810| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:11.852| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:11.866| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
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|2023-12-15|15:57:11.949| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  78%|####################2    | 112/144 [01:08<00:18,  1.75it/s]|2023-
↪12-15|15:57:12.019| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:12.033| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:12.186| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:12.204| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:12.316| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:12.334| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:12.485| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:12.502| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:12.527| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  78%|####################4    | 113/144 [01:09<00:17,  1.75it/s]|2023-
↪12-15|15:57:12.614| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:12.629| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:12.651| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:12.673| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:12.874| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:12.882| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:13.060| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:13.074| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:13.114| [WARNING] Read: Scale > 1.This means that the desired␣
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↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  79%|####################5    | 114/144 [01:09<00:17,  1.74it/s]|2023-
↪12-15|15:57:13.176| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:13.184| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:13.324| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:13.338| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:13.483| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:13.495| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:13.577| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:13.590| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:13.680| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:13.700| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:13.709| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  80%|####################7    | 115/144 [01:10<00:16,  1.75it/s]|2023-
↪12-15|15:57:13.750| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:13.758| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:14.059| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:14.080| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:14.192| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:14.202| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:14.261| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
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↪Interpolation of read regions may occur.
Process Batch:  81%|####################9     | 116/144 [01:10<00:16,  1.71it/s]|2023-
↪12-15|15:57:14.357| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:14.366| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:14.616| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:14.633| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:14.895| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:14.932| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  81%|####################1     | 117/144 [01:11<00:16,  1.67it/s]|2023-
↪12-15|15:57:14.949| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:14.990| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:15.004| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:15.082| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:15.095| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:15.456| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:15.468| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:15.547| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  82%|####################3     | 118/144 [01:12<00:16,  1.62it/s]|2023-
↪12-15|15:57:15.653| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:15.668| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:15.745| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:15.762| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
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→Interpolation of read regions may occur.
|2023-12-15|15:57:16.017| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:16.035| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:16.206| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:16.221| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:16.247| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:16.304| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:16.317| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
Process Batch:  83%|####################4   | 119/144 [01:12<00:16,  1.54it/s]|2023-
→12-15|15:57:16.375| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:16.391| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:16.799| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:16.814| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:16.893| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:16.926| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:16.927| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
Process Batch:  83%|####################6   | 120/144 [01:13<00:15,  1.52it/s]|2023-
→12-15|15:57:17.064| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:17.080| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:17.202| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:17.216| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
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|2023-12-15|15:57:17.309| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:17.325| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:17.646| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:17.708| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:17.733| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  84%|####################8    | 121/144 [01:14<00:15,  1.46it/s]|2023-
↪12-15|15:57:17.810| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:17.833| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:17.936| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:17.958| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:18.224| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:18.238| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:18.365| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  85%|#####################    | 122/144 [01:15<00:15,  1.46it/s]|2023-
↪12-15|15:57:18.506| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:18.516| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:18.599| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:18.614| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:18.772| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:18.786| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:19.049| [WARNING] Read: Scale > 1.This means that the desired␣
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↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  85%|#####################2   | 123/144 [01:15<00:14,  1.47it/s]|2023-
↪12-15|15:57:19.169| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:19.178| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:19.243| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:19.253| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:19.275| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:19.279| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:19.375| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:19.393| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:19.608| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:19.618| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:19.719| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  86%|#####################3   | 124/144 [01:16<00:13,  1.49it/s]|2023-
↪12-15|15:57:19.805| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:19.813| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:19.808| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:19.827| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:19.870| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:19.880| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:19.957| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
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↪Interpolation of read regions may occur.
|2023-12-15|15:57:19.964| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:20.282| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:20.298| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:20.333| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:20.359| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:20.355| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  87%|####################5  | 125/144 [01:17<00:12,  1.51it/s]|2023-
↪12-15|15:57:20.443| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:20.462| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:20.632| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:20.653| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:20.678| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:20.691| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:20.930| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  88%|####################7  | 126/144 [01:17<00:11,  1.60it/s]|2023-
↪12-15|15:57:21.010| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:21.012| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:21.017| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:21.020| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:21.033| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
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|2023-12-15|15:57:21.025| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:21.357| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:21.378| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:21.445| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:21.463| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:21.477| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  88%|####################9  | 127/144 [01:18<00:10,  1.66it/s]|2023-
↪12-15|15:57:21.527| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:21.542| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:21.726| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:21.739| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:21.824| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:21.836| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:22.074| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:22.109| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:22.103| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  89%|####################1  | 128/144 [01:18<00:09,  1.65it/s]|2023-
↪12-15|15:57:22.128| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:22.131| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:22.145| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:22.148| [WARNING] Read: Scale > 1.This means that the desired␣
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→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:22.496| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:22.511| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:22.571| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:22.582| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:22.692| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
Process Batch:  90%|#####################2  | 129/144 [01:19<00:09,  1.65it/s]|2023-
→12-15|15:57:22.750| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:22.760| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:22.764| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:22.789| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:22.922| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:22.939| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:23.242| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:23.257| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:23.261| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:23.284| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:23.291| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
Process Batch:  90%|#####################4  | 130/144 [01:19<00:08,  1.66it/s]|2023-
→12-15|15:57:23.338| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
|2023-12-15|15:57:23.356| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
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↪Interpolation of read regions may occur.
|2023-12-15|15:57:23.504| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:23.526| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:23.610| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:23.618| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:23.799| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:23.807| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:23.808| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:23.835| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:23.817| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  91%|######################6  | 131/144 [01:20<00:07,  1.68it/s]|2023-
↪12-15|15:57:23.928| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:23.939| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:24.009| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:24.037| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:24.207| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:24.220| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:24.320| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:24.326| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:24.416| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:24.433| [WARNING] Read: Scale > 1.This means that the desired␣
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↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:24.435| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  92%|#######################8  | 132/144 [01:21<00:06,  1.72it/s]|2023-
↪12-15|15:57:24.470| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:24.481| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:24.708| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:24.714| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:24.806| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:24.812| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:24.921| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:24.923| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:24.984| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  92%|#######################  | 133/144 [01:21<00:06,  1.74it/s]|2023-
↪12-15|15:57:25.046| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:25.058| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:25.207| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:25.210| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:25.312| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:25.322| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:25.411| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:25.421| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
```

```
↪Interpolation of read regions may occur.
|2023-12-15|15:57:25.528| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  93%|#######################1 | 134/144 [01:22<00:05,  1.77it/s]|2023-
↪12-15|15:57:25.565| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:25.579| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:25.736| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:25.744| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:25.832| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:25.842| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:25.941| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:25.943| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:26.041| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
Process Batch:  94%|#######################3 | 135/144 [01:22<00:04,  1.81it/s]|2023-
↪12-15|15:57:26.092| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:26.098| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:26.244| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:26.256| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:26.343| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:26.346| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:26.434| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
|2023-12-15|15:57:26.436| [WARNING] Read: Scale > 1.This means that the desired␣
↪resolution is higher than the WSI baseline (maximum encoded resolution).␣
↪Interpolation of read regions may occur.
```

```
|2023-12-15|15:57:26.567| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
Process Batch:  94%|#######################5 | 136/144 [01:23<00:04,  1.85it/s]|2023-
→12-15|15:57:27.085| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
Process Batch:  95%|#######################7 | 137/144 [01:23<00:03,  1.88it/s]|2023-
→12-15|15:57:27.592| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
Process Batch:  96%|#######################9 | 138/144 [01:24<00:03,  1.90it/s]|2023-
→12-15|15:57:28.095| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
Process Batch:  97%|######################## | 139/144 [01:24<00:02,  1.93it/s]|2023-
→12-15|15:57:28.603| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
Process Batch:  97%|########################2| 140/144 [01:25<00:02,  1.94it/s]|2023-
→12-15|15:57:29.108| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
Process Batch:  98%|########################4| 141/144 [01:25<00:01,  1.95it/s]|2023-
→12-15|15:57:29.616| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
Process Batch:  99%|########################6| 142/144 [01:26<00:01,  1.94it/s]|2023-
→12-15|15:57:30.142| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
Process Batch:  99%|########################8| 143/144 [01:26<00:00,  1.94it/s]|2023-
→12-15|15:57:30.649| [WARNING] Read: Scale > 1.This means that the desired␣
→resolution is higher than the WSI baseline (maximum encoded resolution).␣
→Interpolation of read regions may occur.
Process Batch: 100%|#########################| 144/144 [01:27<00:00,  1.65it/s]
```

```
|2023-12-15|15:57:30.689| [INFO] Finish: 0
|2023-12-15|15:57:30.690| [INFO] --Input: sample_wsi.svs
|2023-12-15|15:57:30.692| [INFO] --Output: /content/sample_wsi_results/0
```

Note the only differences made here are:

1. Adding `auto_generate_mask=False` to the `SemanticSegmentor`. If `True`, the toolbox automatically extracts tissue masks from WSIs if there is no `masks` input is provided to the `predict` function.

2. Setting `mode='wsi'` in the `predict` function indicates that we are predicting region segmentations for inputs in the form of WSIs.

3. `masks=None` in the `predict` function: `masks` argument similar to the `imgs` should be a list of paths to the desired image masks. Patches from `imgs` are only processed if they are within a masked area of their corresponding `masks`. If not provided (`masks=None`), then a tissue mask will be automatically generated for whole-slide images or the entire image is processed for image tiles.

The above cell might take a while to process, especially if you have set `ON_GPU=False`. The processing time depends

---

on the size of the input WSI and the selected resolution. Here, we have not specified any values, which means that the `baseline` resolution of the WSI, which is 40x in this example, will be used.

