Napari as a tool for deep learning project management

NAPARI

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David ROUSSEAU, Full professor, Université d'Angers, France

5th February 2024
Virtual meeting

Expert

Biologist

S2 (Weighted Loss) Unet_segmentation_notebook.ipynb

Fichier Modifier Affichage Insérer Exécution Outils Aide Dernière modification effectuée le 27 juillet

+ Code + Texte

Split train data into train and validation

```
[ ] from sklearn.model_selection import train_test_split
    x_train, x_val, y_train, y_val = train_test_split(X_train, Y_train, test_size=0.2, random_state=42) #text_
```

```
[ ] print('Train data shape is:',x_train.shape)


    print('validation data shape is:',x_val.shape)
```

```
Train data shape is: (32, 256, 256, 3)
validation data shape is: (8, 256, 256, 3)
```

```
[ ] # Fiting the model
    results = model.fit(x_train, y_train,
                        validation_data=(x_val,y_val),
                        batch_size=2, epochs=50,
                        callbacks=[early_stop,Model_check])
```

```
Epoch 11/50
16/16 [==============================] - ETA: 0s - loss: 5.5026e-04 - dice_coefficient: 0.2432
Epoch 11: val_loss improved from 0.00069 to 0.00065, saving model to /content/gdrive/My Drive/data/best_mo
16/16 [==============================] - 1s 44ms/step - loss: 5.5026e-04 - dice_coefficient: 0.2432 - val_
```

deepImageJ

Nikon

NIS-element

Expert

Biologist

? ? ? ?

interface that satisfies everyone

S2 (Weighted Loss) Unet_segmentation_notebook.ipynb

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napari

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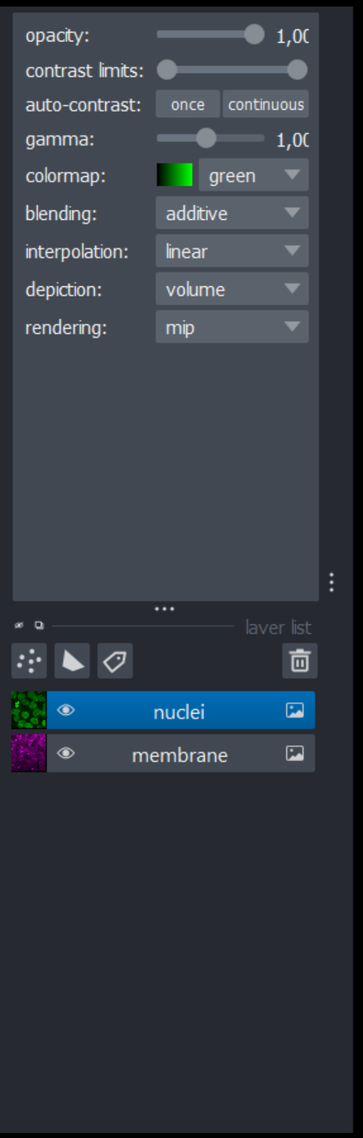
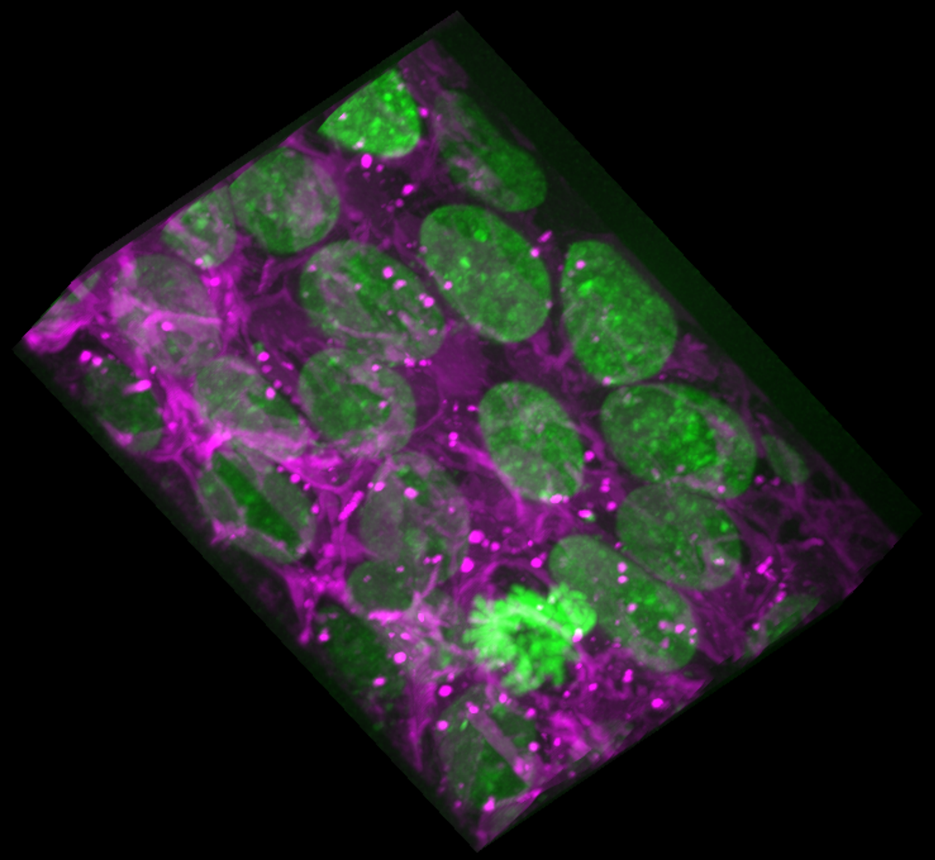
Nikon

