How to train your Elephant (remotely)

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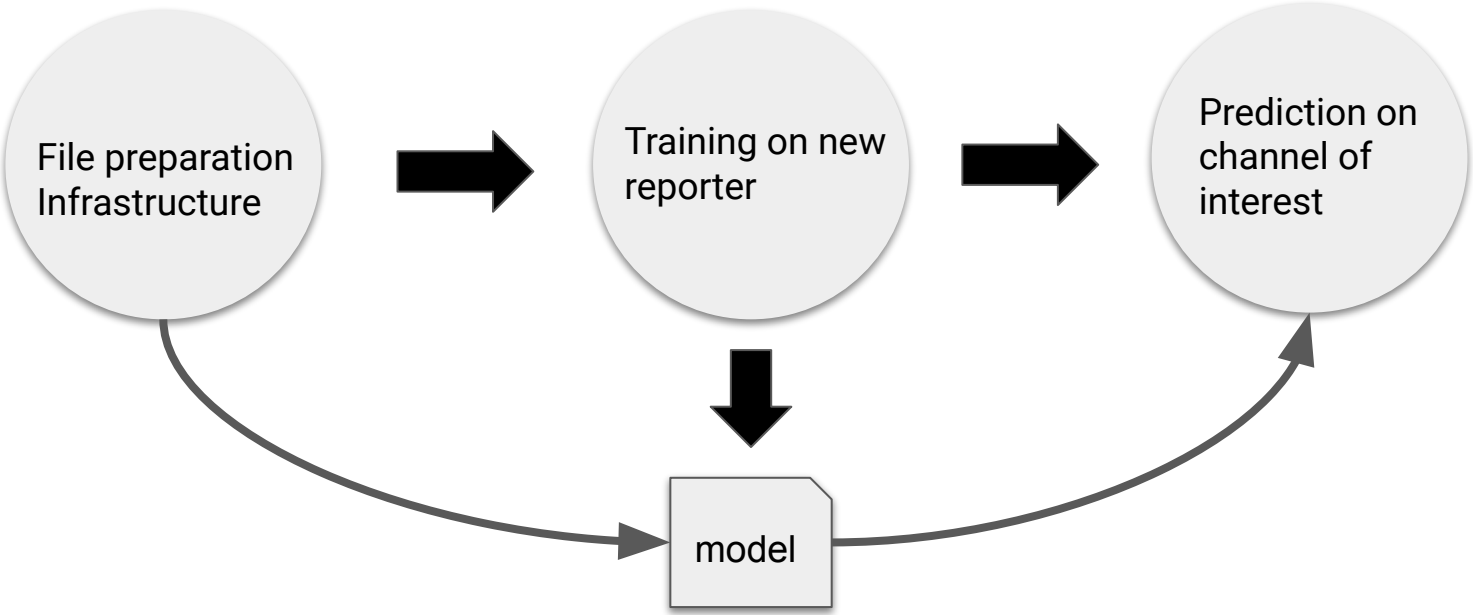
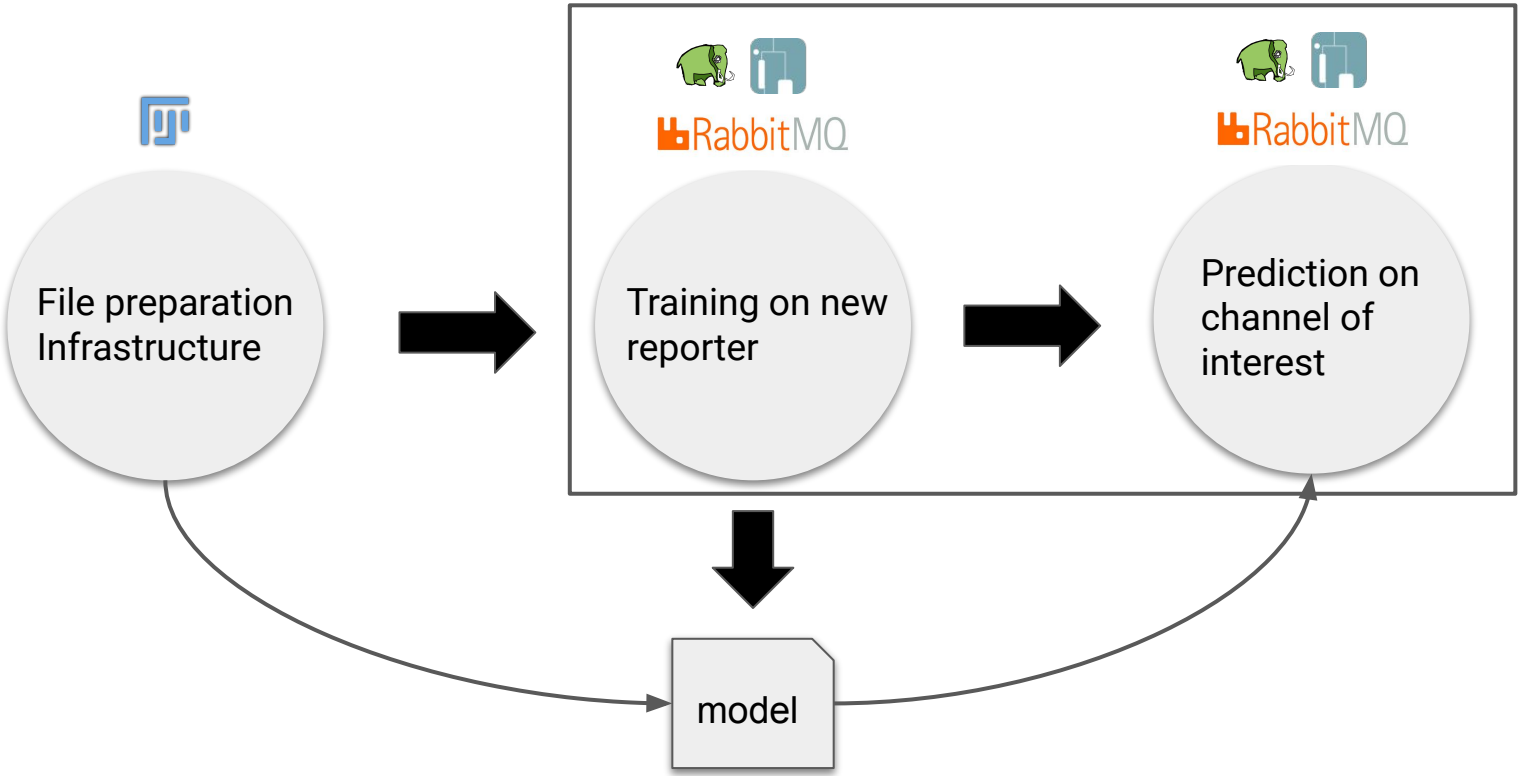
Overview of workflow