```python
logger.info(
    "Prediction method output is: %s, %s",
    wsi_output[0][0],
    wsi_output[0][1],
)
wsi_prediction_raw = np.load(
    wsi_output[0][1] + ".raw.0.npy",
)  # Loading the first prediction [0] based on the output address [1]
logger.info(
    "Raw prediction dimensions: (%d, %d, %d)",
    wsi_prediction_raw.shape[0],
    wsi_prediction_raw.shape[1],
    wsi_prediction_raw.shape[2],
)

# Simple processing of the raw prediction to generate semantic segmentation task
wsi_prediction = np.argmax(
    wsi_prediction_raw,
    axis=-1,
)  # select the class with highest probability
logger.info(
    "Processed prediction dimensions: (%d, %d)",
    wsi_prediction.shape[0],
    wsi_prediction.shape[1],
)

# [WSI overview extraction]
# Now reading the WSI to extract it's overview
wsi = WSIReader.open(wsi_file_name)
logger.info(
    "WSI original dimensions: (%d, %d)",
    wsi.info.slide_dimensions[0],
    wsi.info.slide_dimensions[1],
)

# using the prediction save_resolution to create the wsi overview at the same⌁
↪resolution
overview_info = bcc_wsi_ioconfig.save_resolution

# extracting slide overview using `slide_thumbnail` method
wsi_overview = wsi.slide_thumbnail(
    resolution=overview_info["resolution"],
    units=overview_info["units"],
)
logger.info(
    "WSI overview dimensions: (%d, %d)",
    wsi_overview.shape[0],
    wsi_overview.shape[1],
)
plt.figure(), plt.imshow(wsi_overview)
plt.axis("off")

# [Overlay map creation]
# creating label-color dictionary to be fed into `overlay_prediction_mask` function
# to help generating color legend
```

(continues on next page)

```python
label_dict = {"Tumour": 0, "Stroma": 1, "Inflamatory": 2, "Necrosis": 3, "Others": 4}
label_color_dict = {}
colors = cm.get_cmap("Set1").colors
for class_name, label in label_dict.items():
    label_color_dict[label] = (class_name, 255 * np.array(colors[label]))
# Creat overlay map using the `overlay_prediction_mask` helper function
overlay = overlay_prediction_mask(
    wsi_overview,
    wsi_prediction,
    alpha=0.5,
    label_info=label_color_dict,
    return_ax=True,
)
```

```
|2023-12-15|16:09:38.558| [INFO] Prediction method output is: sample_wsi.svs, /
↪content/sample_wsi_results/0
|2023-12-15|16:09:38.608| [INFO] Raw prediction dimensions: (1503, 1503, 5)
|2023-12-15|16:09:38.673| [INFO] Processed prediction dimensions: (1503, 1503)
|2023-12-15|16:09:38.699| [INFO] WSI original dimensions: (12000, 12000)
|2023-12-15|16:09:39.715| [INFO] WSI overview dimensions: (1503, 1503)
```
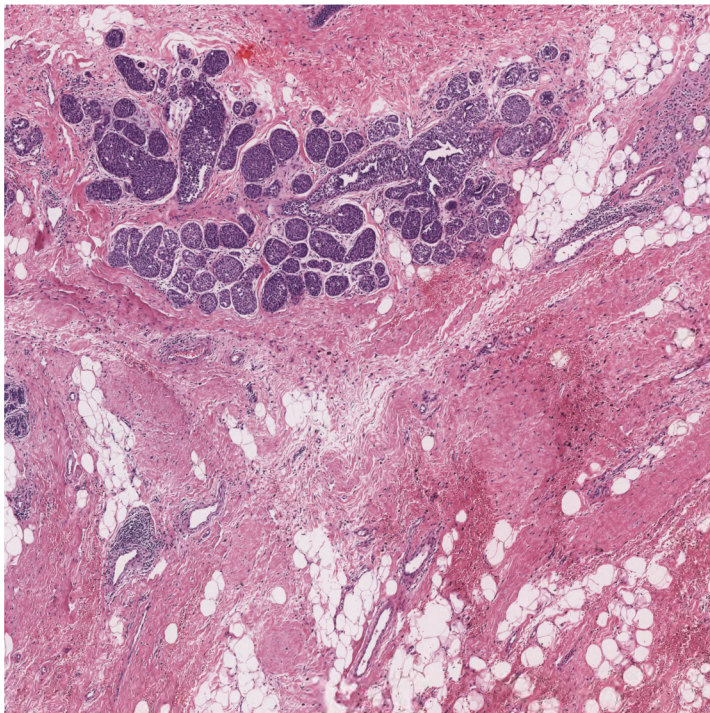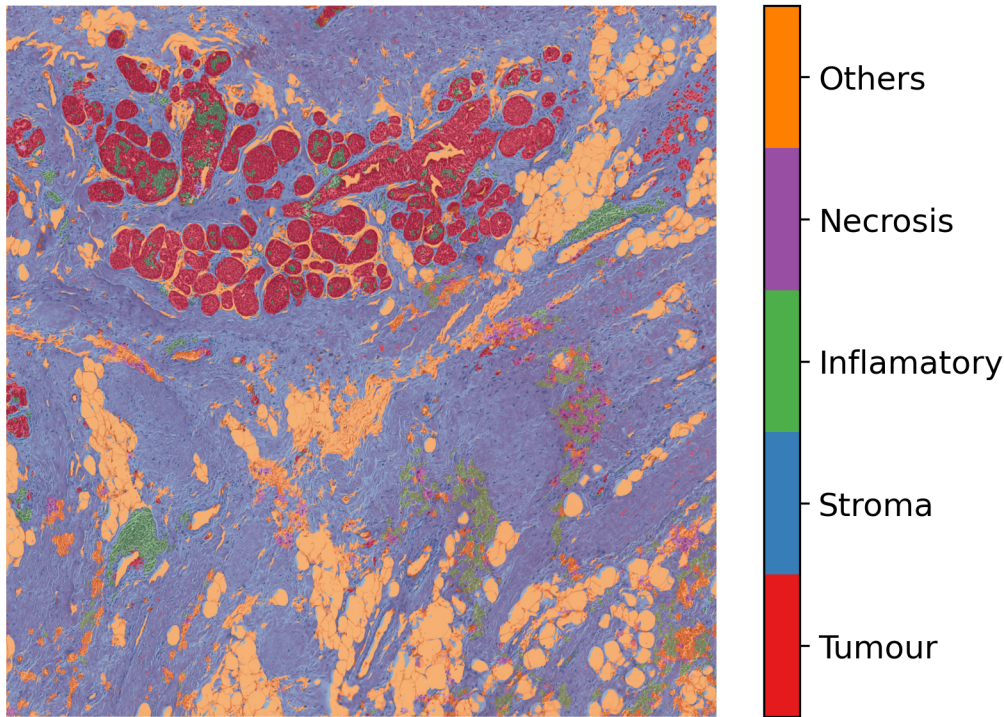
As you can see above, we first post-process the prediction map, the same way as we did for tiles (taking `argmax` of the model output), to create the semantic segmentation map. Then, in order to visualise the segmentation prediction on the tissue image, we read the processed WSI and extract its overview. Please note that the overview is extracted at the same resolution as the saved prediction output (accessed through `bcc_wsi_ioconfig.save_resolution`). Finally, we used the `overlay_prediction_mask` helper function of the TIAToolbox to overlay the prediction map on the overview image and depict it with a colour legend.

In summary, it is very easy to use pretrained models in the TIAToolbox to do predefined tasks. In fact, you don't even need to set any parameters related to a model's input/output when you decide to work with one of TIAToolbox's pretrained models (they will be set automatically, based on their optimal values). Here we explain how the parameters work, so we need to show them explicitly. In other words, region segmentation in images can be done as easily as:

```
segmentor = SemanticSegmentor(pretrained_model="fcn_resnet50_unet-bcss" num_loader_
→workers=4, batch_size=4)
output = segmentor.predict([img_file_name], save_dir="sample_tile_results/", mode=
→"tile")
```

Having said that, you may need to take care of a couple of other things if you want to use the same model with new weights, or even use a whole new model in the TIAToolbox inference pipeline. But don't worry, these will be covered in the next section of this notebook.

Semantic segmentation using user-trained (external) models

At the TIACentre we are extending the number of pretrained models in the toolbox as fast as we can, to cover more tasks and tissue types. Nevertheless, users may need to use their own models in the TIAToolbox inference pipeline. In this case, TIAToolbox removes the burden of programing WSI processing, patch extraction, prediction aggregation, and multi-processing handling. Projects at scale provide further complications. But TIAToolbox comes to the rescue! TIAToolbox supports **Pytorch** models. It's very easy to fit torch models in theTIAToolbox inference pipeline. We show you how.

Tissue segmentation model as an external model

We have a model that has been trained for tissue mask segmentation i.e., a PyTorch model that has been trained to distinguish between tissue and background, and we want to use it for tissue mask generation (instead of using a simple thresholding technique like Otsu's method).

The first thing to do is to prepare our model. As an illustration of the technique, we use a generic UNet architecture that already been implemented in the TIAToolbox. The section "Downloading the required files" above describes downloading the weights pretrained for segmentation, and these are loaded into the model.