NIS-element





napari

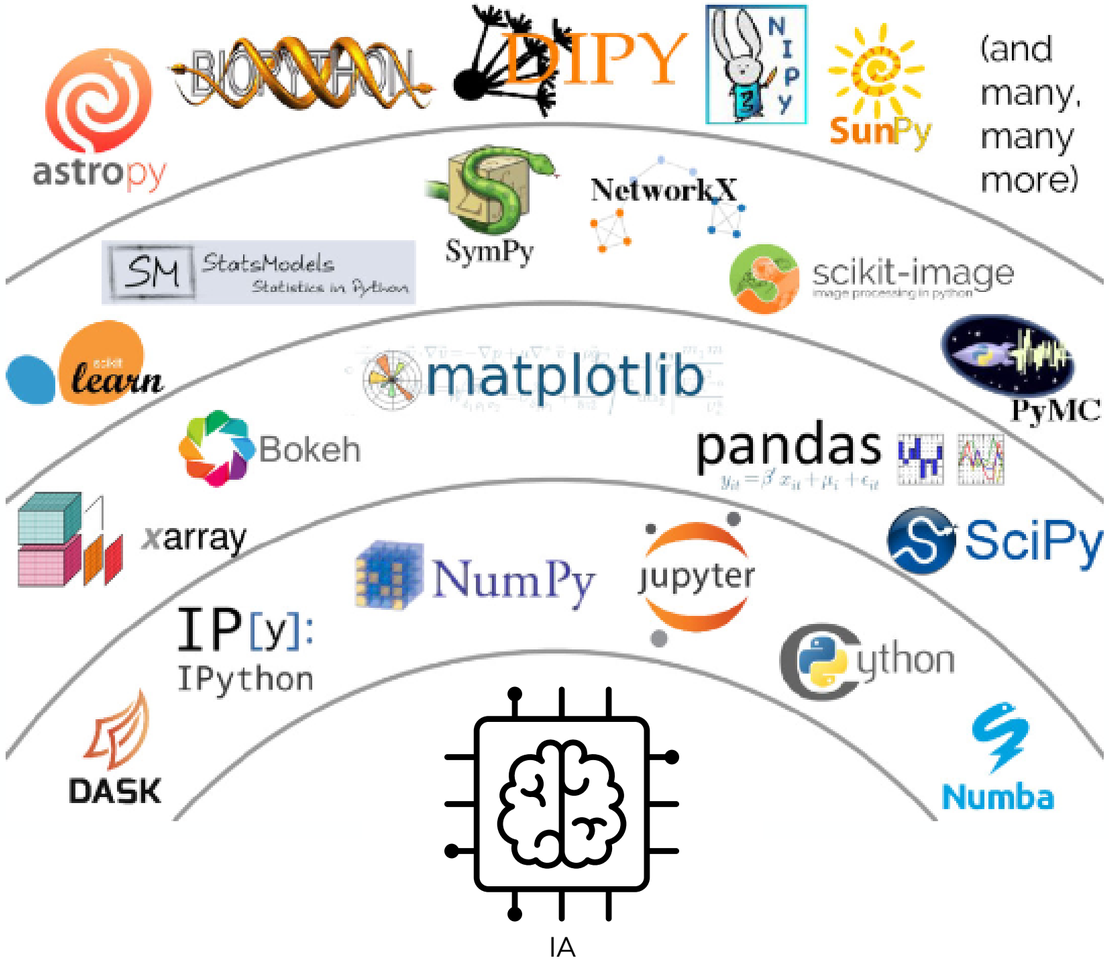
Help scientist to access Python's scientific ecosystem, with no prior coding experience

