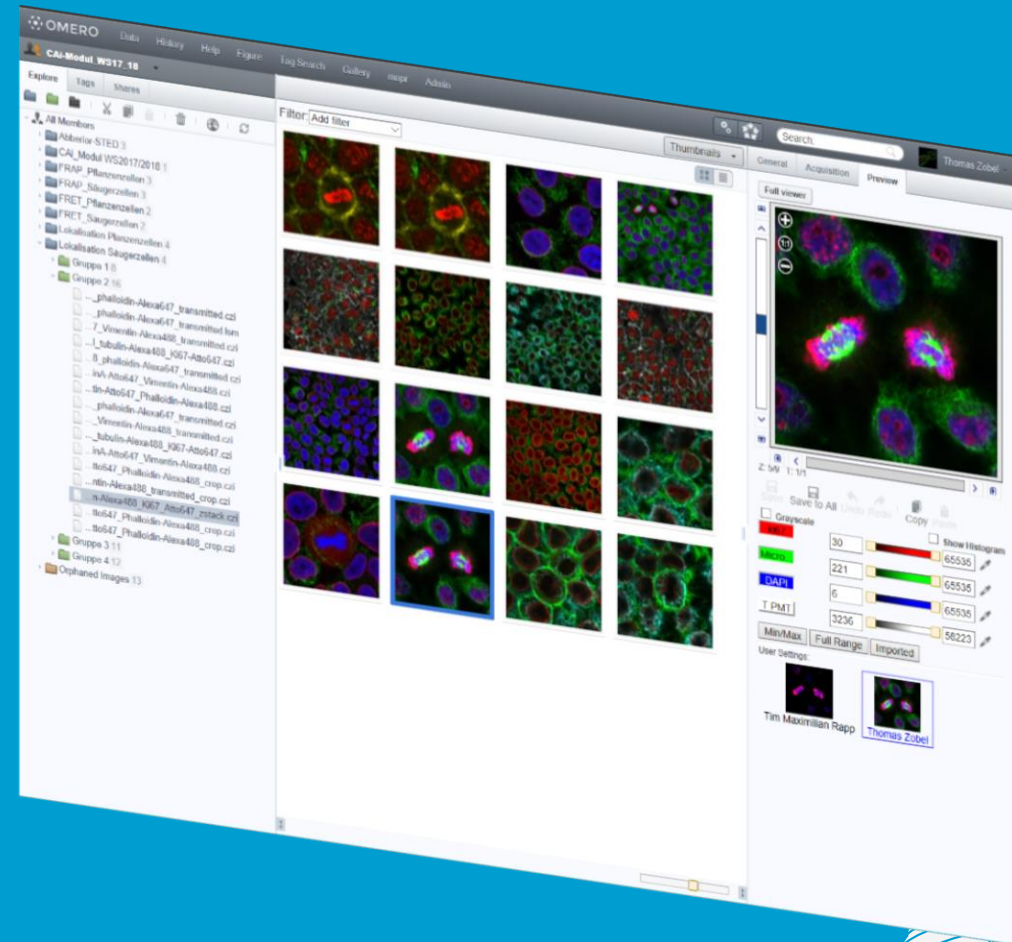


RDM4Mic – Meeting

virtually via Zoom
15.12.2021



MÜNSTER IMAGING NETWORK

Using Fiji & Python for batch analysis in OMERO

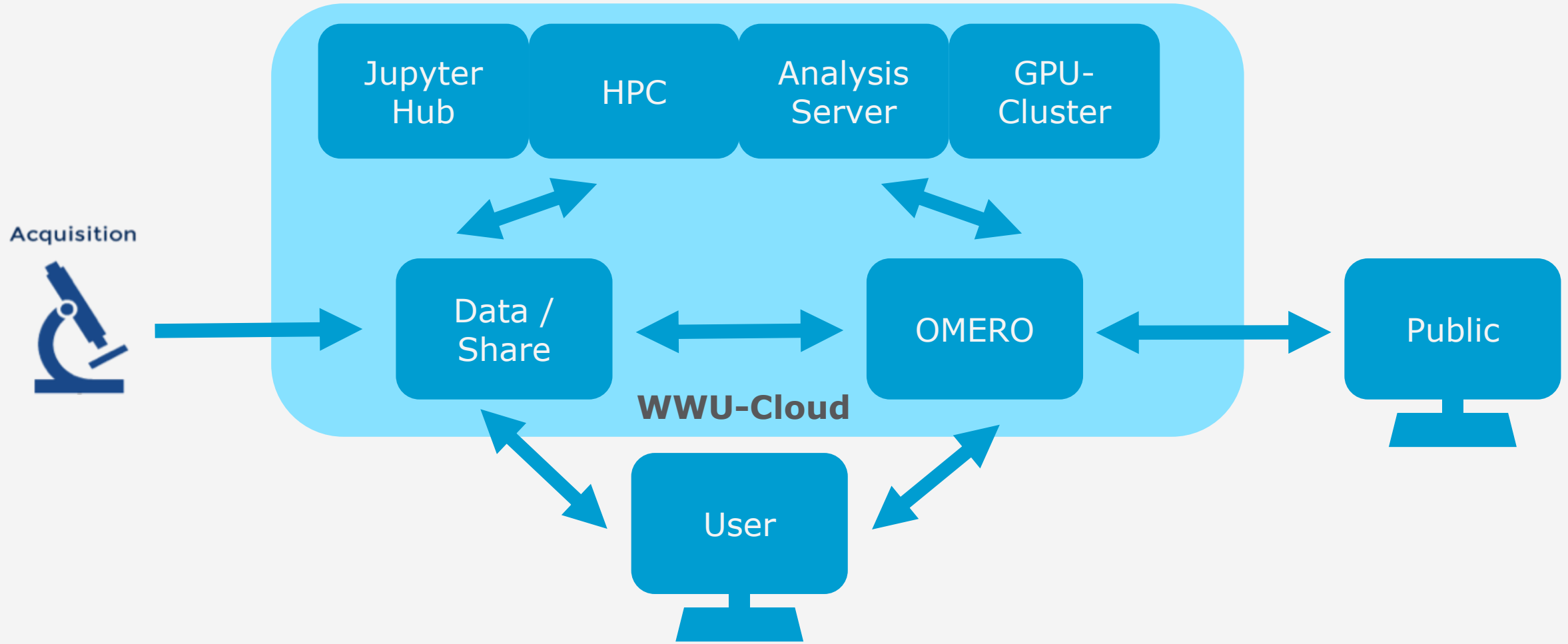


RDM4Mic Meeting
Dr. Thomas Zobel

15.12.2021

Setup/Design	Memory/Storage	Backup/Archive	Data	3rd Party/AddOns
<ul style="list-style-type: none">• VM in OpenStack with direct access to University Cloud infrastructure / services• OMERO.server, OMERO.web (in venv / 1VM)• Data.Dir: NFS-Share in OpenStack / cloud environment• Local OMERO.insight clients	<p>Storage: 43 TB / 12TB in use</p> <ul style="list-style-type: none">• 8 vCPUs• 32GB RAM <p>→ Storage, vCPUs & Memory easily extendable due to OpenStack environment</p>	<ul style="list-style-type: none">• 8+3 erasure coding• In Progress: Backup for published Data together with the library (3 copies)	<p>Type:</p> <ul style="list-style-type: none">• Normal Light microscopy & Electron microscopy• Slide Scans (Histology / Pathology)• Screening Data / HCS <p>Domain:</p> <ul style="list-style-type: none">• Biology• Medicine	<ul style="list-style-type: none">• OMERO.OpenLink• OMERO.iviewer• OMERO.figure• OMERO.webtagging• OMERO.parade• OMERO.OpenLink• OMERO.mde <ul style="list-style-type: none">• Different scripts<ul style="list-style-type: none">• Key-Value from csv
User	Usage	Access	Team/Maintenance	Network infrastructure