```python
# define model architecture
external_model = UNetModel(
    num_input_channels=3,  # number of input image channels (3 for RGB)
    # number of model's output channels. 2 for two classes foreground and background.
    num_output_channels=2,
    # model used in the encoder part of the model to extract features
    encoder="resnet50",
    decoder_block=[
        3,
    ],  #  A list of convolution layers (each item specifies the kernel size)
)

# Loading pretrained weights into the model
map_location = torch.device("cuda") if ON_GPU else torch.device("cpu")
pretrained_weights = torch.load(model_file_name, map_location=torch.device("cpu"))
external_model.load_state_dict(pretrained_weights)
```

```
<All keys matched successfully>
```

This is just an example, and you can use any CNN model of your choice. Remember that, in order to use `Semantic-Segmentor`, `model` weights should already be loaded: when you pass a `model` argument to `SemanticSegmentor`, the latter ignores the `pretrained_model` and `pretrained_weights` arguments. In other words, the argument `pretrained_weights` is associated with the argument `pretrained_model` and not with the argument `model`.

Now that we have our model in place, let's create our `SemanticSegmentor`. Also, we need to configure the Input/Output stream of data for our model using `IOSegmentorConfig`.

```python
tissue_segmentor = SemanticSegmentor(
    model=external_model,
    num_loader_workers=4,
    batch_size=4,
)

# define the I/O configurations for tissue segmentation model
tissue_segmentor_ioconfig = IOSegmentorConfig(
    input_resolutions=[{"units": "mpp", "resolution": 2.0}],
```

```
    output_resolutions=[{"units": "mpp", "resolution": 2.0}],
    patch_input_shape=[1024, 1024],
    patch_output_shape=[512, 512],
    stride_shape=[512, 512],
    save_resolution={"units": "mpp", "resolution": 8.0},
)
```

Now, everything is in place to start the prediction using the defined `tissue_segmentor` on how many input images we like:

```
tissue_mask_output = tissue_segmentor.predict(
    [mini_wsi_file_name],
    mode="wsi",
    on_gpu=ON_GPU,
    ioconfig=tissue_segmentor_ioconfig,
    save_dir="tissue_mask_results/",
)
```

```
Process Batch: 100%|############################| 98/98 [01:21<00:00,  1.20it/s]
```

```
|2023-12-15|16:14:39.729| [INFO] Finish: 0
|2023-12-15|16:14:39.734| [INFO] --Input: mini_wsi.svs
|2023-12-15|16:14:39.735| [INFO] --Output: /content/tissue_mask_results/0
```

If everything has gone well, `tissue_segmentor` should have been able to use our external model to do prediction on a whole slide image. Let's see how well our model worked:

```python
# [Loading the raw prediction]
logger.info(
    "Prediction method output is: %s, %s",
    tissue_mask_output[0][0],
    tissue_mask_output[0][1],
)
mini_wsi_prediction_raw = np.load(
    tissue_mask_output[0][1] + ".raw.0.npy",
)  # Loading the first prediction [0] based on the output address [1]
logger.info(
    "Raw prediction dimensions: (%d, %d, %d)",
    mini_wsi_prediction_raw.shape[0],
    mini_wsi_prediction_raw.shape[1],
    mini_wsi_prediction_raw.shape[2],
)

# Simple processing of the raw prediction
# to generate semantic segmentation task
mini_wsi_prediction = np.argmax(
    mini_wsi_prediction_raw,
    axis=-1,
)  # select the class with highest probability
logger.info(
    "Processed prediction dimensions: (%d, %d)",
    mini_wsi_prediction.shape[0],
    mini_wsi_prediction.shape[1],
```

```python
)

# [WSI overview extraction]
# Now reading the WSI to extract it's overview
mini_wsi = WSIReader.open(mini_wsi_file_name)
logger.info(
    "WSI original dimensions: (%d, %d)",
    mini_wsi.info.level_dimensions[0][0],
    mini_wsi.info.level_dimensions[0][1],
)

# using the prediction save_resolution
# to create the wsi overview at the same resolution
overview_info = {"units": "mpp", "resolution": 8.0}  # same as save_resolution

# extracting slide overview using `slide_thumbnail` method
mini_wsi_overview = mini_wsi.slide_thumbnail(
    resolution=overview_info["resolution"],
    units=overview_info["units"],
)
logger.info(
    "WSI overview dimensions: (%d, %d)",
    mini_wsi_prediction.shape[0],
    mini_wsi_prediction.shape[1],
)

ax = plt.subplot(1, 2, 1), plt.imshow(mini_wsi_overview)
plt.axis("off")
ax = plt.subplot(1, 2, 2), plt.imshow(mini_wsi_prediction)
plt.axis("off")
```

```
|2023-12-15|16:14:39.874| [INFO] Prediction method output is: mini_wsi.svs, /content/
→tissue_mask_results/0
|2023-12-15|16:14:39.898| [INFO] Raw prediction dimensions: (2170, 2921, 2)
|2023-12-15|16:14:39.959| [INFO] Processed prediction dimensions: (2170, 2921)
|2023-12-15|16:14:39.967| [INFO] WSI original dimensions: (51200, 38144)
|2023-12-15|16:14:40.645| [INFO] WSI overview dimensions: (2170, 2921)
```

```
(-0.5, 2920.5, 2169.5, -0.5)
```
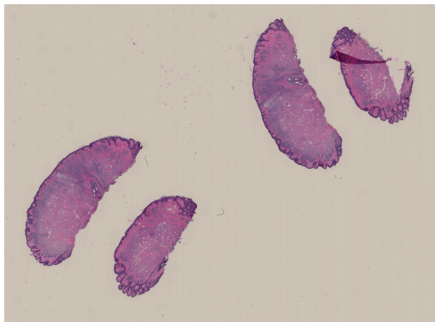

And that's it!

To once again see how easy it is to use an external model in TIAToolbox's semantic segmentation class, we summarize in pseudo-code, as below:

```
# 1- Define the Pytorch model and load weights
model = get_CNN()
model.load_state_dict(pretrained_weights)

# 2- Define the segmentor and IOconfig
segmentor = SemanticSegmentor(model)
ioconfig = IOSegmentorConfig(...)

# 3- Run the prediction
output = tissue_segmentor.predict([img_paths], save_dir, ioconfig, ...)
```

Feel free to play around with the parameters, models, and experimenting with new images (just remember to run the first cell of this notebook again, so the created folders for the current examples would be removed or alternatively change the `save_dir` parameters in new calls of `predict` function). Currently, we are extending our collection of pre-trained models. To keep a track of them, make sure to follow our releases. You can also check here. Furthermore, if you want to use your own pretrained model for semantic segmentation (or any other pixel-wise prediction models) in the TIAToolbox framework, you can follow the instructions in our example notebook on advanced model techniques to gain some insights and guidance. We welcome any trained model in computational pathology (in any task) for addition to TIAToolbox. If you have such a model (in Pytorch) and want to contribute, please contact us or simply create a PR on our GitHub page.

5.2.7 Advanced Model Handling in TIAToolbox

Click to open in: [GitHub][Colab]

About this demo

This notebook demonstrates advanced techniques on how to use TIAToolbox models with your current workflow and how you can integrate your solutions into the TIAToolbox model framework. By doing so, you will be able to utilize extensively tested TIAToolbox tools in your experiments and speed up your computational pathology research. Notice, in this notebook, we assume that you are an advanced user of TIAToolbox who is familiar with object-oriented programming concepts in Python and TIAToolbox models framework. To make yourself familiar with how TIAToolbox models work, we invite you to have a look at our example notebooks on patch classification and semantic segmentation in histology images/WSIs or you can study the documentation and the code base on these matters.

When thinking of either using the TIAToolbox models in your application or expanding it to fit your needs, several scenarios can be imagined. The most common scenarios and their solutions are briefly listed below:

1. Instead of pretrained models embedded in TIAToolbox's repository, you want to use your own deep learning model (in Pytorch) in the TIAToolbox prediction workflow.

   - You can create your model by following the same protocol as the TIAToolbox model does and provide it to the predictor.

2. Your input data is of an exotic form which the TIAToolbox data stream functionality does not support by default.

   - You will need to subclass the `WSIStreamDataset` or related classes in the TIAToolbox to roll your own input form and provide the class for predictor construction.

Note that the output should still fit with existing deep learning models in the toolbox.

Other cases can be imagined, like when the existing *merging strategy* in the TIAToolbox does not fit your method for WSI processes. In this case, it is very likely that you have to overwrite a large portion of the existing workflow in the TIAToolbox which is beyond the scope of this example. However, if you learn the principles in this notebook, you will be able to find a way around that problem as well.

In this notebook, the `SemanticSegmentor` and its kit will be the base for the predictor workflow which we want to adapt to the mentioned scenarios.

Importing related libraries

We import some Python modules that we need to run this example.

