PoL
Physics of Life
TU Dresden

CENTER FOR
SYSTEMS BIOLOGY
DRESDEN

Recap day 2

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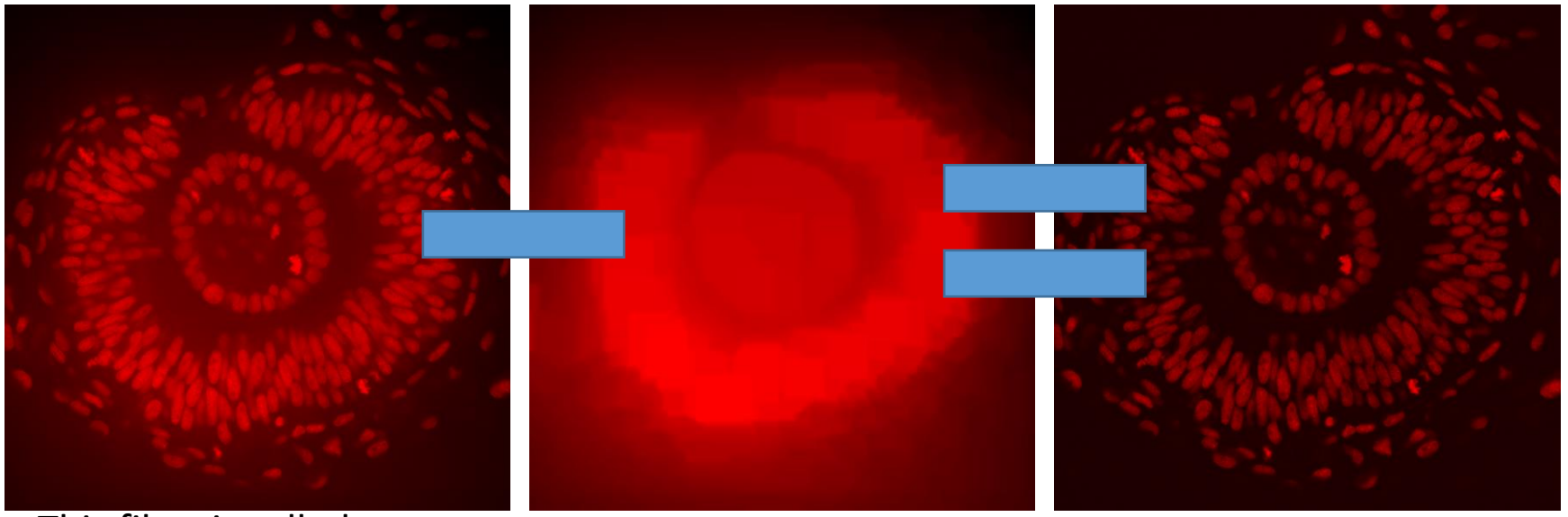
Background subtraction



This filter is called …

Brown bowler	Mexican hat	White tophat	Median sombrero

If the background was bright and the objects were dark we could…

Invert the image	Using opening instead of closing	Cry	Divide by the background

A good value for the range (i.e. size of the structural element) of the background removal filter is