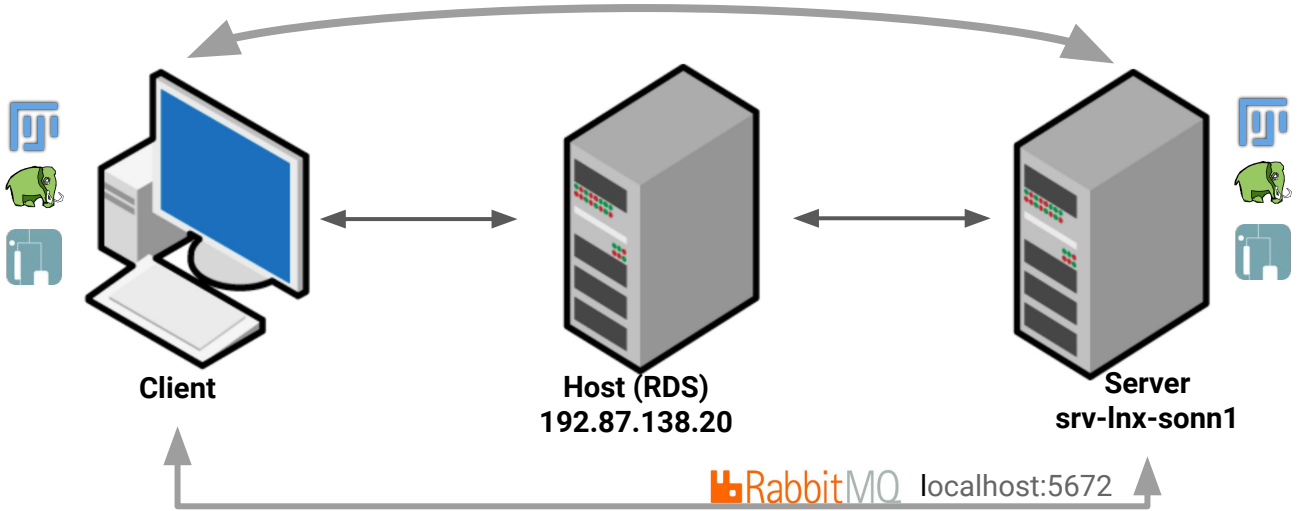


Tools

Fiji
Elephantimorpha
RabbitMQ Docker



Environment



Infrastructure setup

Steps (Page 1) - Infrastructure setup (see utilsZoo.txt)

1. Infrastructure (all done on Client PC) (see utilsZoo.txt)
    1.1. Setup SSH Jump Host
    1.2. Connect to srv-lnx-sonn1 **(Terminal 1)**
    1.3. Create/reattach GNU Screen **(Terminal 1)**
    1.4. Launch docker on the GNU screen **(Terminal 1)**
    1.5. Forward Elephant and RabbitMQ ports **(Terminal 2)**
        1.5.1. In case you need to kill the ports (e.g. frozen ports)
    1.6. Launch Elephant (Fiji)
2. Have your files ready (e.g. nucmem and Hes1 in separated H5/XML pairs)

Training

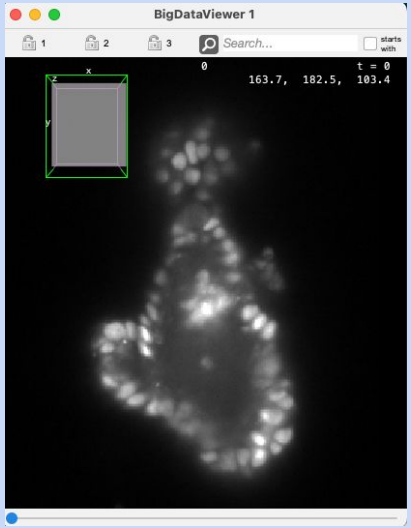
Steps (Page 2) - Training (Segmentation)

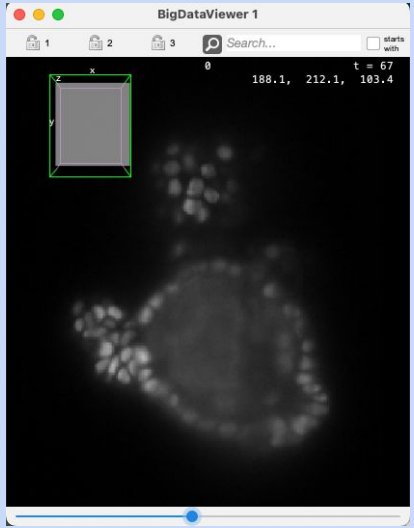
1. Launch Fiji > Mastodon (and Elephant)
2. Open training dataset (e.g. nucmem H5/XML)
3. Check Elephant Control Panel for successful connections
4. Plan for a training strategy

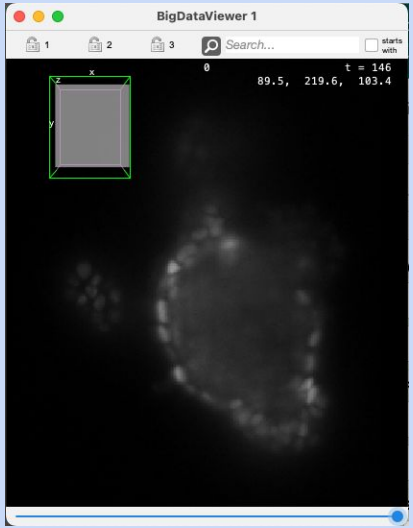
An example of training strategy (Segmentation)

Requirements:

1. Manual annotations: True Positive (crypt nuclei), True Negative (background)
2. Covers suitable ranges of morphological/signal changes (first 10, middle 10, last 10 timepoints)
3. Control sample (so that the trained model is “neutral” or “unbias”)