```python
"""Import modules required to run the Jupyter notebook."""

from __future__ import annotations

# Clear logger to use tiatoolbox.logger
import logging

if logging.getLogger().hasHandlers():
    logging.getLogger().handlers.clear()

import shutil
import warnings
from pathlib import Path
from zipfile import ZipFile

import cv2
import matplotlib as mpl
import matplotlib.pyplot as plt
import numpy as np
import torch
import torch.nn.functional as F  # noqa: N812
import torchvision
from PIL import Image
from skimage.io import imread as skimread
from torchvision import transforms
from torchvision.models import inception_v3

from tiatoolbox import logger
from tiatoolbox.models.engine.patch_predictor import (
    IOPatchPredictorConfig,
    PatchPredictor,
)
from tiatoolbox.models.engine.semantic_segmentor import (
    IOSegmentorConfig,
    SemanticSegmentor,
    WSIStreamDataset,
)
from tiatoolbox.models.models_abc import ModelABC
from tiatoolbox.utils.misc import download_data, imread, select_device
from tiatoolbox.wsicore.wsireader import VirtualWSIReader, WSIMeta, WSIReader

mpl.rcParams["figure.dpi"] = 300  # for high resolution figure in notebook
mpl.rcParams["figure.facecolor"] = "white"  # To make sure text is visible in dark␣
↪mode
```

Downloading the required files

We download, over the internet, image files used for the purpose of this notebook.

```python
# These file name are used for
img_file_name = "./tmp/sample_tile.tif"
wsi_file_name = "./tmp/sample_wsi.svs"
class_names_file = "./tmp/imagenet_classes.txt"
imagenet_samples_name = "./tmp/imagenet_samples.zip"

logger.info("Download has started. Please wait...")

# Downloading sample image tile
download_data(
    "https://tiatoolbox.dcs.warwick.ac.uk/sample_imgs/tile_mif.tif",
    img_file_name,
)

# Downloading sample whole-slide image
download_data(
    "https://tiatoolbox.dcs.warwick.ac.uk/sample_wsis/wsi_2000x2000_blur.svs",
    wsi_file_name,
)

# Download some samples of imagenet to test the external models
download_data(
    "https://tiatoolbox.dcs.warwick.ac.uk/sample_imgs/imagenet_samples.zip",
    imagenet_samples_name,
)
# Unzip it!
with ZipFile(imagenet_samples_name, "r") as zipobj:
    zipobj.extractall(path="./tmp")

# Downloading imagenet class names
download_data(
    "https://raw.githubusercontent.com/pytorch/hub/master/imagenet_classes.txt",
    class_names_file,
)

logger.info("Download is complete.")
```

1. Injecting your model into the TIAToolbox prediction framework

This topic has been already covered in the semantic segmentation notebook, however, we explain it more technically here. In order for your model to be appropriate to fit in the TIAToolbox framework, it has to have the following structure:

```python
# ModelABC class
from tiatoolbox.models.abc import ModelABC
class Model(ModelABC):
    def __init__(self: ModelABC) -> None:
        # your code here
        pass

    @staticmethod
    def infer_batch(self: ModelABC) -> None:
        # your code here
```

(continues on next page)

```
        pass

    @staticmethod
    def preproc() -> None:
        # your code here
        pass

    @staticmethod
    def postproc() -> None:
        # your code here
        pass

    def forward(self: : ModelABC) -> None:
        # your code here
        pass
```

First and foremost, the `Model` class should inherit from from TIAToolbox's `ModelABC` abstract class which is based
on Pytorch's `nn.Module` class. In other words, the TIAToolbox only works with Pytorch models which which have
the above structure. All `infer_batch`, `preproc`, `postproc`, and `forward` methods have particular functionality
that is explained in the `ModelABC class`. However, in order to demonstrate how the structure can be used, we define here
a new model to perform focus scoring i.e., a model that measures how much each pixel in the input image is blurred. As
we realize directly from the model purpose, it works in the same way that a semantic segmentation model works (applying
two convolutional kernels to the input image) and therefore it can be directly fitted in the current workflow. We define it
in the same protocol as the ABC above.

```
class BlurModel(ModelABC):
    """Example model which can be used for image blurring."""

    def __init__(self: ModelABC) -> None:
        """Initialize BlurModel."""
        super().__init__()
        self.to_gray = torchvision.transforms.Grayscale()
        kernel_gauss = np.array(
            [
                [0.00e00, 0.00e00, 0.00e00, 0.00e00, 0.00e00, 0.00e00, 0.00e00],
                [0.00e00, 0.00e00, 0.00e00, 0.00e00, 0.00e00, 0.00e00, 0.00e00],
                [0.00e00, 0.00e00, 3.78e-44, 1.93e-22, 3.78e-44, 0.00e00, 0.00e00],
                [0.00e00, 0.00e00, 1.93e-22, 1.00e00, 1.93e-22, 0.00e00, 0.00e00],
                [0.00e00, 0.00e00, 3.78e-44, 1.93e-22, 3.78e-44, 0.00e00, 0.00e00],
                [0.00e00, 0.00e00, 0.00e00, 0.00e00, 0.00e00, 0.00e00, 0.00e00],
                [0.00e00, 0.00e00, 0.00e00, 0.00e00, 0.00e00, 0.00e00, 0.00e00],
            ],
            dtype=np.float32,
        )
        kernel_laplace = np.array(
            [[1.0, 1.0, 1.0], [1.0, -8.0, 1.0], [1.0, 1.0, 1.0]],
            dtype=np.float32,
        )
        # out_channels,in_channels,H,W
        kernel_gauss = torch.from_numpy(kernel_gauss[None, None])
        kernel_laplace = torch.from_numpy(kernel_laplace[None, None])
        self.register_buffer("kernel_gauss", kernel_gauss)
        self.register_buffer("kernel_laplace", kernel_laplace)

    @staticmethod
    def preproc(image: np.ndarray) -> np.ndarray:
```

```python
        """Pre-processing function."""
        return image

    @staticmethod
    def postproc(image: np.ndarray) -> np.ndarray:
        """Post-processing function."""
        return image

    def forward(self: ModelABC, img_list: list) -> torch.nn.Module:
        """Model forward function."""
        # must be rgb input
        img_list = self.to_gray(img_list)
        laplace = F.conv2d(img_list, self.kernel_laplace, padding="same")
        return F.conv2d(torch.abs(laplace), self.kernel_gauss, padding="same")

    @staticmethod
    def infer_batch(
        model: torch.nn.Module,
        img_list: list,
        *,
        on_gpu: bool,
    ) -> list[np.ndarray]:
        """Model inference."""
        img_list = img_list.to("cuda").type(torch.float32)
        img_list = img_list.permute(0, 3, 1, 2).contiguous()
        device = select_device(on_gpu=on_gpu)
        img_list = img_list.to(device)
        model = model.to(device)

        with torch.no_grad():
            output = model(img_list)
            output = output.permute(0, 2, 3, 1)  # to NCHW
        return [output.cpu().numpy()]
```

Now, let's create a TIAToolbox segmentor that uses the model defined above. Before that, we also need to define the Input/Output configuration expected by the model. In TIAToolbox, the `IOSegmentorConfig` class is used to set these configurations, as we have done in the cell below. (For more information on `IOSegmentorConfig` and `SemanticSegmentor` parameters, please refer to documentations or semantic segmentation notebook):

```python
# Defining ioconfig
iostate = IOSegmentorConfig(
    input_resolutions=[
        {"units": "mpp", "resolution": 1.0},
    ],
    output_resolutions=[
        {"units": "mpp", "resolution": 1.0},
    ],
    patch_input_shape=[512, 512],
    patch_output_shape=[512, 512],
    stride_shape=[512, 512],
    save_resolution={"units": "mpp", "resolution": 1.0},
)

# Setting the save directory and delete previous results
wsi_prediction_dir = "./tmp/wsi_prediction/"
rmdir(wsi_prediction_dir)
```

```python
# Creating the model
model = BlurModel()
```

```python
# Creating a SemanticSegmentor using our model and start prediction
predictor = SemanticSegmentor(model=model, num_loader_workers=WORKERS, batch_size=1)
```

```python
wsi_output = predictor.predict(
    [wsi_file_name],
    mode="wsi",
    on_gpu=ON_GPU,
    ioconfig=iostate,
    crash_on_exception=True,
    save_dir=wsi_prediction_dir,
)
```

```
Process Batch: 100%|##############################| 1/1 [00:00<00:00,  1.10it/s]
INFO:root:Finish: 0
INFO:root:--Input: ./tmp/sample_wsi.svs
INFO:root:--Output: /content/tmp/wsi_prediction/0
```

Now we check the prediction and source image to see if our model worked as expected.