> Radius of object	Width of the image	Number of cells	Current time in minutes

Segmentation with neuronal networks

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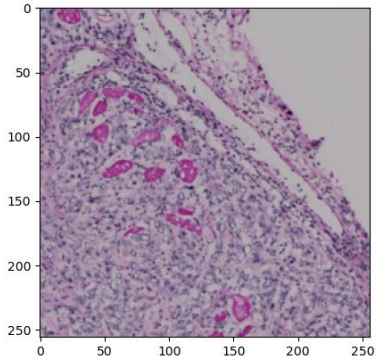
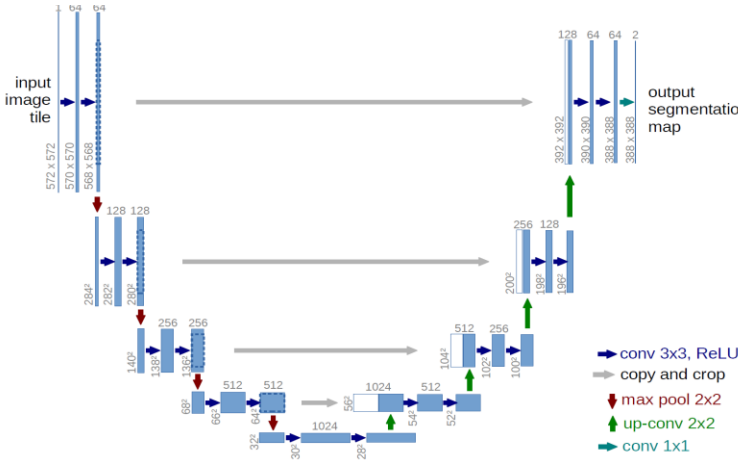
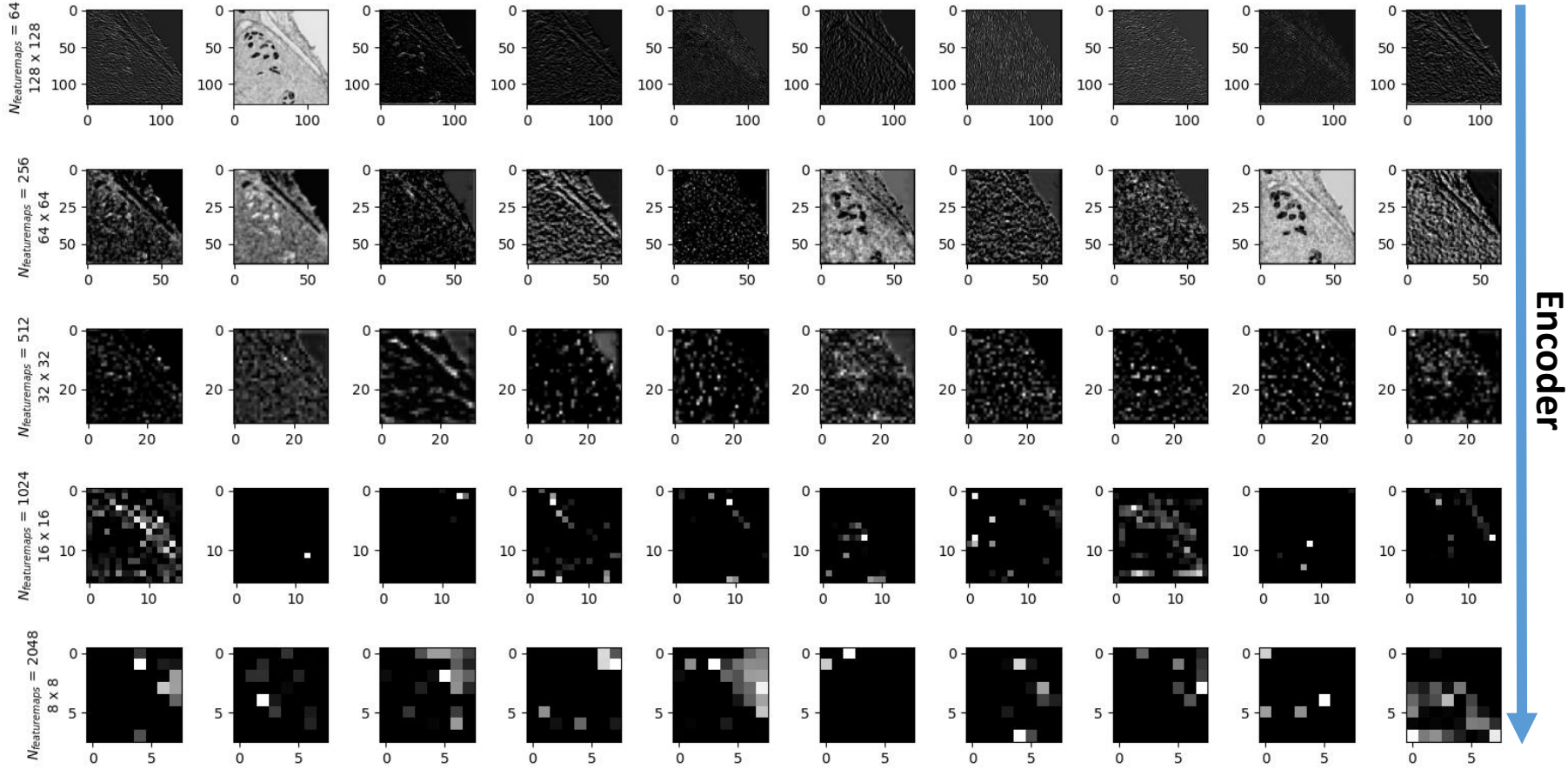
Working horse: U-net







The encoder replaces the….