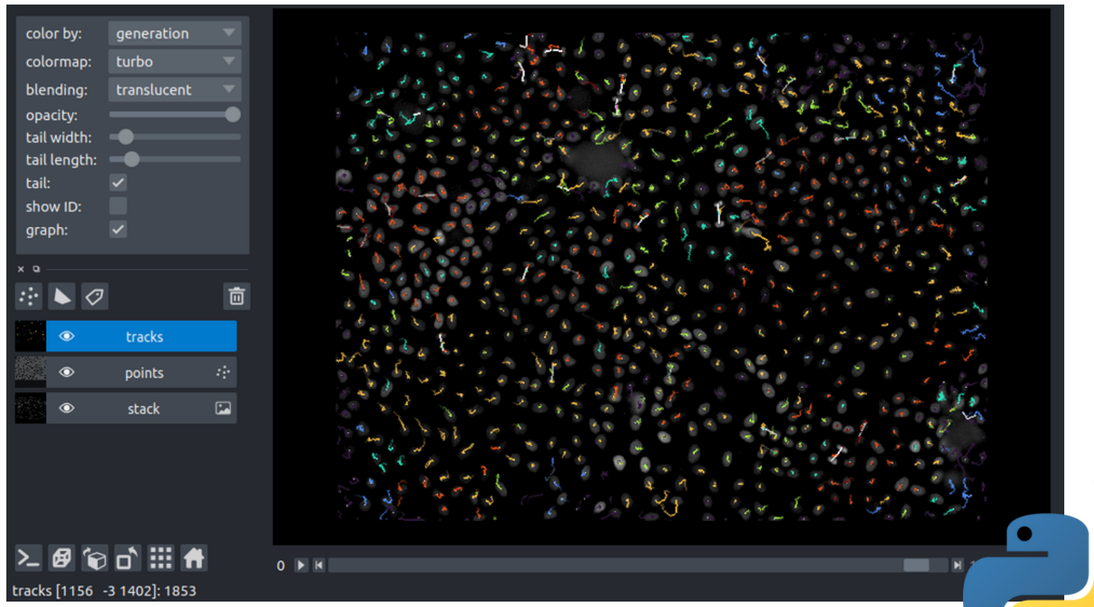
Multi-dimensional data viewer in Python

open-source, community-developed

Napari

Process large data and run Deep Learning (DL) model

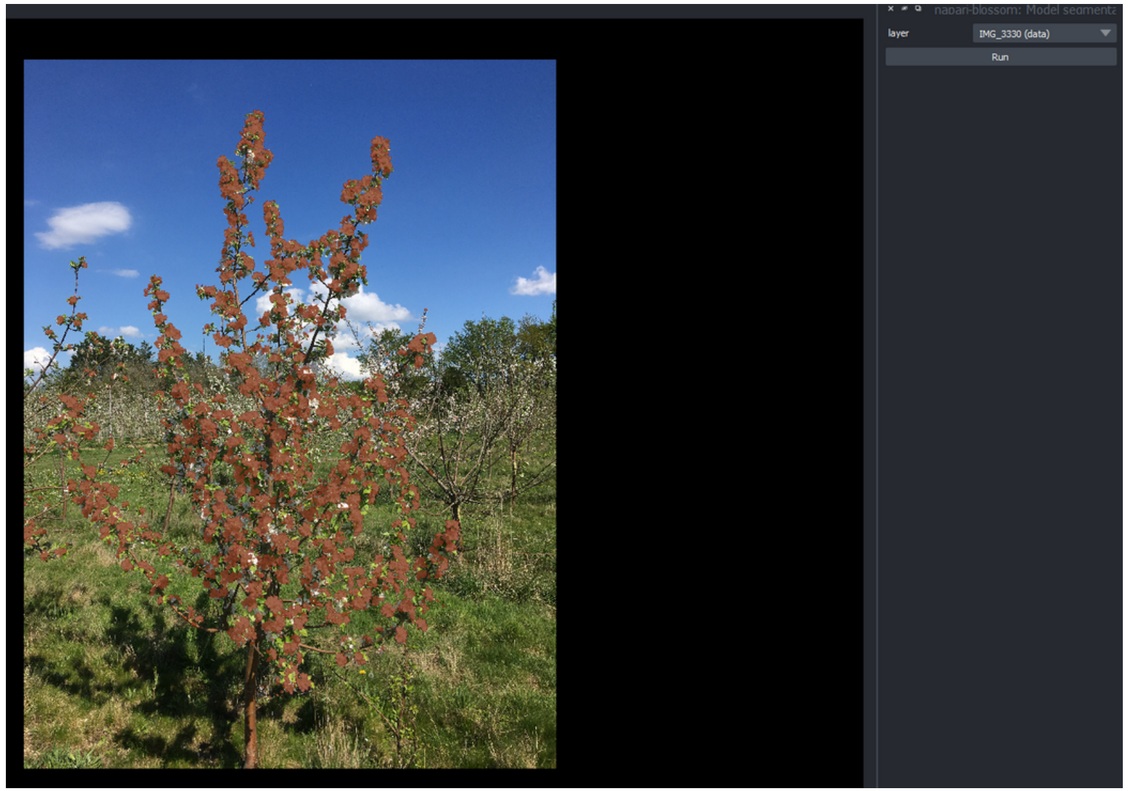




Deep learning in Napari

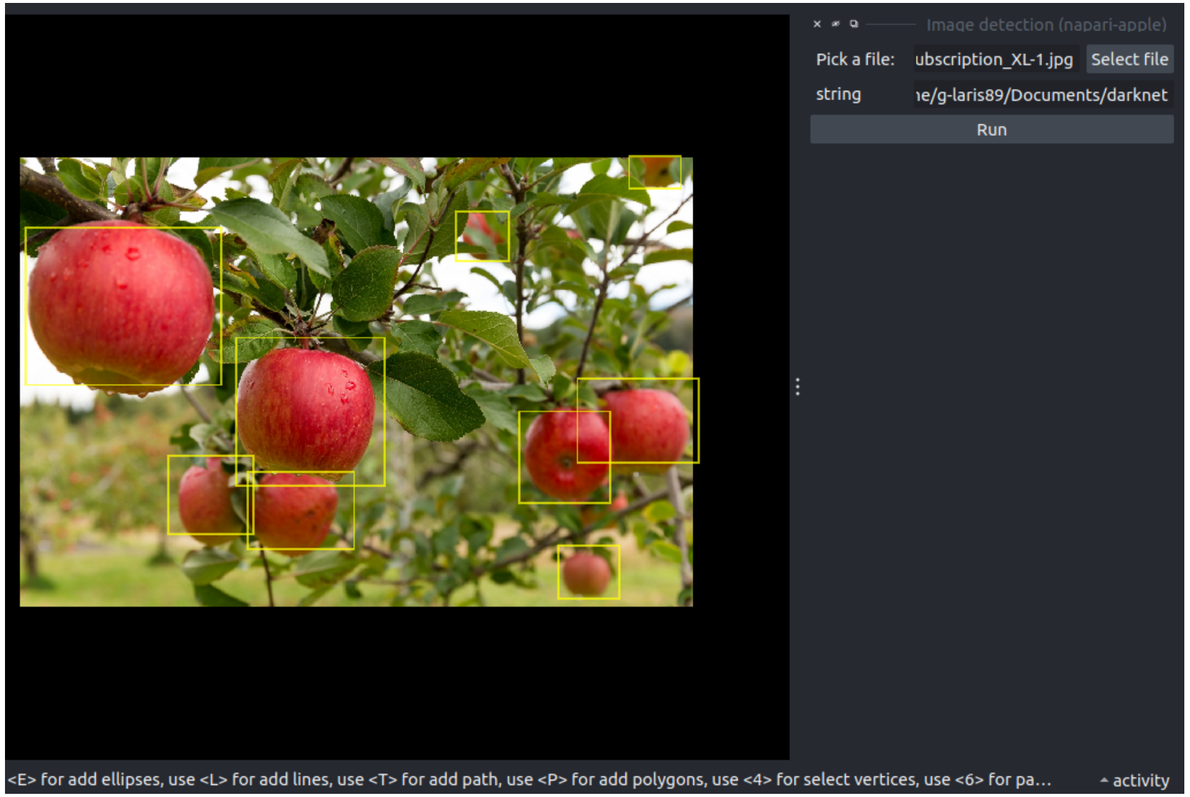
Apple flower detection

Plugin: napari-blossom



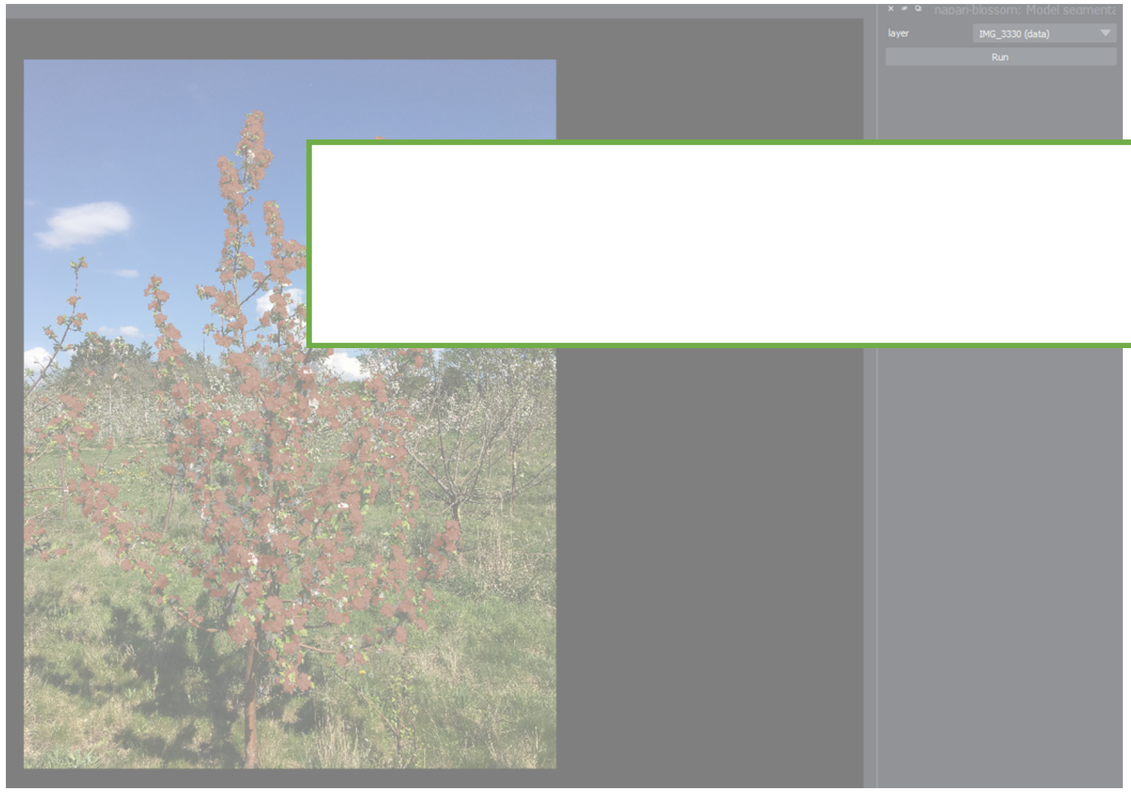
Apple detection in orchard

Plugin: napari-apple



Deep learning in Napari

Apple flower detection *Plugin: napari-blossom*



Apple detection in orchard *Plugin: napari-apple*

And many more !

Topic of this workshop

Objective

Create a napari plugin from image processing code including DL model

What we will do

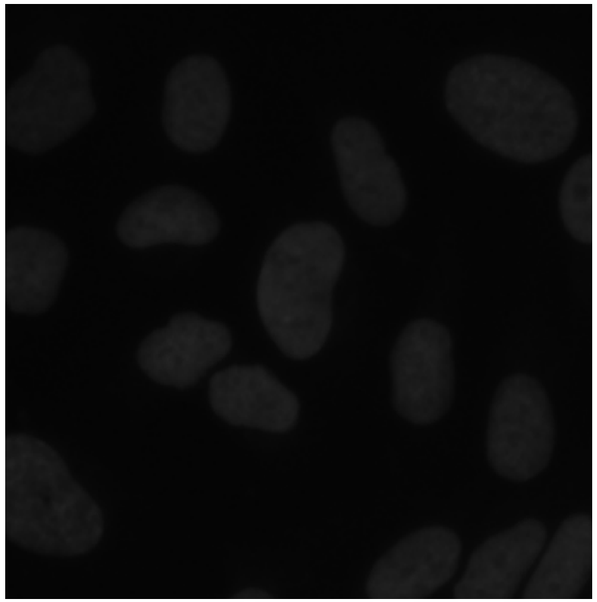
Review a DL code
Create a napari plugin in local
Integrate DL model (tensorflow) in plugin

What we will not do

Teach Python programming and the base of deep learning (requirements)
Deploy the plugin in napari-hub plateform (napari library plugin)

Pratical session

Let’s suppose we have



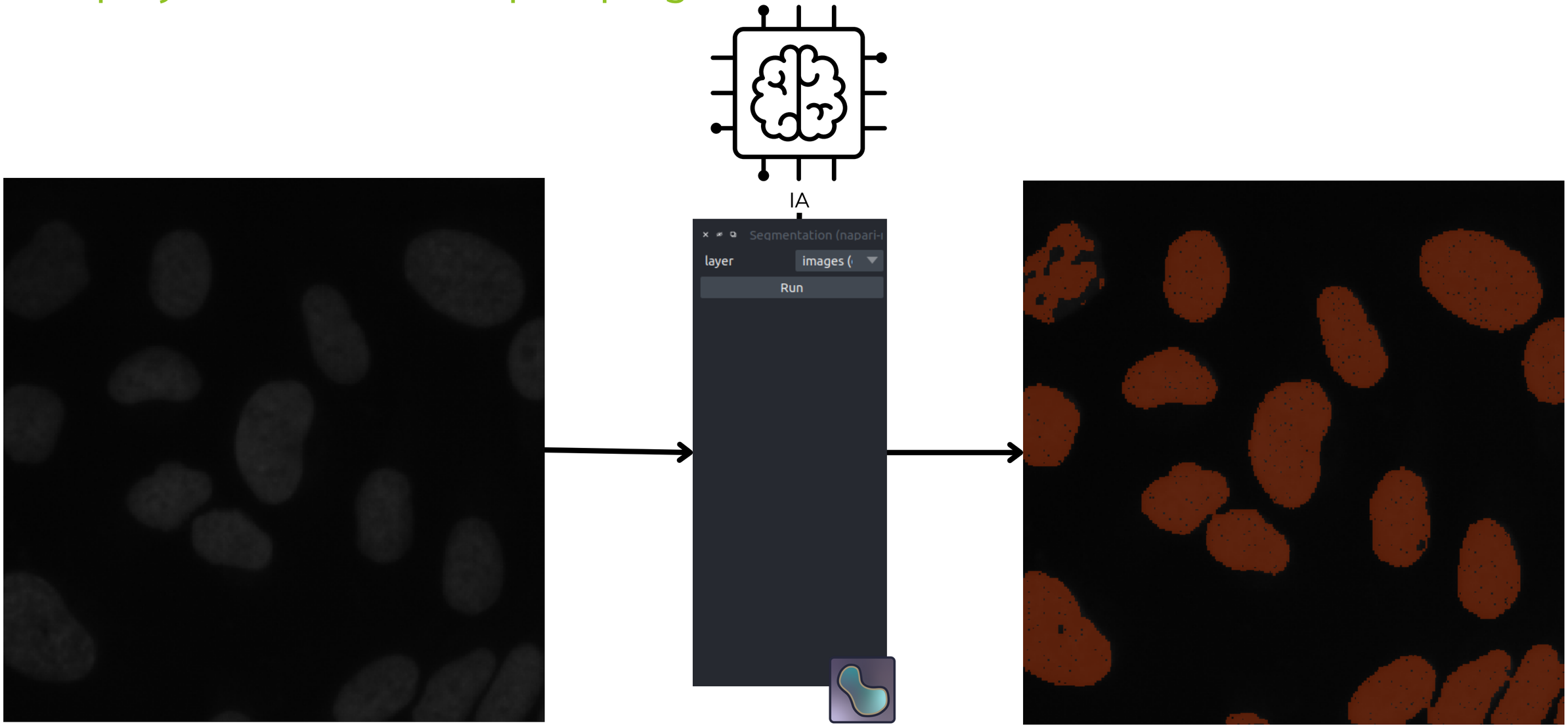
In [69]:

```