```python
reader = WSIReader.open(wsi_file_name)
thumb = reader.slide_thumbnail(
    resolution=iostate.save_resolution["resolution"],
    units=iostate.save_resolution["units"],
)
predictions = np.load(wsi_output[0][1] + ".raw.0.npy")
logger.info(
    "Raw prediction dimensions: (%d, %d, %d)",
    predictions.shape[0],
    predictions.shape[1],
    predictions.shape[2],
)

ax = plt.subplot(1, 2, 1)
(
    plt.imshow(thumb),
    plt.xlabel("WSI thumbnail"),
    ax.axes.xaxis.set_ticks(
        [],
    ),
    ax.axes.yaxis.set_ticks([]),
)
ax = plt.subplot(1, 2, 2)
(
    plt.imshow(predictions[..., -1]),
    plt.xlabel("Focus map"),
    ax.axes.xaxis.set_ticks(
        [],
    ),
    ax.axes.yaxis.set_ticks([]),
)
```
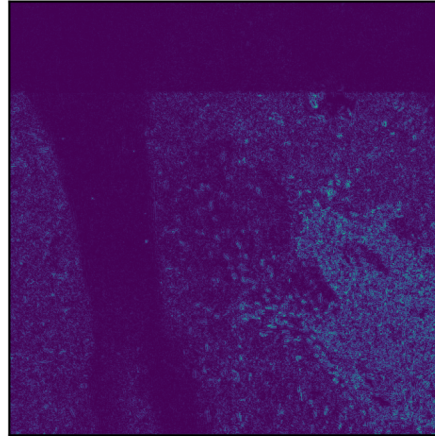
```
INFO:root:Raw prediction dimensions: (460, 460, 1)
```

```
(<matplotlib.image.AxesImage at 0x78f8f0204220>,
 Text(0.5, 0, 'Focus map'),
 [],
 [])
```
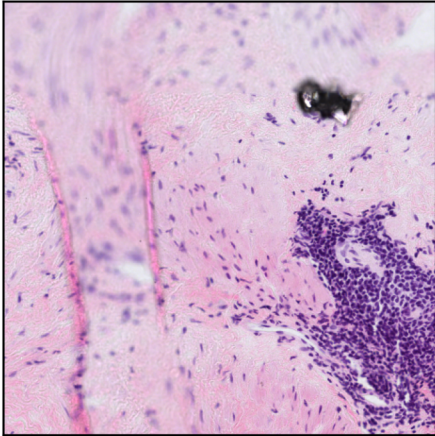

WSI thumbnail

Focus map

As you can see, our model successfully detects focused regions of the input WSI. In this example, we used a small WSI for the sake of low computation but you can test its functionality on any sample of your choice. In any case, the only thing that the user needs to provide is the model (with its weights loaded) and the TIAToolbox will take care of WSI processing, patch extraction, prediction aggregation, and multi-processing handling. When defining your model, you can even add your desired preprocessing function (for example, stain normalization) through the `preproc` method to be applied on each patch prior to inference.

To once again see how easy it is to use an external model in TIAToolbox's semantic segmentation class, we summarize in pseudo-code, as below:

```python
# 1- Define the Pytorch model and load weights
model = get_CNN() # model should follow tiatoolbox.model.abc.ModelABC

# 2- Define the segmentor and IOconfig
segmentor = SemanticSegmentor(model=model)
ioconfig = IOSegmentorConfig(...)

# 3- Run the prediction
output = segmentor.predict([img_paths], save_dir, ioconfig, ...)
```

Injecting pretrained patch classification models

There are two ways in TIAToolbox that you can use your own pretrained classification models. The first way if to use TIAToolbox pretrained classification models, a list of which is available here. With this option, you can override the model weights with your own set of fine-tuned weights via the `pretrained_weights` argument (the argument is case insensitive).

However, sometimes you want to use a pretrained model that has not been implemented in the TIAToolbox framework. We can use the same principles explained in the previous example to use an externally pretrained model in the TIAToolbox pipeline. In the example below, we show how to import a native `torchvision` pretrained model (not included in the TIAToolbox repository) and use it in the TIAToolbox patch prediction pipeline.

The first step is to import the model with its weights loaded and then we need to add some methods to the model class so that it would be suitable for a TIAToolbox pipeline (the model class should follow the `tiatoolbox.models.abc.ModelABC` structure).

```python
transform = transforms.Compose(
    [
        transforms.Resize(256),
        transforms.CenterCrop(224),
        transforms.ToTensor(),
        transforms.Normalize(mean=[0.485, 0.456, 0.406], std=[0.229, 0.224, 0.225]),
    ],
)

# Define the pretrained model and load the weights
external_model = inception_v3(pretrained=True)
external_model.eval()


# define the methods needed for `tiatoolbox.models.abc.ModelABC abstract` class.
def infer_batch(
    model: torch.nn.Module,
    batch_data: np.ndarray | torch.Tensor,
    *,
    on_gpu: bool,
) -> np.ndarray:
    """Model inference on a batch of images."""
    model.eval()
    device = "cuda" if on_gpu else "cpu"

    imgs = batch_data

    imgs = imgs.to(device).type(torch.float32)

    with torch.inference_mode():
        logits = model(imgs)
        probs = F.softmax(logits, 1)

    return probs.cpu().numpy()


def postproc_func(output: np.ndarray) -> np.ndarray:
    """Pre-processing function."""
    return output


def preproc_func(img: np.ndarray) -> np.ndarray:
```

```python
    """Post-processing function."""
    pil_image = Image.fromarray(img)
    transformed = transform(pil_image)
    return np.array(transformed)



# add the methods to the `external_model` class
external_model.infer_batch = infer_batch
external_model.preproc_func = preproc_func
external_model.postproc_func = postproc_func
```

Based on our knowledge of the imported external model, which is an imagenet pretrained `inception_v3` CNN model, and the requirements of the TIAToolbox friendly model class, we have added `infer_batch`, `postproc_func`, and `preproc_func` methods to the `external_model` class. These functions apply the appropriate pre and post-processing on the image and model predictions, respectively. The design of these functions should be based on the external model and the problem at hand. You can follow the above cell example or the code in the TIAToolbox UNet architecture to be inspired and get an idea of what you need to do to suit your application (problem).

Now that we have our `external_model` ready, we just need to define the `IOPatchPredictorConfig` for data control and instantiate the `PatchPredictor`, which can ultimately be used for patch prediction. In the cell below, we have applied the `external_model` to a subset of 4 images from the "ImageNet" dataset.

```python
external_ioconfig = IOPatchPredictorConfig(
    input_resolutions=[{"units": "mpp", "resolution": 0.5}],
    patch_input_shape=[224, 224],
    stride_shape=[224, 224],
)

# 3. Define the patch predictor
external_predictor = PatchPredictor(model=external_model, batch_size=64)

# First, find the patch addresses
imagenet_files = list(Path("./tmp/imagenet/").glob("*.jpeg"))

# Now call the predict function on the patches
external_output = external_predictor.predict(
    imgs=imagenet_files,
    mode="patch",
    ioconfig=external_ioconfig,
    return_probabilities=True,
    return_labels=False,
    on_gpu=ON_GPU,
)
```

```
100%|##########################################| 1/1 [00:00<00:00,  6.88it/s]
```

Now let's see if each class has been correctly predicted by showing the sample images and their prediction's "class:probability".

```python
# Loade imagenet classes
with Path(class_names_file).open() as f:
    classes = [line.strip() for line in f.readlines()]

# Showing the input images and their predicted classes
num_pics = len(imagenet_files)
for i, img_file in enumerate(imagenet_files):
```

```python
    img = imread(img_file)
    cls_idx = np.argmax(external_output["predictions"][i])
    cls_prob = external_output["predictions"][i][cls_idx]
    cls_name = classes[cls_idx]

    ax = plt.subplot(1, num_pics, i + 1)
    (
        plt.imshow(img),
        plt.xlabel(
            "{}:{:.2f}".format(cls_name.split(" ")[0], cls_prob),
        ),
        ax.axes.xaxis.set_ticks([]),
        ax.axes.yaxis.set_ticks([]),
    )
```
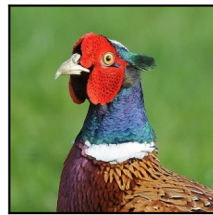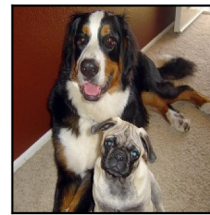

Maltese:1.00   goldfish:1.00   cock:1.00   Bernese:1.00

2. Dealing with exotic data formats

To speed up the inference process for multiple WSIs, TIAToolbox uses `WSIStreamDataset` class to read a wsi in parallel mode with persistent workers. In other words, this class is responsible for providing data to the model during the prediction process. In this class, the `torch.utils.data.Dataloader` is used which is set to run in persistent mode. Normally, this mode will prevent workers from altering their initial states (for example, provided input). To sidestep this, a shared parallel workspace context manager (`mp_shared_space`) is utilized in the TIAToolbox to send data and signals from the main thread, thus allowing each worker to load a new WSI as well as corresponding patch information.

Naturally, the `WSIStreamDataset` only works with the image formats that TIAToolbox supports. A list of supported WSI formats can be found here. Also, TIAToolbox supports reading the same types of plane images as OpenCV. So, if you like to work with some external data formats that TIAToolbox does not support, you have to subclass the `WSIStream-Dataset` and add your extra bits to it. Various segments may need to be overwritten depending on your application, however, it is important that some portions related to `mp_shared_space` should follow the structure of the original function. Otherwise, you risk breaking the functionality of the predictor. For example, the first part of `__getitem__` function in `WSIStreamDataset` should remain intact, as below:

```python
def __getitem__(self, idx):
    # ! no need to lock as we do not modify source value in shared space
    if self.wsi_idx != self.mp_shared_space.wsi_idx:
        self.wsi_idx = int(self.mp_shared_space.wsi_idx.item())
        self.reader = self._get_reader(self.wsi_path_list[self.wsi_idx])

    bound = self.mp_shared_space.patch_input_list[idx]
    ...
```

because this portion queries the latest signal coming from the main thread via the shared memory space and uses this information to decide which source image to read. Afterwards, the new input location (`bound`) for WSI reading is is also queried through the shared memory space.

In order to better demonstrate how you can read new data formats using TIAToolbox, we present the example below, where we subclass `WSIStreamDataset` to load a 'multiplex tif' tile, although this is not officially supported by TIAToolbox.

First, let's define an image reader function that is capable of loading 'multiplex tif' files.