- Where with the what
- Where with the how
- What with the who
- Why with the what for

Ronneberger et al (2015): https://arxiv.org/abs/1505.04597

Quiz

- “ground truth” is …

Wisdom

Reality

A form of data annotation

On the bottom of the Elbe

Quiz

- If a library is not installed what do you try first?

```
[1]: import stackview
```

```
---------------------------------------------------------------------------
ModuleNotFoundError                                 Traceback (most recent call last)
Cell In [1], line 1
----> 1 import stackview

ModuleNotFoundError: No module named 'stackview'
```

conda install …

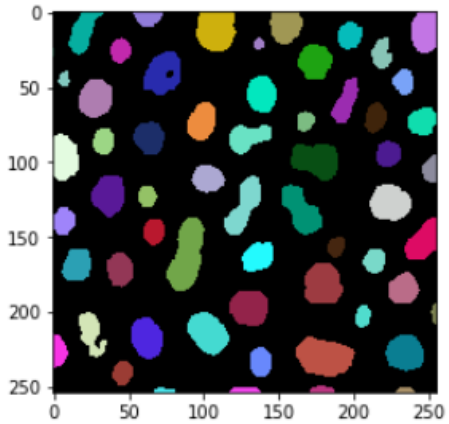
pip install …

conda activate …

reinstall conda

Quiz

- A label image showing nuclei is a result of…



Instance segmentation

Semantic segmentation

Dense segmentation

Sparse annotation

Model validation

- A good classifier is trained on a hand full of datasets and works on thousands similarly well.
- In order to assess that, we split the ground truth into two set
  - Training set (50%-90% of the available data)
  - Test set (10%-50% of the available data)

Typically done with hundreds or thousands of cells / images / objects / whatever.