# INPUT
# Write model ESRF_Seg_Hands_on_best_model.h5 path
model_path_ = "/home/g-laris89/DEEP-NAPARI/Exercise-4_My first widget/model/ESRF_Seg_Hands_on_best_model.h5"
input_ = "/home/g-laris89/DEEP-NAPARI/Exercise-2_Notebook_Code/images/03f583ec5018739f4abb9b3b4a580ac43bd933c4337ad8877aa18

model_New = tf.keras.models.load_model(model_path_,custom_objects={'dice_coefficient': dice_coefficient})

_, IMG_HEIGHT, IMG_WIDTH, IMG_CHANNELS = list(model_New.input.shape)

img_ = imread(input_)

nbr_image = len(img_.shape)
if nbr_image==3:
    img_ = img_[:,:,:IMG_CHANNELS]
    X = np.zeros((1, IMG_HEIGHT, IMG_WIDTH, IMG_CHANNELS), dtype=np.uint8)
    h_or, w_or, _ = img_.shape
    ORIGIN = np.zeros((1, h_or, w_or, IMG_CHANNELS), dtype=np.uint8)
    ORIGIN[0] = img_
    img = resize(img_, (IMG_HEIGHT, IMG_WIDTH), mode='constant', preserve_range=True)
    X[0] = img
elif nbr_image==4:
    img_ = img_[:,:,:,:IMG_CHANNELS]
    X = np.zeros((img_.shape[0], IMG_HEIGHT, IMG_WIDTH, IMG_CHANNELS), dtype=np.uint8)
    shape_h, shape_w = [], []
    for i in range(img_.shape[0]):
        print(img_[i,...].shape)
        shape_h.append(img_[i,...].shape[0])
        shape_w.append(img_[i,...].shape[1])