```python
def xreader(img_path: str | Path) -> VirtualWSIReader:
    """Multiplex tif image reader."""
    img_path = Path(img_path)
    img = skimread(img_path, plugin="tifffile")
    img = np.transpose(img, axes=[1, 2, 0])
    # initialise metadata for VirtualWSIReader.

    # here we create a virtual whole slide image,
    # with a single level, from the image array
    metadata = WSIMeta(
        mpp=np.array([0.5, 0.5]),
        objective_power=20,
        slide_dimensions=np.array(img.shape[:2][::-1]),
        level_downsamples=[1.0],
        level_dimensions=[np.array(img.shape[:2][::-1])],
        axes="YXS",
    )
    return VirtualWSIReader(img, info=metadata, mode="bool")
```

Next, we define a new reader class, called `XReader`, based on the `WSIStreamDataset` class and replace the `_get_reader` internal function to force the class to use `xreader` as its image reader instead of TIAToolbox's `wsireader`. We need to make sure that `XReader`, our new WSI streaming class, is being used in the prediction. Therefore, prior to creating our segmentor, we should subclass the `SemanticSegmentor` class and replace the parts that `xreader` should be used instead of TIAToolbox's `wsireader`, in this case, the `get_reader` function is defined as follows:

```python
class XReader(WSIStreamDataset):
    """Multiplex image reader as a WSIStreamDataset."""

    def _get_reader(self: WSIStreamDataset, img_path: Path) -> WSIStreamDataset:
        """Get approriate reader for input path."""
        return xreader(img_path)


class XPredictor(SemanticSegmentor):
    """Multiplex image predictor engine."""

    @staticmethod
    def get_reader(
        img_path: str | Path,
        mask_path: str | Path,
        mode: str,
        *,
        auto_get_mask: bool,
    ) -> tuple[WSIReader, WSIReader]:
        """Get reader for mask and source image."""
        img_path = Path(img_path)

        reader = xreader(img_path)
        mask_reader = None
        if mask_path is not None:
            if not Path(mask_path).is_file():
                msg = "`mask_path` must be a valid file path."
```

(continues on next page)

```
            raise ValueError(msg)
        mask = imread(mask_path)    # assume to be gray
        mask = cv2.cvtColor(mask, cv2.COLOR_RGB2GRAY)
        mask = np.array(mask > 0, dtype=np.uint8)

        mask_reader = VirtualWSIReader(mask)
        mask_reader.info = reader.info
    elif auto_get_mask and mode == "wsi" and mask_path is None:
        # if no mask provided and `wsi` mode, generate basic tissue
        # mask on the fly
        mask_reader = reader.tissue_mask(resolution=1.25, units="power")
        mask_reader.info = reader.info
    return reader, mask_reader
```

Now that we have both new `XReader` and `XPredictor` classes in place, we can use the prediction framework of TIAToolbox to do inference on input images. To test if our data loader class can successfully load the images, we create a temporary model, called `XModel`, based on the `BlurModel` from the previous section. We will overwrite the `forward` function so that it returns its own input. Returning model input as the output allows us to check what our model sees in the input. As this is basically the same model, we can use the same `IOSegmentorConfig` as before:

```python
class XModel(BlurModel):
    """Dummy XModel based on BlurModel."""

    def forward(self: BlurModel, img_list: np.ndarray) -> np.ndarray:
        """Model forward function."""
        return img_list


iostate = IOSegmentorConfig(
    input_resolutions=[
        {"units": "baseline", "resolution": 1.0},
    ],
    output_resolutions=[
        {"units": "baseline", "resolution": 1.0},
    ],
    patch_input_shape=[512, 512],
    patch_output_shape=[512, 512],
    stride_shape=[256, 256],
    save_resolution={"units": "baseline", "resolution": 1.0},
)
```

Everything is in place. Let's instantiate our model segmentor, and start the prediction. Here we predict from a 'tif' image file that we have downloaded before and save the results in the `./tmp/xdata_prediction/` directory:

```python
rmdir("./tmp/xdata_prediction/")    # remove directories from previous runs
model = XModel()
predictor = XPredictor(model=model, dataset_class=XReader)
x_output = predictor.predict(
    [img_file_name],
    mode="tile",
    on_gpu=ON_GPU,
    ioconfig=iostate,
    crash_on_exception=True,
    save_dir="./tmp/xdata_prediction/",
)
```

```
WARNING:root:WSIPatchDataset only reads image tile at `units="baseline"`. Resolutions␣
↪will be converted to baseline value.
WARNING:root:WSIPatchDataset only reads image tile at `units="baseline"`. Resolutions␣
↪will be converted to baseline value.
WARNING:root:Raw data is None.
Process Batch:   0%|                                      | 0/3 [00:00<?, ?it/
↪s]WARNING:root:Raw data is None.
Process Batch: 100%|##############################| 3/3 [00:02<00:00,  1.45it/s]
INFO:root:Finish: 0
INFO:root:--Input: ./tmp/sample_tile.tif
INFO:root:--Output: /content/tmp/xdata_prediction/0
```

Now we check the prediction (model's output) and source image to see if we have created the pipeline in the right way
(input and output images should be the same).

```python
reader = xreader(img_file_name)
thumb = reader.slide_thumbnail(
    resolution=iostate.save_resolution["resolution"],
    units=iostate.save_resolution["units"],
)
logger.info(
    "Overview dimensions: (%d, %d, %d)",
    thumb.shape[0],
    thumb.shape[1],
    thumb.shape[2],
)

predictions = np.load(x_output[0][1] + ".raw.0.npy")
logger.info(
    "Raw prediction dimensions: (%d, %d, %d)",
    predictions.shape[0],
    predictions.shape[1],
    predictions.shape[2],
)

ax = plt.subplot(1, 2, 1)
(
    plt.imshow(thumb[..., :3]),
    plt.xlabel("Input Image"),
    ax.axes.xaxis.set_ticks(
        [],
    ),
    ax.axes.yaxis.set_ticks([]),
)
ax = plt.subplot(1, 2, 2)
(
    plt.imshow(predictions[..., :3]),
    plt.xlabel(
        "Model`s Input/Output",
    ),
    ax.axes.xaxis.set_ticks([]),
    ax.axes.yaxis.set_ticks([]),
)
```

```
WARNING:root:Raw data is None.
INFO:root:Overview dimensions: (992, 1328, 8)
INFO:root:Raw prediction dimensions: (992, 1328, 8)
```
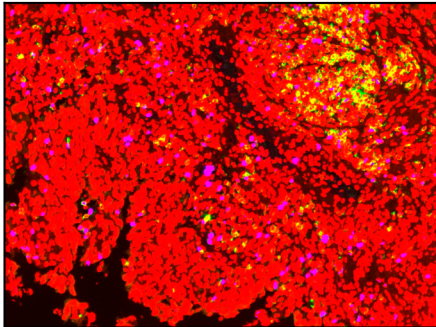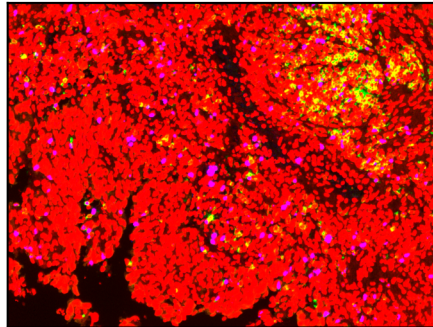
```
WARNING:matplotlib.image:Clipping input data to the valid range for imshow with RGB␣
↪data ([0..1] for floats or [0..255] for integers).
WARNING:matplotlib.image:Clipping input data to the valid range for imshow with RGB␣
↪data ([0..1] for floats or [0..255] for integers).
```