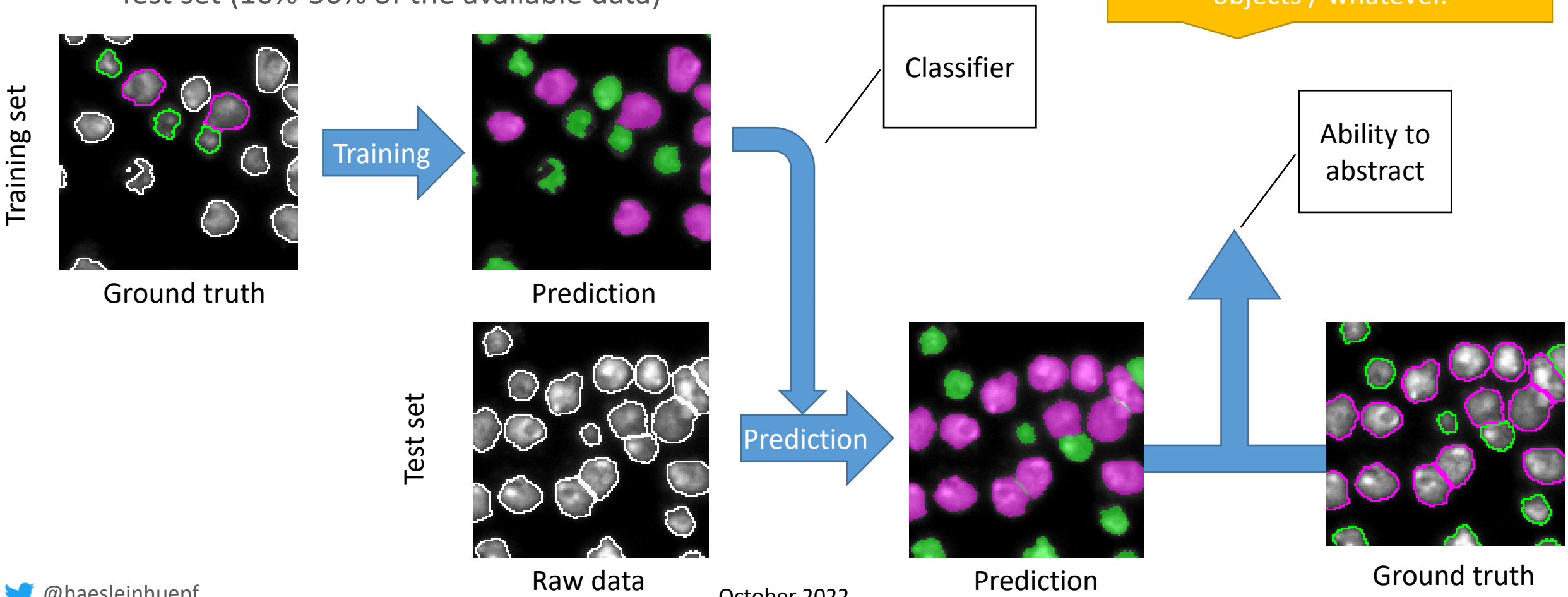


Image data source: BBBC038v1, available from the Broad Bioimage Benchmark Collection (Caicedo et al., Nature Methods, 2019).

Clarification: model validation

Train dataset (e.g. 80% of the data)

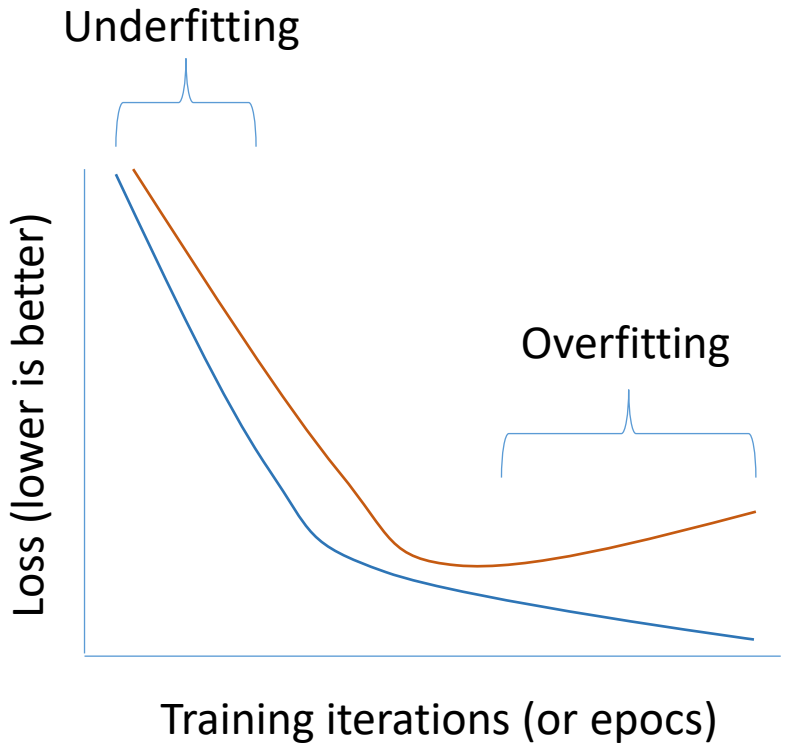
- Used for training directly

Validation dataset (10% of the data)

- After every iteration see if the model overfits

Test dataset (10% of the data)