        img = resize(img_[i,...], (IMG_HEIGHT, IMG_WIDTH), mode='constant', preserve_range=True)
        X[i] = img

    ORIGIN = np.zeros((img_.shape[0],np.max(shape_h),np.max(shape_w),IMG_CHANNELS), dtype=np.uint8)
    for i in range(img_.shape[0]):
        ORIGIN[i,...][:shape_h[i], :shape_w[i],:] = img_[i,...]

preds_test = model_New.predict(X, verbose=1)
# we apply a threshold on predicted mask (probability mask) to convert it to a binary mask.
preds_test_opt = (preds_test > 0.5).astype(np.uint8)

if nbr_image==3:
    result_ = np.squeeze(preds_test_opt[0, :, :, 0])
    output_ = np.zeros((1,h_or,w_or), dtype=np.uint8)
    res_ = resize(result_, (h_or, w_or), mode='constant', preserve_range=True)
    output_[0] = res_
elif nbr_image==4:
    img_ = img_[:,:,:,:IMG_CHANNELS]
    result_ = np.squeeze(preds_test_opt[:, :, :, 0])
    output_ = np.zeros((img_.shape[0],np.max(shape_h),np.max(shape_w)), dtype=np.uint8)
    for i in range(img_.shape[0]):
        res_ = resize(result_[i], (shape_h[i], shape_w[i]), mode='constant', preserve_range=True)
        output_[i,...][:shape_h[i], :shape_w[i]] = res_
```

```
1/1 [==============================] - 0s 290ms/step
```