<div># User: 878</div> <div>Activated User: 870</div> <div>Daily active: ~15 170 in courses</div> <div>2021-06-08 to 2021-06-12: 324</div> <div>Groups: 35</div> <div>Public Group for publications</div>	<p>Monthly increase of storage: 613/670/412/133/2236 GB over the last 5 months</p> <p>Concurrent users:</p> <div>background_threads: 100</div> <div>db.poolsize: 290</div>	<p>Internal:</p> <ul style="list-style-type: none">• LDAP• OMERO.clients• OpenLink <p>External:</p> <ul style="list-style-type: none">• Public group• OpenLink	<p>General Management</p> <ul style="list-style-type: none">• 3 Facility Members <p>System Administrator</p> <ul style="list-style-type: none">• 1 (0.1 FTE)	<ul style="list-style-type: none">• 100Mbit – 10Gbit connections to OMERO (Microscopes / Office Computer)• 2x25Gbit connection between analysis server and OMERO
				Date: 2021-12-14

Infrastructure



Olympus ScanR Screening System



Problems:

- No *nativ* import to OMERO as screen or plate
- *Dataset to plate* script is not working properly
- *Key Value from CSV* script not working for screens yet
- Analysis workflow not established yet

Dataset to Plate.py for Olympus ScanR Data

Adapted Dataset to Plate.py

Take a Dataset of Images and put them in a new or existing Plate, arranging them into rows or columns according to their Image names.

Optionally add the Plate to a new or existing Screen.

See <http://help.openmicroscopy.org/scripts.html>

Authors: William Moore, OME Team, Jens Wendt, Imaging Network WWU Muenster

Contact: ome-users@lists.openmicroscopy.org.uk

Version: 4.3.2

Data Type: *

IDs: *

Filter Names:

Images Per Well: * Min: 1

Dataset integration into existing Plate:

Column Names: *

Row Names: *

Screen:

Remove From Dataset: ☒

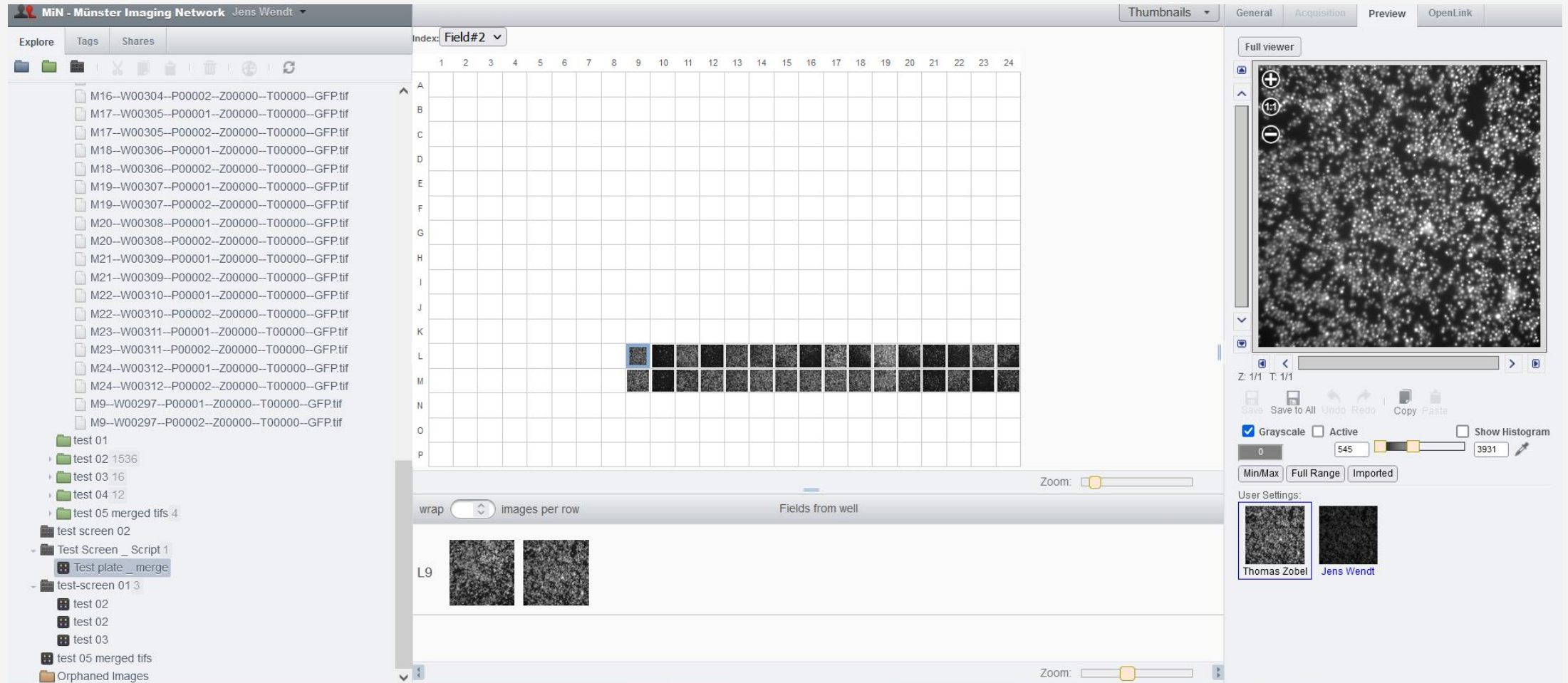
Adoptions:

- For Olympus data structure:
 - **E17--W00113--P00001--Z00000--T00000--GFP.tif**
- Integration of new files into existing plates needed (rescreen)
 - **Starts with the latest files dataset**

Dataset to Plate.py for Olympus ScanR Data

The screenshot displays the MiN - Münster Imaging Network web interface. The top navigation bar includes 'General', 'Acquisition', 'Preview', and 'OpenLink'. The left sidebar shows a file explorer with a list of image files, including folders like 'L20-W00284-P00002-Z00000-T00000-GFP.tif' and 'Overlap 2 32'. The main area shows a grid of image thumbnails under the heading 'OVERLAP 1'. A specific image is highlighted with a blue border. The right sidebar contains a 'Full viewer' section with a large image of a cell culture plate, a 'Z: 1/1 T: 1/1' indicator, and a 'User Settings' section with two user profiles: 'Thomas Zobel' and 'Jens Wendt'.

Dataset to Plate.py for Olympus ScanR Data



Screening Data Analysis with Fiji

script:C:\Users\ICDI\Desktop\Fiji Macros\Omero... X

Omero User
Omero Password
Omero Server
Omero Port
Input Dataset ID
OMERO Group ID
Name of target Dataset
ID of target Project

master omero-guide-fiji / scripts / groovy /

Go to file Add file ...

pwalczyzsko Fix link to s3 ✓ a4946c0 5 days ago History

..		
analyse_dataset_and_save_rois.groovy	update license header	6 months ago
analyse_dataset_ilastik.groovy	update license header	6 months ago
analyse_dataset_save_rois_and_summary_table.groovy	update license header	6 months ago
analyse_image_map_annotation.groovy	update license header	6 months ago
analyse_particles_for_another_user.groovy	update license header	6 months ago
annotate_dataset.groovy	update license header	6 months ago
background_subtract_batch.groovy	update license header	6 months ago
crop_rectangle_from_image.groovy	update license header	6 months ago
idr0021.groovy	update license header	6 months ago
import_local_file.groovy	update license header	6 months ago
mobie_ome_zarr.groovy	Fix link to s3	5 days ago
open_image_after_download.groovy	update license header	6 months ago
open_omero_image_no_download.groovy	update license header	6 months ago
template_run_macro_for_another_user_on_dataset.groovy	update license header	6 months ago

