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# **napari\_nucleaizer**

***Release 0.1***

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**NucleAIzer** is a nuclei segmentation algorithm.

By installing our plugin into the Napari viewer, you can:

- Predict your microscopy images loaded into the Napari's stage.
- Predict multiple images using one click by selecting the input and the result folder (batch prediction).
- If you have GPU support, you can optimize our models to your data (or train new models from scratch).

Check out the [General architecture](#) for installation and the [Usage](#) manual.

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**Note:** This project is under active development.

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## 1.1 Getting started

### 1.1.1 General architecture

We separated the GUI interface and the code that does the actual job (prediction and training).

- `napari_nucleaizer`: the GUI frontend. It depends on napari (only minor dependencies, their elimination is work in progress), but it can be still launched as a standalone app. It uses the functionality implemented in `nucleaizer_backend` (see below).
- `nucleaizer_backend`: the actual code that does the prediction and training. It does not depend on napari at all, and provides a command line interface (CLI) for training new models. It does not have a CLI for prediction yet (it is work in progress).

### 1.1.2 Installing the frontend (Napari plugin)

To install `napari_nucleaizer` from PyPI:

1. Install & launch napari: <https://napari.org/tutorials/fundamentals/installation.html>
2. Open **Plugins** -> **Install/Uninstall Plugins...** and type filter for **napari-nucleaizer** and click the install button.

To install the plugin directly from source:

1. Create a virtual environment (recommended).
2. Install napari:

```
(.venv) $ pip install "napari[pyqt5]"
```

Other methods: <https://napari.org/tutorials/fundamentals/installation.html>

1. Clone `napari_nucleaizer` and use

```
(.venv) $ python3 -m pip install -e <napari_nucleaizer-path>
```

This way, the backend will be downloaded from PyPI. If you wish to use the most recent version of the backend, install it first (see below).

### 1.1.3 Installing the backend (Only CLI)

1. Create a virtual environment and clone nucleaizer\_backend
2. Install:

```
(.venv) $ python3 -m pip install -e <nucleaizer_backend-path>
```

## 1.2 Usage

### 1.2.1 Napari plugin

Open the plugin:

1. Start napari by calling *napari*.
2. Then, activate the plugin in the *Plugins* menu.

The GUI provides a tabbed interface. Click on the **New task...** button. It offers several tasks:

- **Prediction:** it creates a prediction tab. You can predict a single image loaded into the Napari stage.
- **New project...:** choose this if you want to train a nucleAIzer model. A file dialog will be opened to select the working directory.
- **Open project...:** choose this if you wish to open a previously created project. A dialog will open to select the project's working directory.

Prediction:

1. After adding a prediction tab you can predict single images or you can run batch prediction.
  - To predict a single image, load it into the stage first. Make sure that the correct layer is selected.
  - To predict multiple images, you have to first click on the **Batch prediction...** button. Select the input directory containing your images and the output directory. The predicted labelled masks by the model will be put into the output directory in 16-bit TIFF format.
  - After selecting the input and output directory, the images will be listed. If you click on an image, the image will be loaded into the **Quick view**. If a segmentation is available to the selected image in the output folder, then the segmentation will also outlined in the **Quick view**. If you double click on an image the image (and its segmentation if available) will be loaded into the napari stage as separate layers. The images already having a segmentation marked with bold text. Using the checkboxes you can select which images you wish to predict. You can also select all images based on their status: **prediction exists** / **prediction does not exist**.
2. Click on the **Browse for models...** button and select the model you want to use for segmenting your image(s).
3. Most of the models are trained on rescaled images depending on the median size of the objects. You can specify the “Expected cell size” (in pixels) of your images. Then, your images will be rescaled accordingly to match the scale of the images the selected model was trained on. If you do not specify the cell size, then a default size will be used.
4. Click on the **Predict current image** or **Batch predict selected** to predict your image(s).