```
(<matplotlib.image.AxesImage at 0x78f8f5ea9e10>,
 Text(0.5, 0, 'Model`s Input/Output'),
 [],
 [])
```


Input Image   Model`s Input/Output

5.2.8 Nucleus Instance Segmentation

Click to open in: [GitHub][Colab]

About this demo

Each WSI can contain up to million nuclei of various types, which can be further analysed systematically and used for predicting clinical outcomes. In order to use nuclear features for downstream analysis within computational pathology, nucleus segmentation and classification must be carried out as an initial step. However, this remains a challenge because nuclei display a high level of heterogeneity and there is significant inter- and intra-instance variability in the shape, size and chromatin pattern between and within different cell types, disease types or even from one region to another within a single tissue sample. Tumour nuclei, in particular, tend to be present in clusters, which gives rise to many overlapping instances, providing a further challenge for automated segmentation, due to the difficulty of separating neighbouring instances.
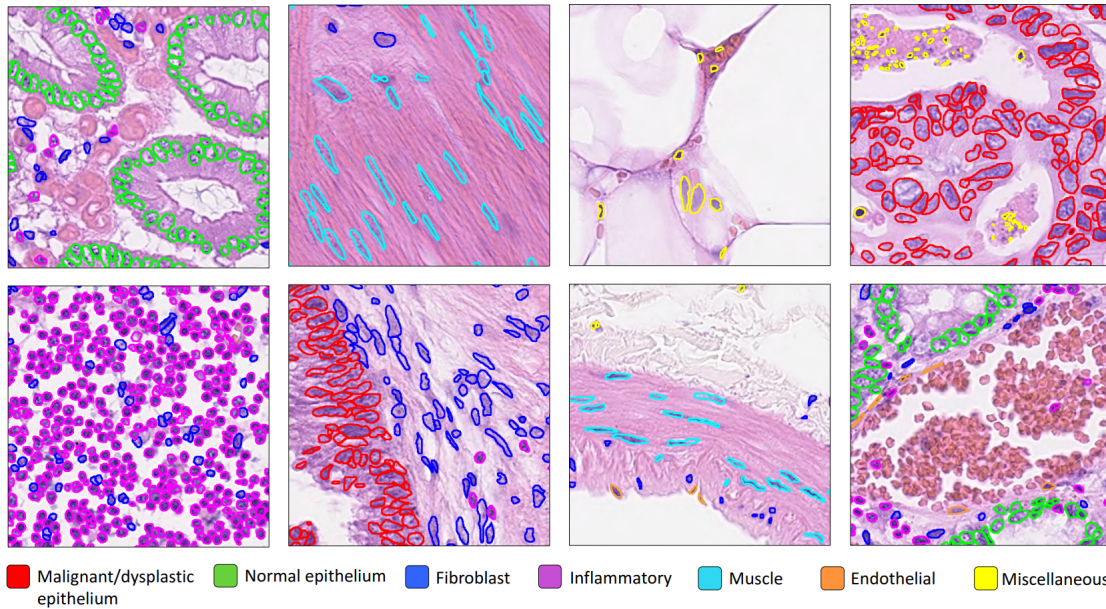
🟥 Malignant/dysplastic epithelium	🟩 Normal epithelium	🟦 Fibroblast	🟪 Inflammatory	🟦 Muscle	🟧 Endothelial	🟨 Miscellaneous

Image courtesy of Graham, Simon, et al. "Hover-net: Simultaneous segmentation and classification of nuclei in multi-tissue histology images." Medical Image Analysis 58 (2019): 101563.

In this example, we will demonstrate how you can use the TIAToolbox implementation of HoVer-Net to tackle these challenges and solve the problem of nuclei instance segmentation and classification within histology images. HoVer-Net is a deep learning approach based on horizontal and vertical distances (and hence the name HoVer-Net) of nuclear pixels to the centre of mass of the corresponding nucleus. These distances are used to separate clustered nuclei. For each segmented instance, the nucleus type is subsequently determined via a dedicated up-sampling branch.

In this example notebook, we are not going to explain how HoVer-Net works (for more information we refer you to the HoVer-Net paper), but we will show how easily you can use the sophisticated HoVer-Net model, which is incorporated in TIATtoolbox, to do automatic segmentation and classification of nucleus instances. Mostly, we will be working with the NucleusInstanceSegmentor which by default uses one of the pretrained HoVerNet models. We will also cover the visualisation tool embedded in TIAToolbox for overlaying the instance segmentation results on the input image.

Importing related libraries

We import some standard Python modules, and also the Python module `wsireader` (see details) written by the TIA Centre team.

```python
"""Import modules required to run the Jupyter notebook."""

# Clear logger to use tiatoolbox.logger
import logging
import warnings

if logging.getLogger().hasHandlers():
    logging.getLogger().handlers.clear()

import cv2
import joblib
import matplotlib as mpl
import matplotlib.pyplot as plt
import numpy as np
```

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```python
from tiatoolbox import logger
from tiatoolbox.models.engine.nucleus_instance_segmentor import␣
→NucleusInstanceSegmentor
from tiatoolbox.utils.misc import download_data, imread

# We need this function to visualize the nuclear predictions
from tiatoolbox.utils.visualization import (
    overlay_prediction_contours,
)
from tiatoolbox.wsicore.wsireader import WSIReader

warnings.filterwarnings("ignore")
mpl.rcParams["figure.dpi"] = 300  # for high resolution figure in notebook
mpl.rcParams["figure.facecolor"] = "white"  # To make sure text is visible in dark␣
→mode
plt.rcParams.update({"font.size": 5})
```

Downloading the required files

We download, over the internet, image files used for the purpose of this notebook. In particular, we download a histology
tile and a whole slide image of cancerous breast tissue samples to show how the nucleus instance segmentation model
works.

> In Colab, if you click the files icon (see below) in the vertical toolbar on the left hand side then you can see
> all the files that the code in this notebook can access. The data will appear here when it is downloaded.

```python
# These file name are used for the experimenets
img_file_name = "sample_tile.png"
wsi_file_name = "sample_wsi.svs"


logger.info("Download has started. Please wait...")

# Downloading sample image tile
download_data(
    "https://tiatoolbox.dcs.warwick.ac.uk/sample_imgs/breast_tissue_crop.png",
    img_file_name,
)

# Downloading sample whole-slide image
download_data(
    "https://tiatoolbox.dcs.warwick.ac.uk/sample_wsis/wsi4_12k_12k.svs",
    wsi_file_name,
)

logger.info("Download is complete.")
```

```
|2023-07-25|08:50:43.003| [INFO] Download has started. Please wait...
|2023-07-25|08:50:46.368| [INFO] Download is complete.
```

Nucleus instance segmentation and classification using TIAToolbox's pretrained HoVer-Net model

In this section, we will investigate the use of the HoVer-Net model that has been already trained on the PanNuke dataset and incorporated in the TIAToolbox. The model we demonstrate can segment out nucleus instances in the image and assign one of the following 6 classes to them:

- Background
- Neoplastic Epithelial
- Non-Neoplastic Epithelial
- Inflammatory
- Connective
- Dead

Inference on tiles

Similarly to the semantic segmentation functionality of the TIAToolbox, the instance segmentation module works both on image tiles and structured WSIs. First, we need to create an instance of the `NucleusInstanceSegmentor` class which controls the whole process of the nucleus instance segmentation task and then use it to do prediction on the input image(s):

```
# Tile prediction
inst_segmentor = NucleusInstanceSegmentor(
    pretrained_model="hovernet_fast-pannuke",
    num_loader_workers=2,
    num_postproc_workers=2,
    batch_size=4,
)

tile_output = inst_segmentor.predict(
    [img_file_name],
    save_dir="sample_tile_results/",
    mode="tile",
    on_gpu=ON_GPU,
    crash_on_exception=True,
)
```

```
|2023-07-25|08:50:53.281| [WARNING] WSIPatchDataset only reads image tile at `units=
→"baseline"`. Resolutions will be converted to baseline value.
|2023-07-25|08:51:01.553| [WARNING] WSIPatchDataset only reads image tile at `units=
→"baseline"`. Resolutions will be converted to baseline value.
|2023-07-25|08:51:01.644| [WARNING] Raw data is None.
|2023-07-25|08:51:01.645| [WARNING] Unknown scale (no objective_power or mpp)
Process Batch:   0%|                                  | 0/13 [00:00<?, ?it/s]|2023-
→07-25|08:51:01.824| [WARNING] Raw data is None.
|2023-07-25|08:51:01.828| [WARNING] Raw data is None.
Process Batch: 100%|#########################| 13/13 [00:13<00:00,  1.02s/it]
Process Batch: 100%|#########################| 4/4 [00:01<00:00,  2.01it/s]
Process Batch: 100%|#########################| 4/4 [00:01<00:00,  2.13it/s]
Process Batch: 100%|#########################| 1/1 [00:00<00:00,  1.82it/s]
Process Batch: 100%|#########################| 4/4 [00:01<00:00,  2.24it/s]
Process Batch: 100%|#########################| 1/1 [00:00<00:00,  1.86it/s]
Process Batch: 100%|#########################| 4/4 [00:01<00:00,  2.24it/s]
```

(continues on next page)

```
Process Batch: 100%|############################| 1/1 [00:00<00:00,  1.84it/s]
Process Batch: 100%|############################| 3/3 [00:01<00:00,  2.64it/s]
```

```
|2023-07-25|08:51:25.933| [INFO] Finish: 0
|2023-07-25|08:51:25.937| [INFO] --Input: sample_tile.png
|2023-07-25|08:51:25.939| [INFO] --Output: /content/sample_tile_results/0
```

There we go! With only two lines of code, thousands of images can be processed automatically. There are various parameters associated with `NucleusInstanceSegmentor`. We explain these as we meet them while proceeding through the notebook. Here we explain only the ones mentioned above:

- `pretrained_model`: specifies the name of the pretrained model included in the TIAToolbox (case sensitive). We are expanding our library of models pretrained on various (instance) segmentation tasks. You can find a complete list of currently available pretrained models here. In this example, we use the `"hovernet_fast-pannuke"` pretrained model, which is HoVer-Net model trained on the PanNuke dataset. Another option for HoVer-Net is `hovernet_original-kumar` which is the original version of the HoVer-Net model trained on a dataset by Kumar et al.

- `num_loader_workers`: as the name suggests, this parameter controls the number of CPU cores (workers) that are responsible for the "loading of network input" process, which consists of patch extraction, preprocessing, etc.

- `num_postproc_workers`: as the name suggests, this parameter controls the number of CPU cores (workers) that are responsible for the "model related post-processing" tasks, which consist of horizontal and vertical maps gradient calculations, instance marker generation, and marker-controlled watershed method to generate the final instance map (for more information, please refer to the HoVer-Net paper).

- `batch_size`: controls the batch size, or the number of input instances to the network in each iteration. If you use a GPU, be careful not to set the `batch_size` larger than the GPU memory limit would allow.

After the `inst_segmentor` has been instantiated as the instance segmentation engine with our desired pretrained model, one can call the `predict` method to do inference on a list of input images (or WSIs). The `predict` function automatically processes all the images on the input list and saves the results on the disk. The process usually comprises patch extraction (because the whole tile or WSI won't fit into limited GPU memory), preprocessing, model inference, post-processing and prediction assembly. Here are some important parameters required by the `predict` method properly:

- `imgs`: List of inputs to be processed. Note that items in the list should be paths to the inputs.