<https://github.com/ome/omero-guide-fiji/tree/master/scripts/groovy>

Screening Data Analysis with Fiji

script:C:\Users\ICDI\Desktop\Fiji Macros\Omero... X

Omero User

Omero Password

Omero Server

Omero Port

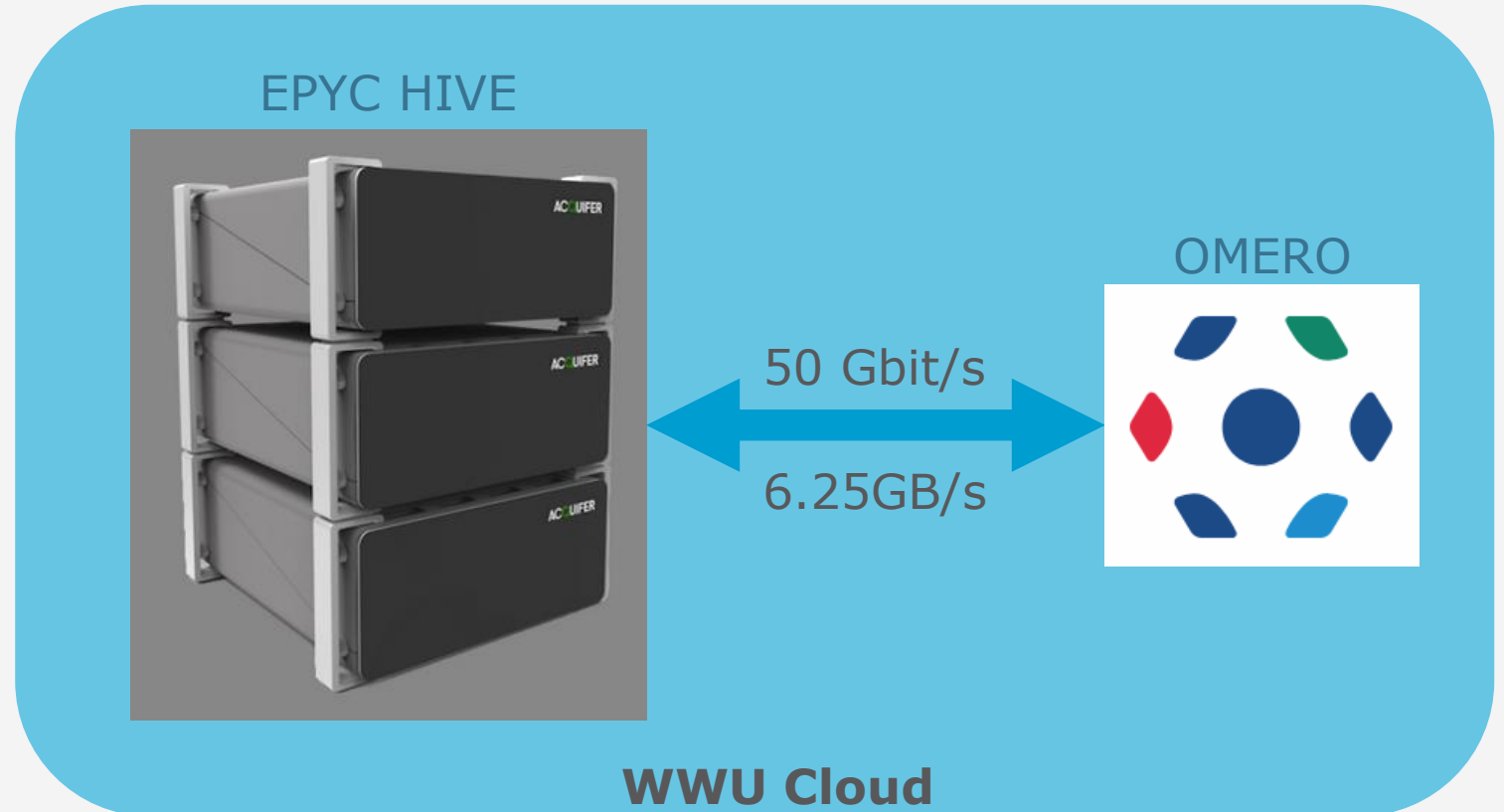
Input Dataset ID

OMERO Group ID

Name of target Dataset

ID of target Project

OK Abbrechen



Screening Data Analysis with Fiji

script:C:\Users\ICDI\Desktop\Fiji Macros\Omero... X

Omero User

Omero Password

Omero Server

Omero Port

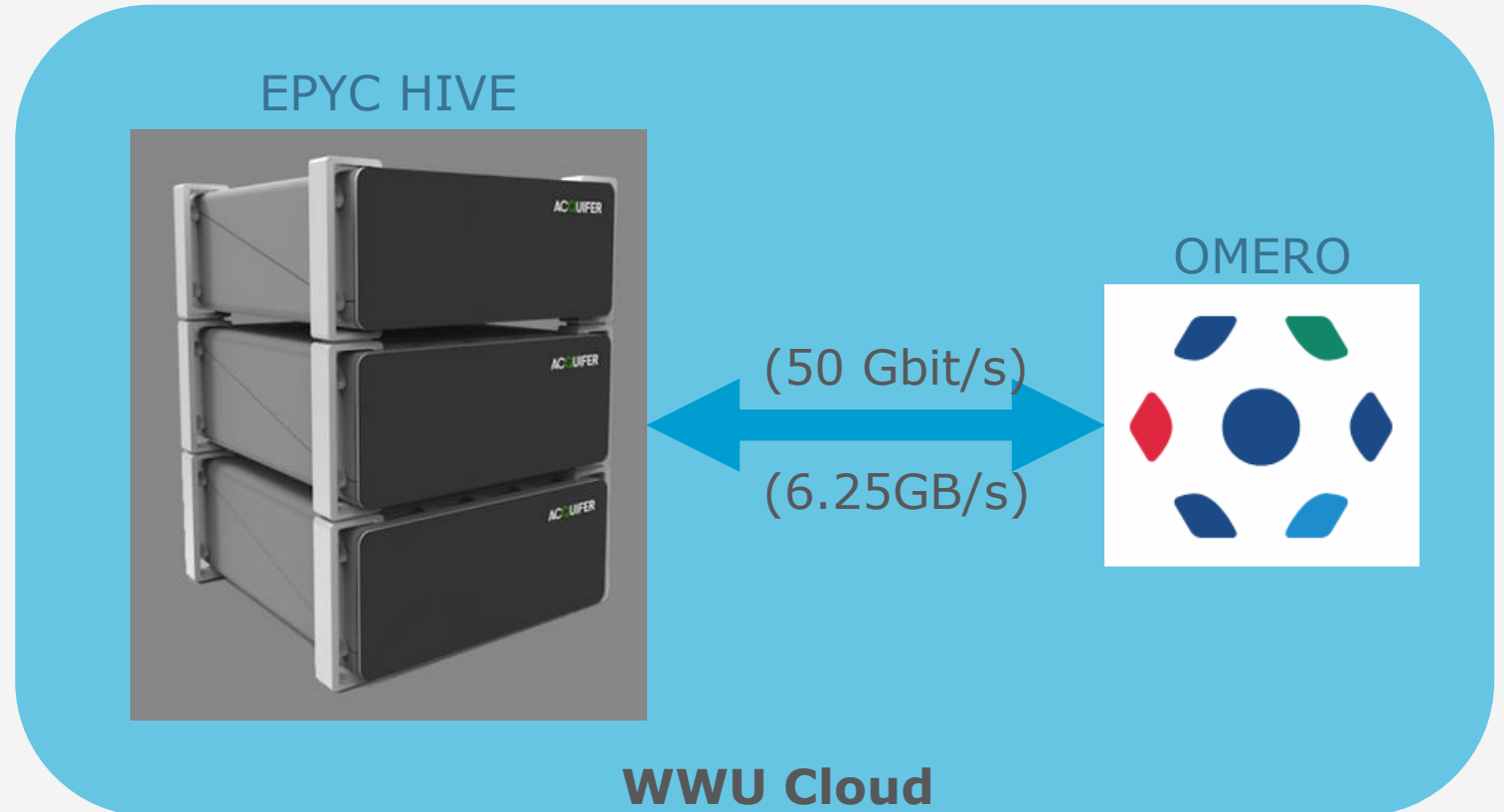
Input Dataset ID

OMERO Group ID

Name of target Dataset

ID of target Project

OK Abbrechen



Screening Data Analysis with Fiji

The screenshot displays the OMERO web client interface. The top navigation bar includes links for Data, History, Help, Tag Search, Figure, and Admin. The user is logged in as Jens Wendt. The left sidebar shows a file tree with folders like 'Screen to Plate Testing 8' and 'test 01'. Two blue boxes highlight specific file lists. The main area shows a grid of image thumbnails. The right sidebar contains metadata for 'Fiji Test 01', including Dataset ID, Owner, Creation Date, and various counts (Tags, Key-Value Pairs, Attachments, Comments, Ratings, Others).

File List 1 (Highlighted):

- E17--W00113--P00001--Z00000--T00000--GFP-processed.tif