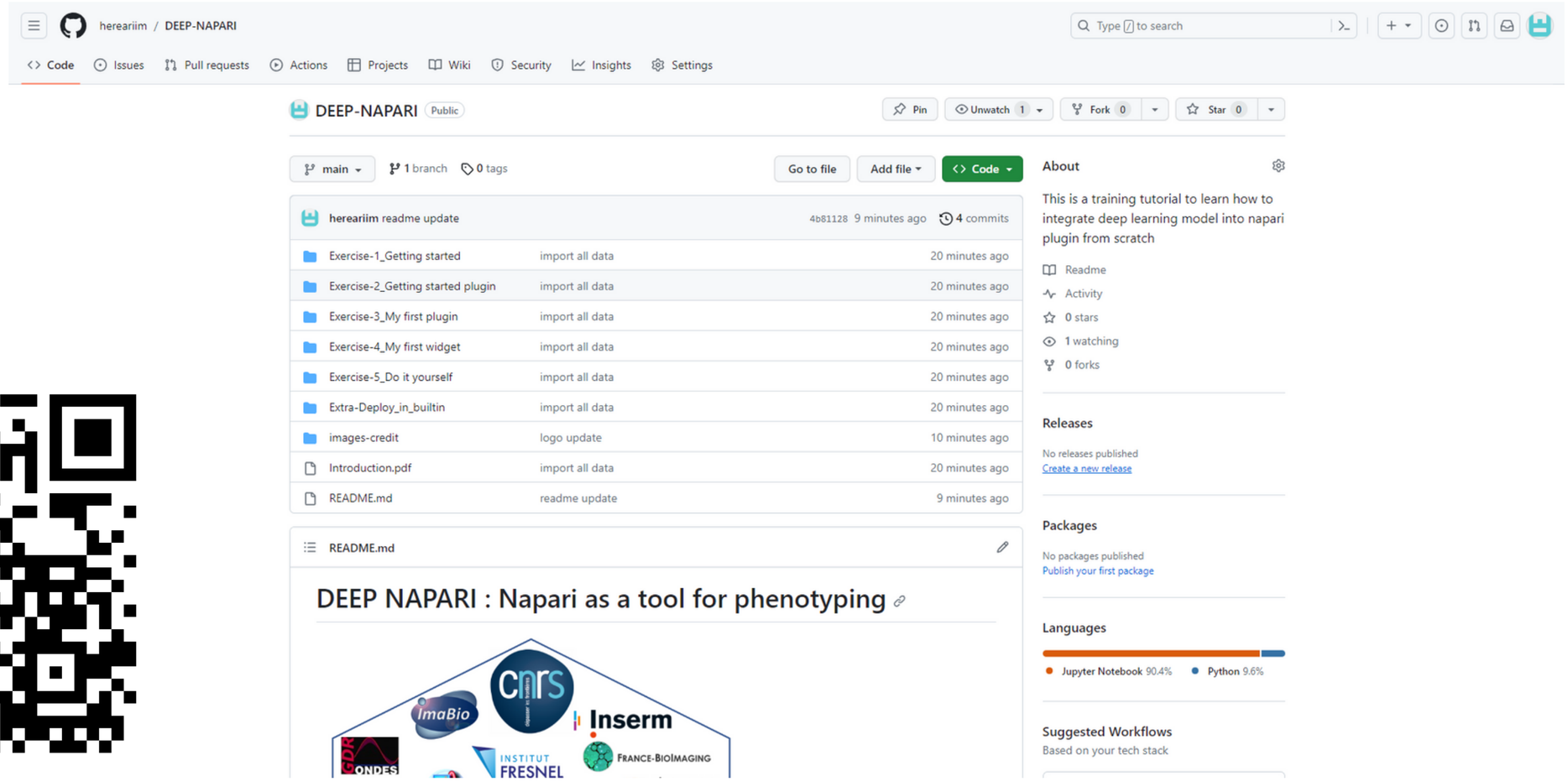
Pratical session

Deploy DL model in Napari plugin



Pratical session

Go to this page: `https:/github.com/hereariim/DEEP-NAPARI`



DEEP-NAPARI

Pratical Session is over

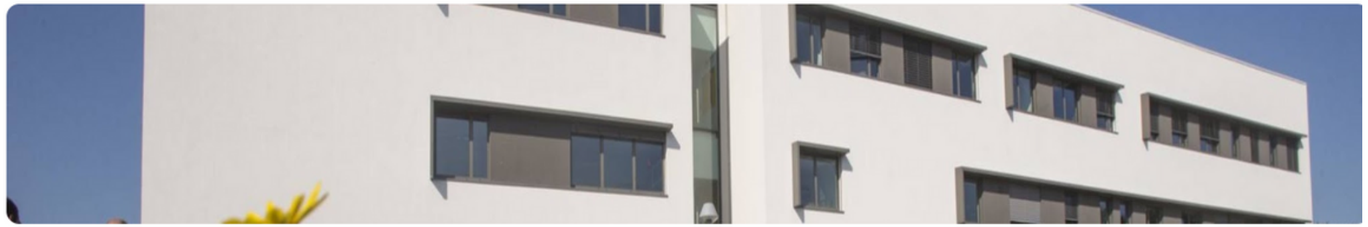
Please, remove the plugin in your PC

```
pip uninstall napari-mifobio
```

and

To go further in this exercise

Tutorial on the presentation, design of a plugin… and even more



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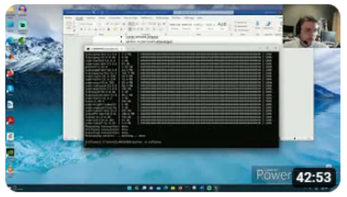


Installation de Cellpose

753 views • 1 year ago

Conclusion

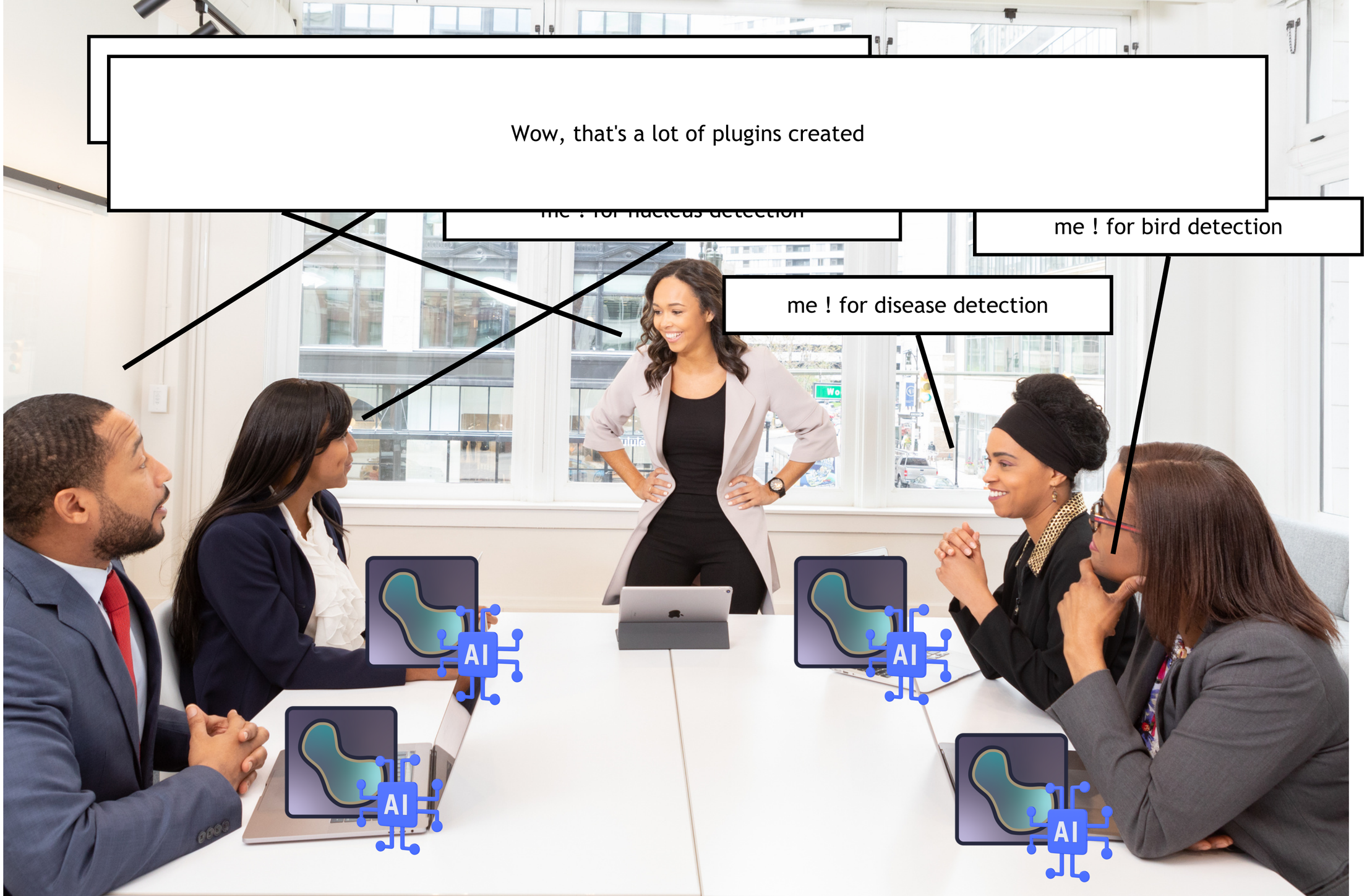

What we learnt ?
What we learnt ?
What we learnt ?
What we learnt ?