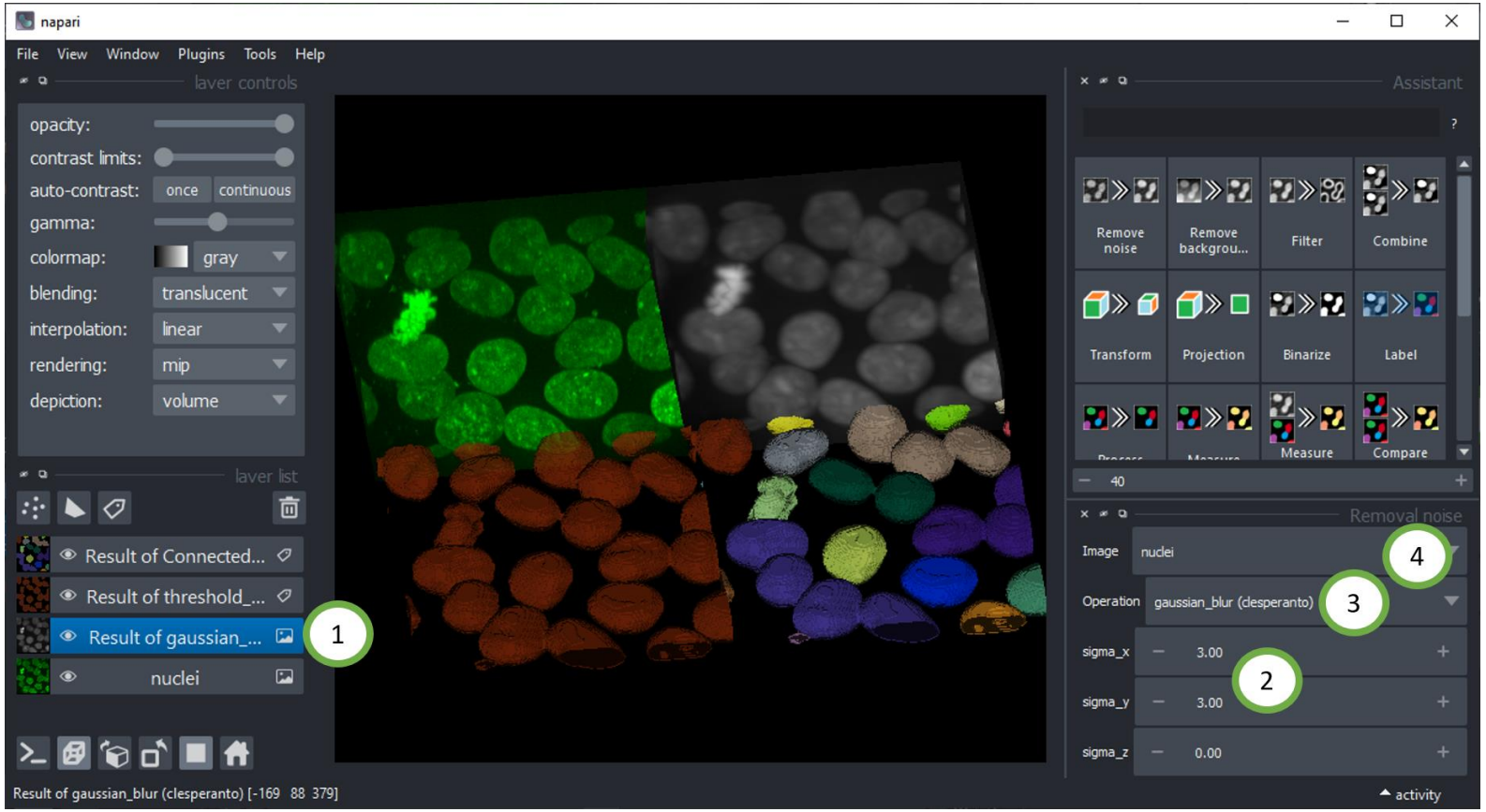
- Final evaluation after training is finished (once)

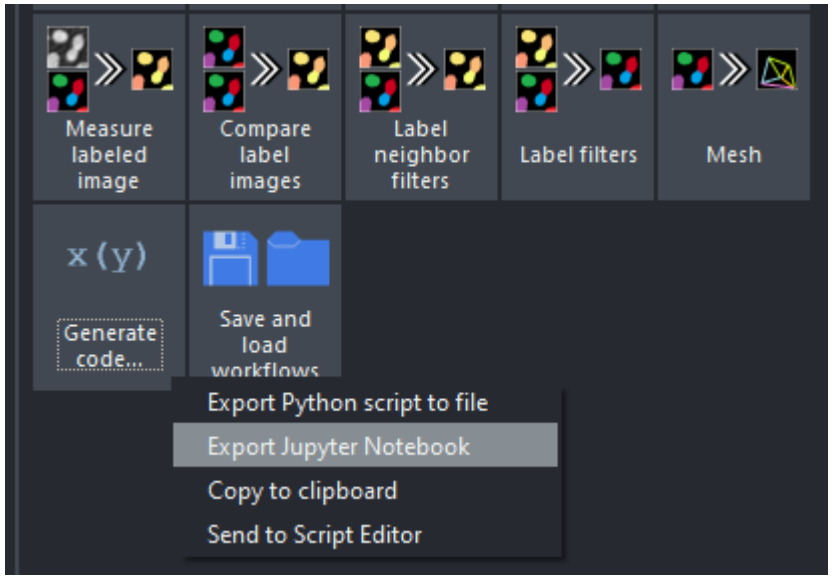


https://towardsdatascience.com/how-to-split-data-into-three-sets-train-validation-and-test-and-why-e50d22d3e54c

The napari-assistant

- For generating Jupyter notebooks





1: Select layer, 2: select input, 3: select operation, 4: select parameters

https://github.com/haesleinhuepf/napari-assistant