- E17--W00113--P00001--Z00000--T00000--mcherry-processed.tif
- E17--W00113--P00001--Z00000--T00000--Trans-processed.tif
- E17--W00113--P00002--Z00000--T00000--GFP-processed.tif
- E17--W00113--P00002--Z00000--T00000--mcherry-processed.tif
- E17--W00113--P00002--Z00000--T00000--Trans-processed.tif
- E18--W00114--P00001--Z00000--T00000--GFP-processed.tif
- E18--W00114--P00001--Z00000--T00000--mcherry-processed.tif
- E18--W00114--P00001--Z00000--T00000--Trans-processed.tif
- E18--W00114--P00002--Z00000--T00000--GFP-processed.tif
- E18--W00114--P00002--Z00000--T00000--mcherry-processed.tif
- E18--W00114--P00002--Z00000--T00000--Trans-processed.tif

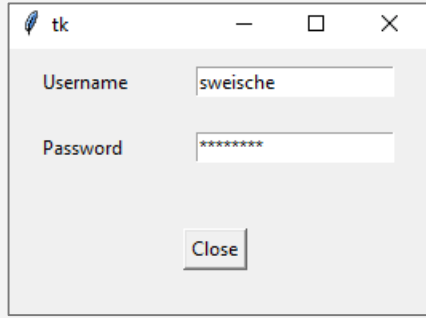
File List 2 (Highlighted):

- E17--W00113--P00001--Z00000--T00000--GFP.tif
- E17--W00113--P00001--Z00000--T00000--mcherry.tif
- E17--W00113--P00001--Z00000--T00000--Trans.tif
- E17--W00113--P00002--Z00000--T00000--GFP.tif
- E17--W00113--P00002--Z00000--T00000--mcherry.tif
- E17--W00113--P00002--Z00000--T00000--Trans.tif
- E18--W00114--P00001--Z00000--T00000--GFP.tif
- E18--W00114--P00001--Z00000--T00000--mcherry.tif
- E18--W00114--P00001--Z00000--T00000--Trans.tif
- E18--W00114--P00002--Z00000--T00000--GFP.tif
- E18--W00114--P00002--Z00000--T00000--mcherry.tif
- E18--W00114--P00002--Z00000--T00000--Trans.tif