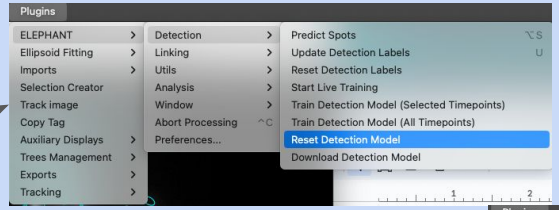


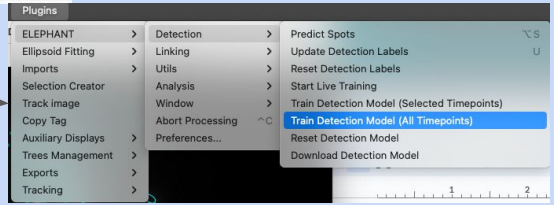
Steps (Page 2) - Training (Segmentation)

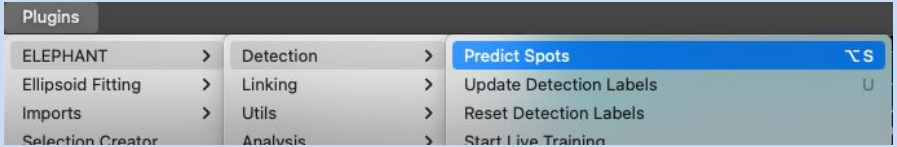
1. Launch Fiji > Mastodon (and Elephant)
2. Open training dataset (e.g. nucmem H5/XML)
3. Check Elephant Control Panel for successful connections
4. Plan for a training strategy
5. Manual annotations + incremental training

Manual annotations + incremental training

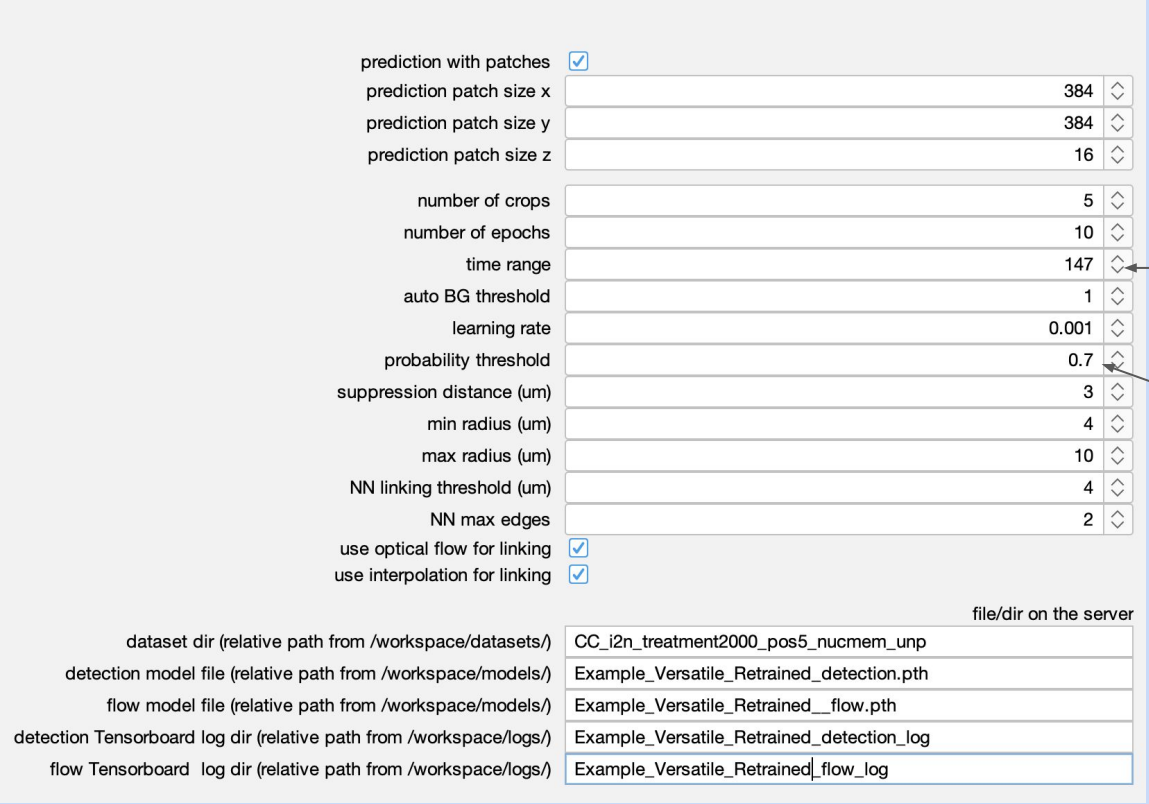
1. Configure tags
    1.1. tp = True Positive (nuclei)
    1.2. tn = True Negative (background)
2. Annotate https://elephant-track.github.io/#/v0.5/?id=_2-shortcuts
3. Assign tags
4. Assign training parameters
5. Reset detection model > Versatile
6. Training
7. Incremental training (repeat step 3)