We learnt a method to use easily your DL model with GUI aka Napari


We learnt a method to use easily your DL model with GUI aka Napari
AI

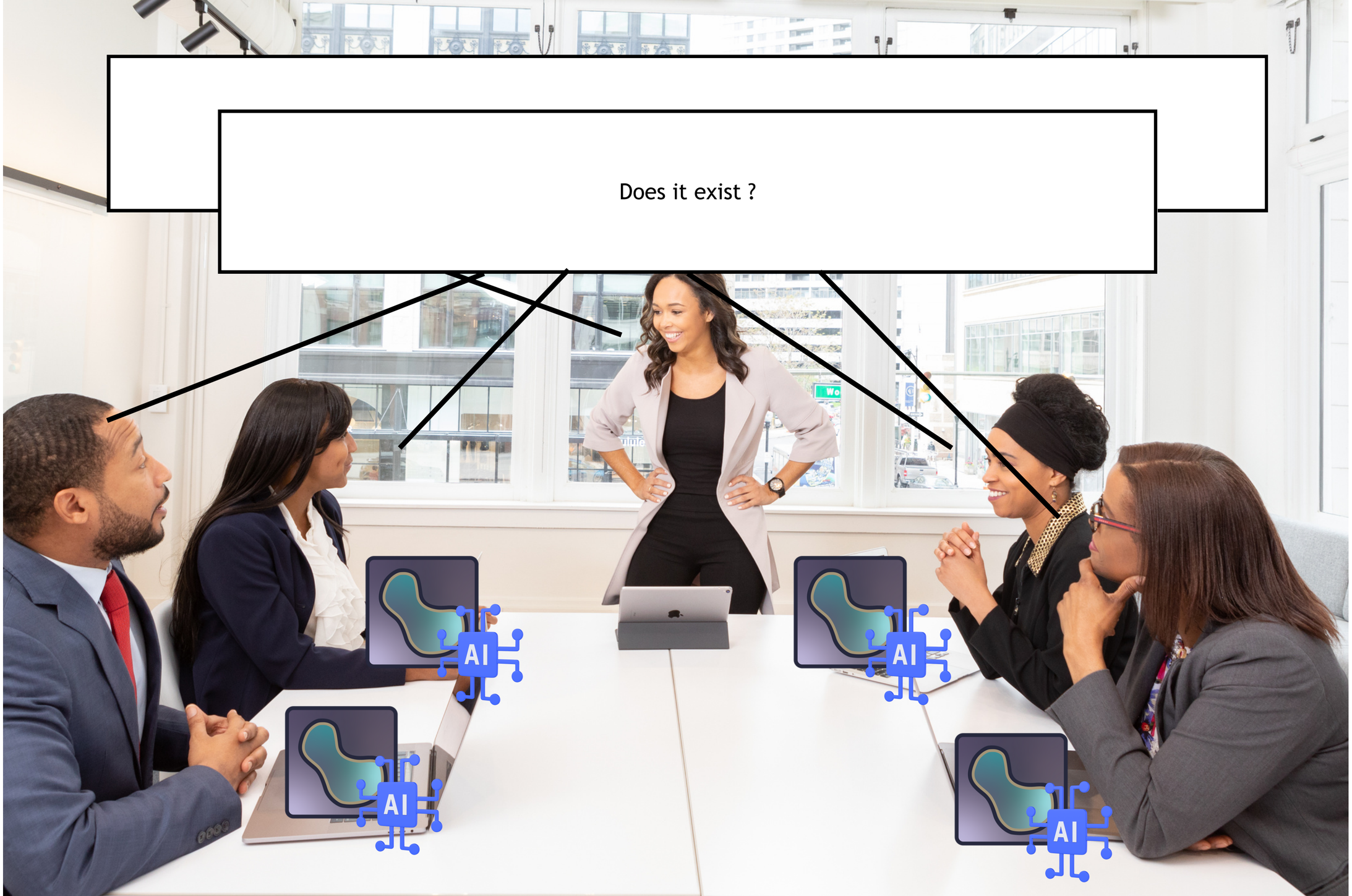

I hope this method we let you deploy your DL model to help experimental scientist
AI
AI
AI
AI


Thanks ! I will deploy my model for Cell detection
me ! for nucleus detection
me ! for disease detection
me ! for bird detection
AI
AI
AI
AI


Wow, that's a lot of plugins created
me ! for nucleus detection
me ! for bird detection
me ! for disease detection
AI
AI
AI
AI


Imagine, we have a single plugin to read all your DL model.
AI
AI
AI
AI


No need to create a set of plugins and your DL model remains confidential
AI
AI
AI
AI


Does it exist ?
AI
AI
AI
AI


Does it exist ?
Sure !!!!!!!
AI
AI
AI
AI

MANINI

napari **hub** Plugins

Manini MAchiNe INference & correctIon

manini

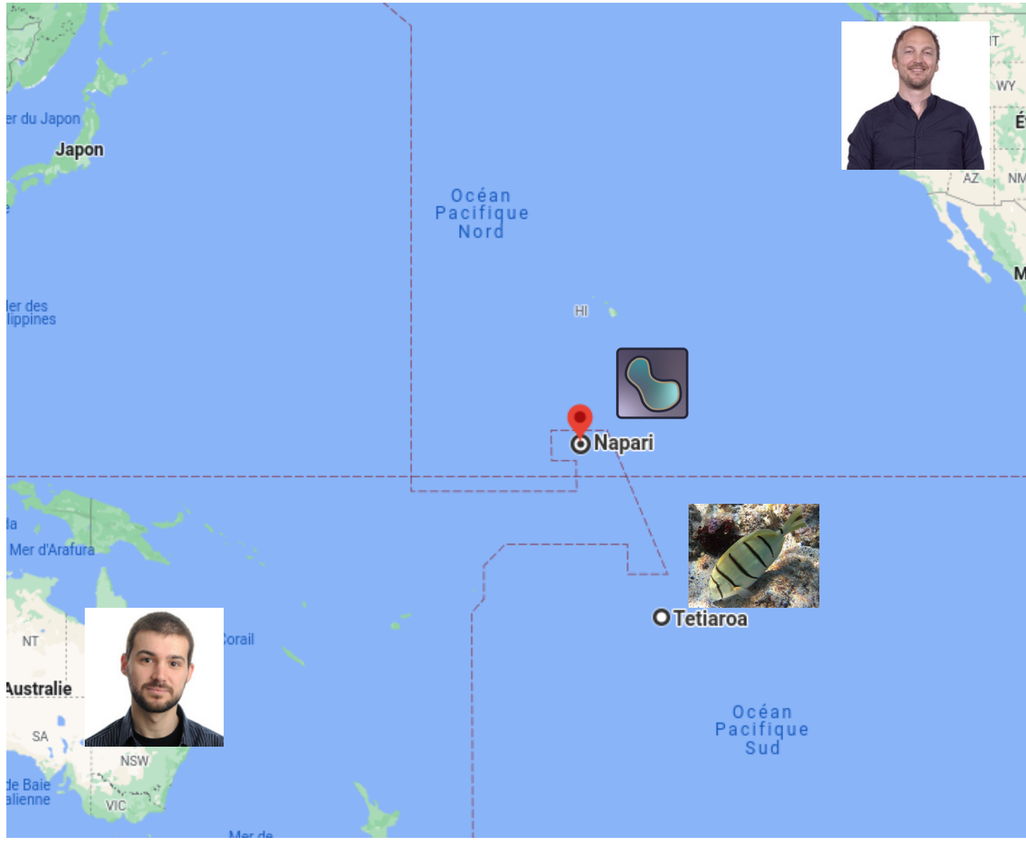
An user-friendly plugin that enables to annotate images from a pre-trained model (segmentation, classification, detection) given by an user.