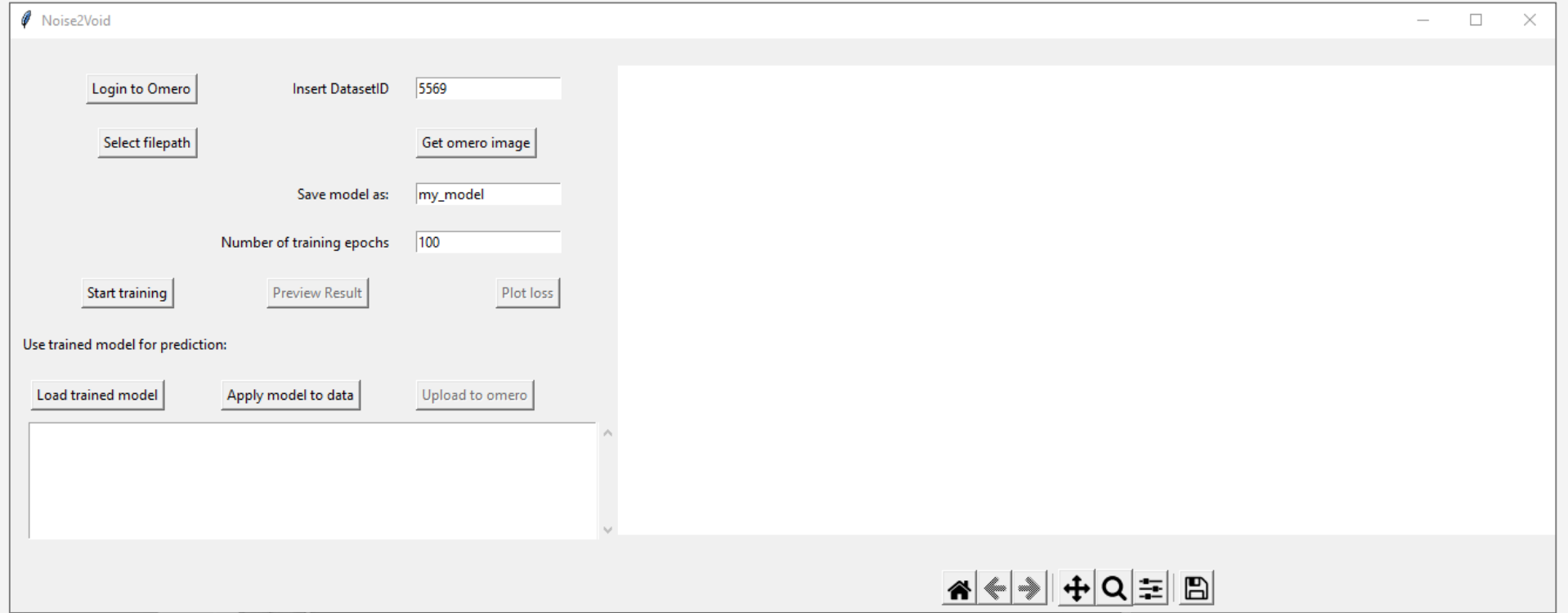
Dataset Metadata (Fiji Test 01):

- Dataset ID: 5625
- Owner: Jens Wendt
- Creation Date: 2021-12-13 16:23:44
- Tags: 0
- Key-Value Pairs: 0
- Attachments: 0
- Comments: 0
- Ratings: 0
- Others: 0

DeepLearning tool N2V using Python with automated OMERO download



A small Tkinter-style login dialog box with a title bar containing a feather icon and the text 'tk'. It has two input fields: 'Username' with the text 'sweische' and 'Password' with masked characters '*****'. A 'Close' button is at the bottom.

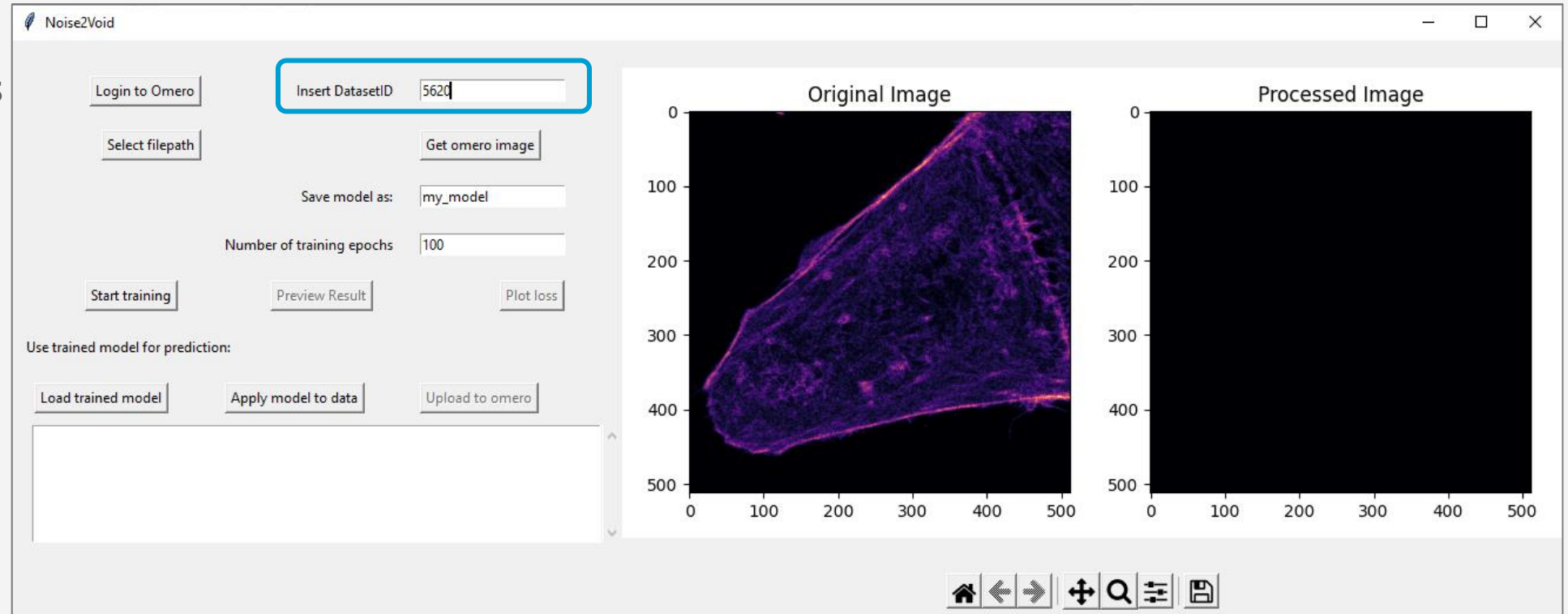


The main interface of the Noise2Void tool, titled 'Noise2Void'. It features a light gray background with various controls. At the top left, there are buttons for 'Login to Omero' and 'Select filepath'. To the right, there is an 'Insert DatasetID' field with the value '5569' and a 'Get omero image' button. Below these, there is a 'Save model as:' field with 'my_model' and a 'Number of training epochs' field with '100'. Further down, there are buttons for 'Start training', 'Preview Result', and 'Plot loss'. A section titled 'Use trained model for prediction:' contains buttons for 'Load trained model', 'Apply model to data', and 'Upload to omero'. A large white rectangular area on the right side of the interface is currently empty. At the bottom right, there is a toolbar with icons for home, back, forward, zoom in, zoom out, and save.