Retraining hyperparameters



Full time range

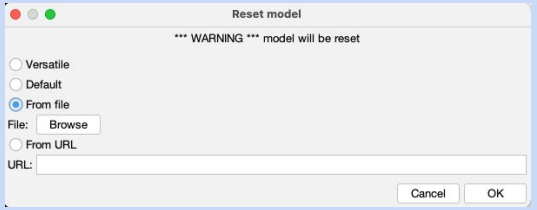
Be strict during training

Prediction

Steps (Page 3) - Prediction (segmentation) and tracking

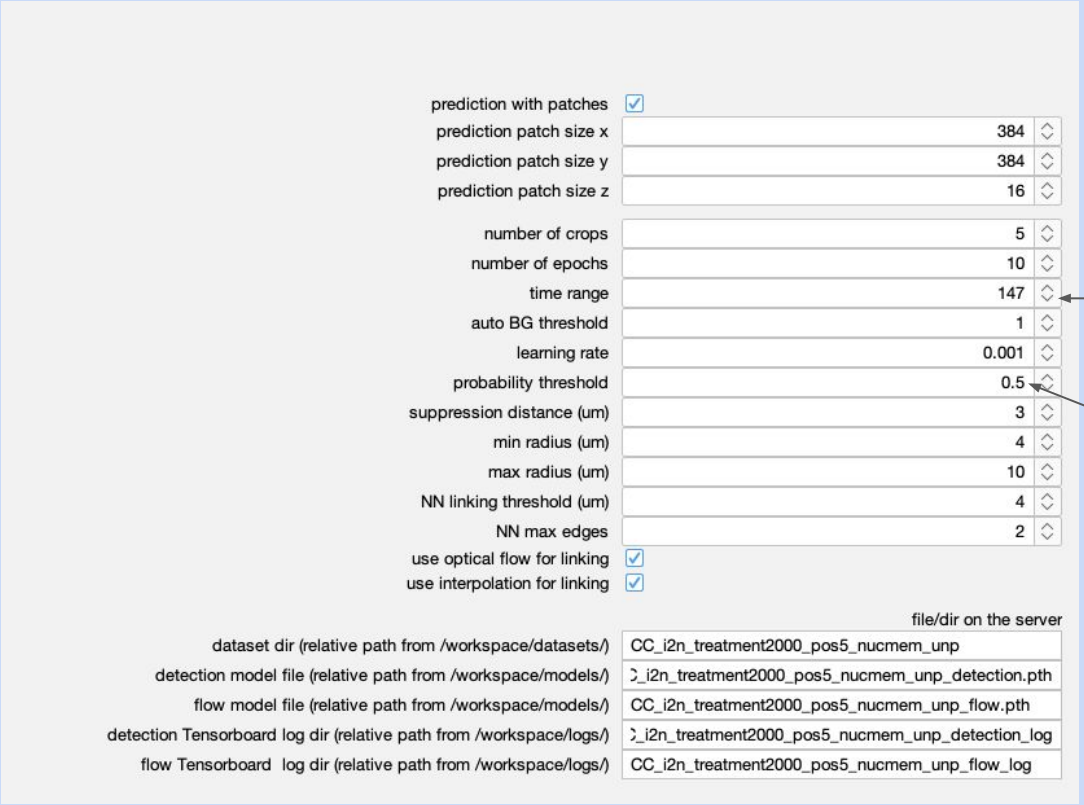
1. Download the trained model (_elephant_server/workspace/models)
2. Open new nucmem file on Mastodon (that you wanna have the spots predicted)
3. Predict!