- `save_dir`: Path to the main folder in which prediction results for each input are stored separately.

- `mode`: the mode of inference which can be set to either `'tile'` or `'wsi'` for plain histology images or structured whole slides images, respectively.

- `on_gpu`: can be `True` or `False` to dictate running the computations on GPU or CPU.

- `crash_on_exception`: If set to `True`, the running loop will crash if there is an error during processing a WSI. Otherwise, the loop will move on to the next image (wsi) for processing. We suggest that you first make sure that the prediction is working as expected by testing it on a couple of inputs and then set this flag to `False` to process large cohorts of inputs.

In `tile_output`, the `prediction` method returns a list of paths to its inputs and to the processed outputs saved on disk. This can be used later during processing and visualisation. Similarly to prediction for the `Semantic-Segmentor` class, the `predict` method here can also accepts some arguments to set the input/output configurations of the model. These arguments are `ioconfig` (which accecpts a instance from `tiatoolbox.models.engine.semantic_segmentor.IOSegmentorConfig` class) or `resolution`, `patch_input_shape`, `patch_output_shape`, and `stride_shape` based on which an appropriate `IOSegmentorConfig` will be generated. When you are using TIAToolbox pretrained models, we recommend using the default values of input/output shape.

Now that the prediction has finished, let's use the paths in `tile_output` to load and examine the predictions. For that, we need to use `joblib` package.

```python
tile_preds = joblib.load(f"{tile_output[0][1]}.dat")
logger.info(f"Number of detected nuclei: {len(tile_preds)}")

# Extracting the nucleus IDs and select the first one
nuc_id_list = list(tile_preds.keys())
selected_nuc_id = nuc_id_list[0]
logger.info(f"Nucleus prediction structure for nucleus ID: {selected_nuc_id}")
sample_nuc = tile_preds[selected_nuc_id]
sample_nuc_keys = list(sample_nuc)
logger.info(
    "Keys in the output dictionary: [%s, %s, %s, %s, %s]",
    sample_nuc_keys[0],
    sample_nuc_keys[1],
    sample_nuc_keys[2],
    sample_nuc_keys[3],
    sample_nuc_keys[4],
)
logger.info(
    "Bounding box: (%d, %d, %d, %d)",
    sample_nuc["box"][0],
    sample_nuc["box"][1],
    sample_nuc["box"][2],
    sample_nuc["box"][3],
)
logger.info(
    "Centroid: (%d, %d)",
    sample_nuc["centroid"][0],
    sample_nuc["centroid"][1],
)
```

```
|2023-07-25|09:45:39.345| [INFO] Number of detected nuclei: 458
|2023-07-25|09:45:39.347| [INFO] Nucleus prediction structure for nucleus ID:␣
→b984b6c725a942fa87b9e490f3b86a38
|2023-07-25|09:45:39.352| [INFO] Keys in the output dictionary: [box, centroid,␣
→contour, prob, type]
|2023-07-25|09:45:39.354| [INFO] Bounding box: (374, 1, 405, 18)
|2023-07-25|09:45:39.357| [INFO] Centroid: (389, 8)
```

After loading the prediction for the first image in the `tile_output` list (there is only one image or path in this example), we can see that the nucleus predictions for that image are stored in a Python Dictionary each with a unique dictionary key which we will call `nuc_id` from now on. Here is the dictionary format:

```python
sample_dict = {nuc_id: {
                         box: List[],
                         centroid: List[],
                         contour: List[List[]],
                         prob: float,
                         type: int
                         }
                ... # other instances
             }
```

One can extract the list of all nucleus IDs by calling `nuc_id_list = list(tile_preds.keys())`. The value for each `nuc_id` is a dictionary itself which contains information related to that particular nucleus instance. Each nucleus instance dictionary consists the following information (keys):

- `'box'`: Bounding box information in the $[x_{top\text{-}left}, y_{top\text{-}left}, width, hight]$ format.

- `'centroid'`: Centroid of the nucleus in $[x_{centre}, y_{centre}]$ format.

- `'contour'`: A list of points that form the contour or segmentation boundary (polygon) of the nucleus. This can be used to regenerate the nucleus mask.

- `'prob'`: The probability of type prediction.

- `'type'`: Predicted type or label for the nucleus which can be an integer between 0 and 5: {0: 'neoplastic epithelial', 1: 'Inflammatory', 2: 'Connective', 3: 'Dead', 4: 'non-neoplastic epithelial'}

Instance Segmentation Visualisation

Investigating the quality of instance segmentation/classification by going through the predicted nucleus dictionary, as explained above, is impossible. A good workaround is to visualize the instance segmentation results on the input image to check the quality of instance segmentation and classification. To this end, TIAToolbox has incorporated a boundary visualisation tool, called `overlay_prediction_contours`.

```python
# Reading the original image
tile_img = imread(img_file_name)

# defining the coloring dictionary:
# A dictionary that specifies a color to each class {type_id : (type_name, colour)}
color_dict = {
    0: ("background", (255, 165, 0)),
    1: ("neoplastic epithelial", (255, 0, 0)),
    2: ("Inflammatory", (255, 255, 0)),
    3: ("Connective", (0, 255, 0)),
    4: ("Dead", (0, 0, 0)),
    5: ("non-neoplastic epithelial", (0, 0, 255)),
}

# Create the overlay image
overlaid_predictions = overlay_prediction_contours(
    canvas=tile_img,
    inst_dict=tile_preds,
    draw_dot=False,
    type_colours=color_dict,
    line_thickness=2,
)

# showing processed results alongside the original images
fig = plt.figure()
ax1 = plt.subplot(1, 2, 1), plt.imshow(tile_img), plt.axis("off")
ax2 = plt.subplot(1, 2, 2), plt.imshow(overlaid_predictions), plt.axis("off")
```
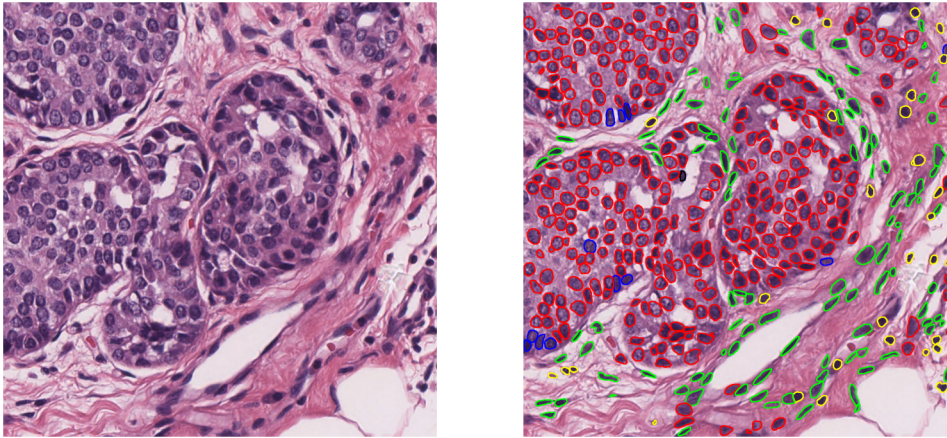
As you can see, `overlay_prediction_contours` beautifully generates an image that has the instance segmentation classification overlaid. Here are the explanations regarding this function's arguments:

- `canvas`: the image on which we would like to overlay the predictions. This is the same image as the input to the `predict` method, loaded as a numpy array.

- `inst_dict`: predicted instance dictionary. This is the dictionary that we earlier loaded using the `joblib.load()` function. It is the output of HoVer-Net and contains the predicted instances.

- `draw_dot`: specifies whether to show detected nucleus centroids on the overlap map. Default is False.

- `type_colours`: a dictionary containing the name and colour information for each class in the prediction. The HoVer-Net model in this example predicts 6 classes of cell, and so we created `color_dict` containing colour information for all types. The `type_colours` dictionary uses the formal `{type_id : (type_name, colour)}` format where `type_id` is from 0 to N (corresponding to classes) and `colour` is a tuple (R, G, B) specifying the colour in RGB format.

- `inst_colours`: if you only have the instance segmentation results or do not like to colour instances based on their types, you can set this parameter to assign a colour for all instances or provide a list of colours to assign different colours to different instances in `inst_dict`.

Inference on WSIs

The next step is to use TIAToolbox's embedded model for nucleus instance segmentation on a whole slide image. The process is quite similar to what we have done for tiles. We will just introduce some important parameters that configure the instance segmentor for WSI inference.

Here we re-defined the `inst_segmentor` just to show the use of the `auto_generate_mask` parameter. By setting this parameter to `True`, we are telling TIAToolbox to automatically extract the tissue masks of the input WSIs if they are not provided in the `predict` function parameters. In this example, we leave `auto_generate_mask=False` because we are using a WSI that contains only tissue region (there is no background region) and therefore there is no need for tissue mask extraction.

> Please note that this part may take too long to process, depending on the system you are using (GPU enabled/disabled) and how large the input WSI is.

```
# Instantiate the nucleus instance segmentor
inst_segmentor = NucleusInstanceSegmentor(
    pretrained_model="hovernet_fast-pannuke",
    num_loader_workers=0,
    num_postproc_workers=0,
```

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