runs remotely on Hive (analysis server)

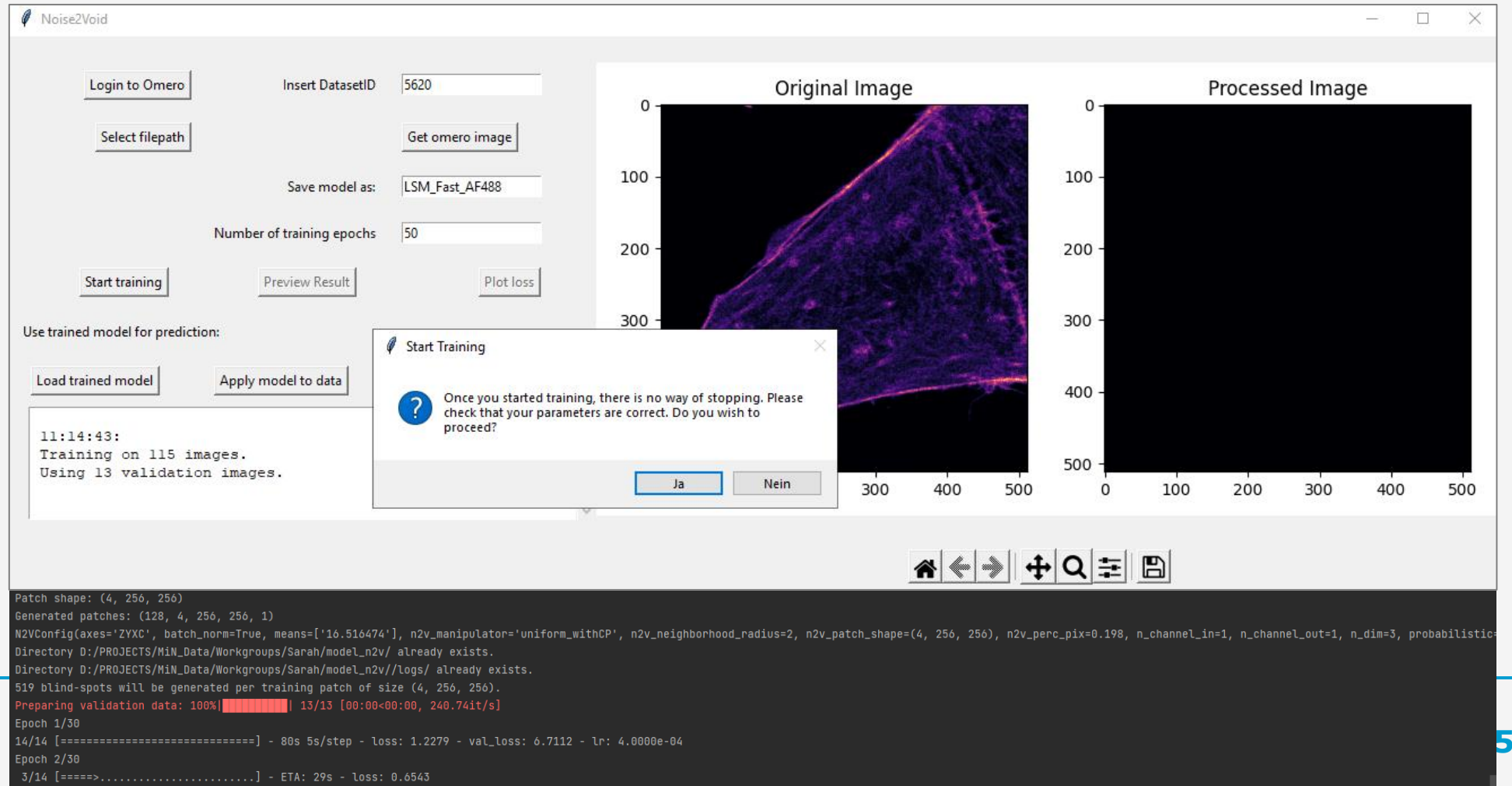
DeepLearning tool N2V using Python with automated OMERO download

- Insert DatasetID
- Retrieve images as np.array



* Code adapted from:
<https://docs.openmicroscopy.org/omero/5.6.0/developers/Python.html#read-data>