Predict!



1. Reset detection model > From file > select your trained model
2. Assign prediction parameters
3. Predict (remember to scroll to the last time point on the BDV before running the prediction)

Prediction hyperparameters



Full time range

Be less strict in prediction

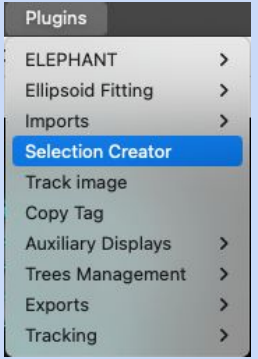
Steps (Page 3) - Prediction (segmentation) and tracking

1. Download the trained model (_elephant_server/workspace/models)
2. Open new nucmem file on Mastodon (that you wanna have the spots predicted)
3. Predict!
4. Track!
5. Selection creator (specific region of interest)

Selector - create boxes around the ROI

1. Example script

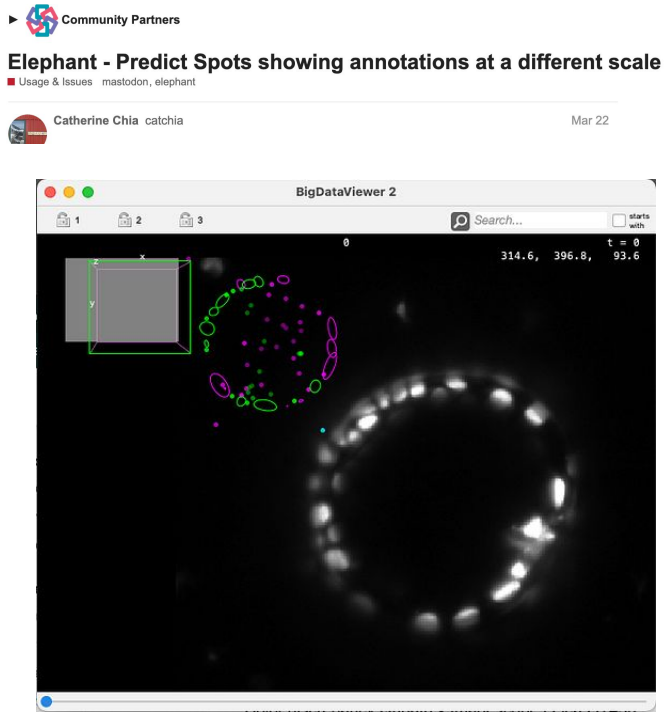
```
(vertexFeature('Spot position', 'X') > 58 & vertexFeature('Spot position', 'X') < 150
& vertexFeature('Spot position', 'Y') > 20 & vertexFeature('Spot position', 'Y') < 85
& vertexFeature('Spot position', 'Z') > 25 & vertexFeature('Spot position', 'Z') <
100.) | (vertexFeature('Spot position', 'X') > 10 & vertexFeature('Spot position',
'X') < 70 & vertexFeature('Spot position', 'Y') > 90 & vertexFeature('Spot position',
'Y') < 140 & vertexFeature('Spot position', 'Z') > 50 & vertexFeature('Spot position',
'Z') < 110.) | (vertexFeature('Spot position', 'X') > 75 & vertexFeature('Spot
position', 'X') < 150 & vertexFeature('Spot position', 'Y') > 75 & vertexFeature('Spot
position', 'Y') < 130 & vertexFeature('Spot position', 'Z') > 125 &
vertexFeature('Spot position', 'Z') < 185.)
```



2. Assign tag

Encountered issues

1. Timeout (use GNU screen)
2. Wrong scale on BDV (fix the XML, use fixXMLBug.py)



https://forum.image.sc/t/elephant-predict-spots-showing-annotations-at-a-different-scale/78919

Reference

1. 20230309_UserGuide_ElephantClient_GNUScreen.pdf
2. utilsZoo.txt
3. fixXMLBug.py