DeepLearning tool N2V using Python with automated OMERO download



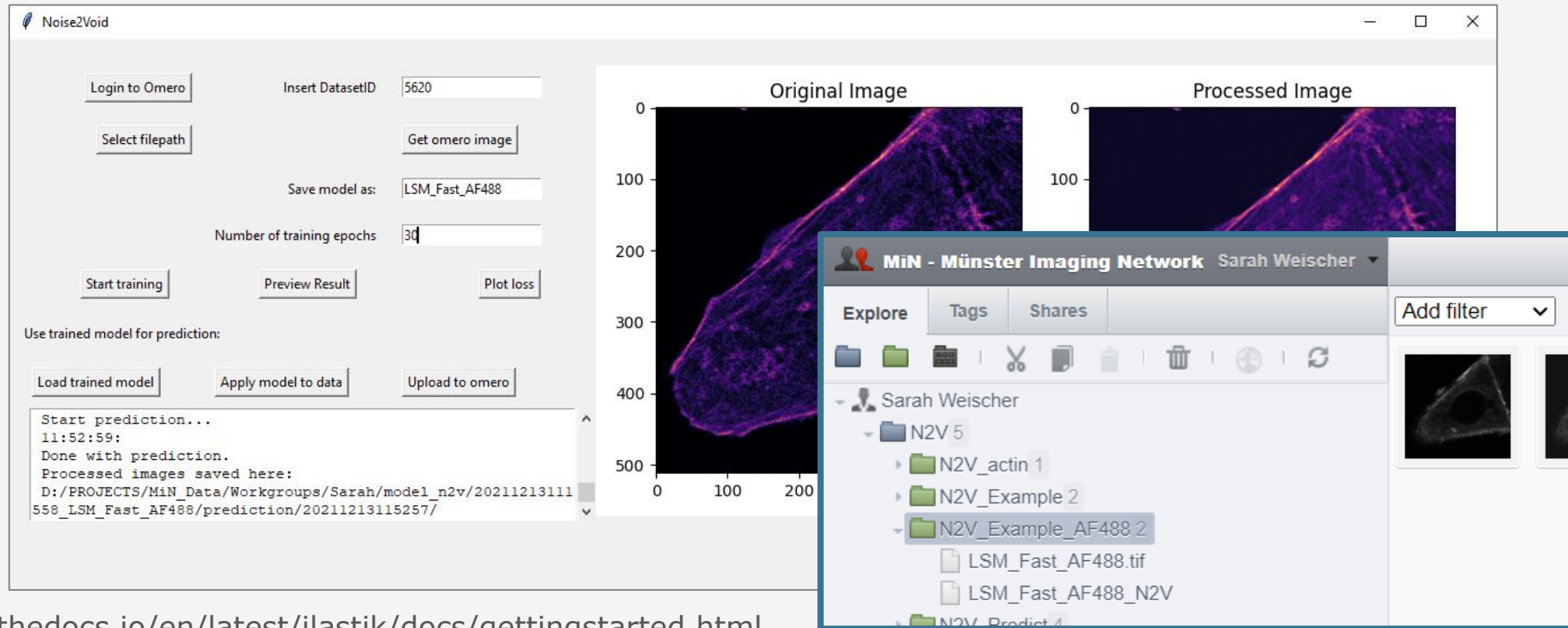
The screenshot displays the Noise2Void application window. On the left, there are controls for dataset selection (Login to Omero, Select filepath, Insert DatasetID: 5620, Get omero image), model saving (Save model as: LSM_Fast_AF488), and training parameters (Number of training epochs: 50). Buttons for 'Start training', 'Preview Result', and 'Plot loss' are visible. Below these, a section for 'Use trained model for prediction' includes 'Load trained model' and 'Apply model to data' buttons. A terminal window at the bottom shows the following output:

```

11:14:43:
Training on 115 images.
Using 13 validation images.
Patch shape: (4, 256, 256)
Generated patches: (128, 4, 256, 256, 1)
N2VConfig(axes='ZYXC', batch_norm=True, means=['16.516474'], n2v_manipulator='uniform_withCP', n2v_neighborhood_radius=2, n2v_patch_shape=(4, 256, 256), n2v_perc_pix=0.198, n_channel_in=1, n_channel_out=1, n_dim=3, probabilistic=True)
Directory D:/PROJECTS/Min_Data/Workgroups/Sarah/model_n2v/ already exists.
Directory D:/PROJECTS/Min_Data/Workgroups/Sarah/model_n2v/logs/ already exists.
519 blind-spots will be generated per training patch of size (4, 256, 256).
Preparing validation data: 100% [██████████] 13/13 [00:00<00:00, 240.74it/s]
Epoch 1/30
14/14 [=====] - 80s 5s/step - loss: 1.2279 - val_loss: 6.7112 - lr: 4.0000e-04
Epoch 2/30
3/14 [=====>.....] - ETA: 29s - loss: 0.6543
  
```

On the right, two image preview windows are shown: 'Original Image' and 'Processed Image'. The 'Original Image' shows a noisy, low-contrast biological sample, while the 'Processed Image' shows the same sample with significantly reduced noise and enhanced contrast. A 'Start Training' dialog box is overlaid on the interface, asking for confirmation to proceed with training, stating: 'Once you started training, there is no way of stopping. Please check that your parameters are correct. Do you wish to proceed?' with 'Ja' (Yes) and 'Nein' (No) buttons.

DeepLearning tool N2V using Python with automated OMERO download



Upload code adapted from:
<https://omero-guides.readthedocs.io/en/latest/ilastik/docs/gettingstarted.html>
 def save_results(...)

Missing functions

- Key-Value Pairs for Screens
 - **Ideally via OMERO.mde or CSV file**
- „Experimental“ Key-Value Pairs already at the microscopes
- Automatic file attachments (Python / Fiji / ELN)
- Faster data transfer between OMERO and analysis server
- ELN integration (eLabFTW)
-

Acknowledgements



Sarah Weischer
MiN



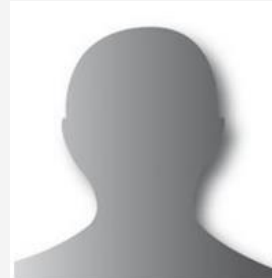
Jens Wendt
MiN



Christian Döring
CiM



Markus Blank-Burian
WWU-IT



Frank Berkemeier
Holger Przibytzin

WWU ULB