Herearii Metuarea

View project data

Description Activity NEW!

White paper
Installation
Description
License
Issues



license BSD-3-Clause | pypi v0.0.6 | python 3.8 | 3.9 | 3.10 | tests passing | codecov 9% | napari hub manini

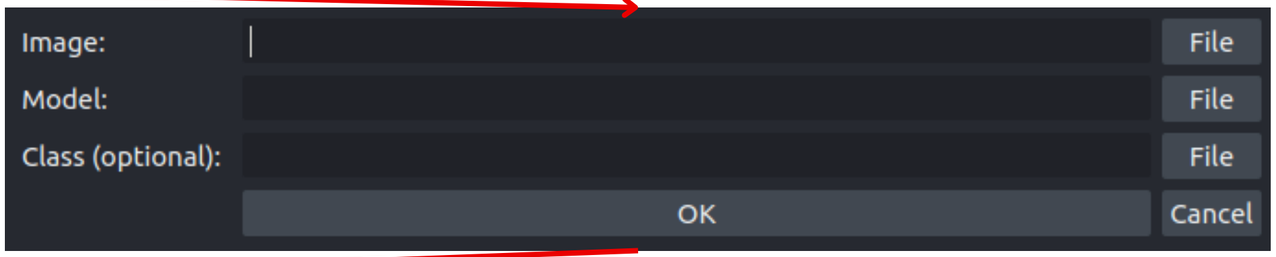
Manini (**MA**chi**N**e **IN**ference & Correct**I**on) is thought as a tool to boost the collaborative contribution of end-users to the assessment of deep learning model during their testing phase. It is a user-Friendly plugin that enables to manually correct the result of an inference of deep learning model by an end-user. The plugin covers the following informational tasks: segmentation, classification and object detection.

White paper

Herearii Metuarea, David Rousseau, Toward more collaborative deep learning project management in plant

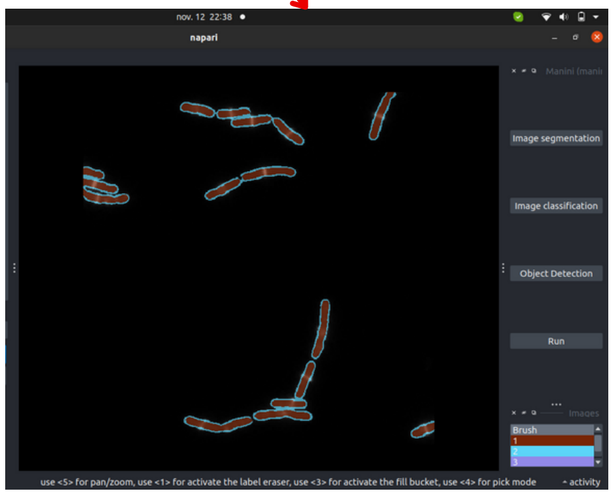
1. Choose the type of Deep learning task

2. Import your data (Image, Model, Class (optional)

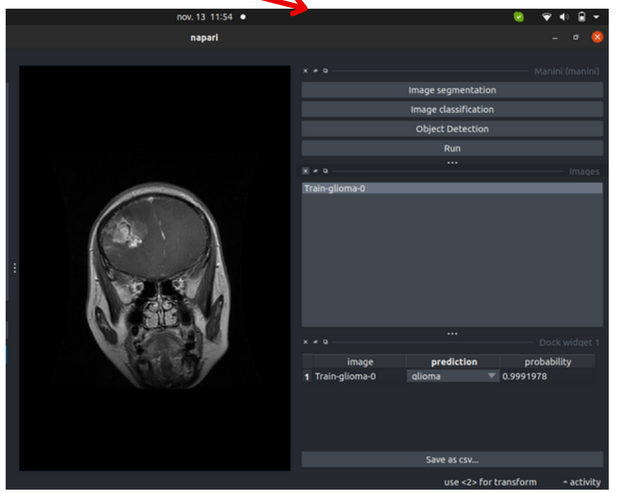


3. Run

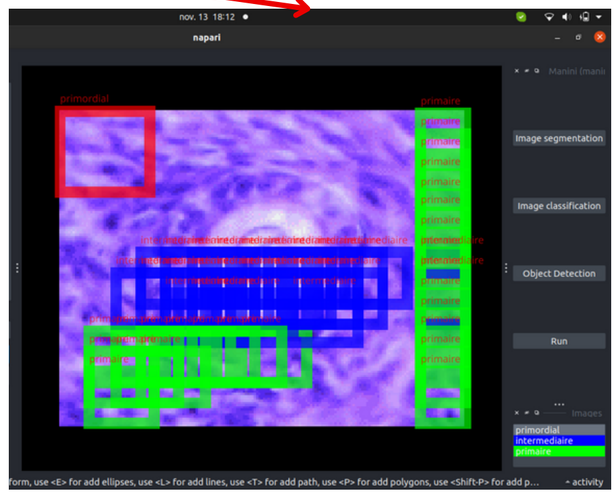
4. Correct your data



Segmentation



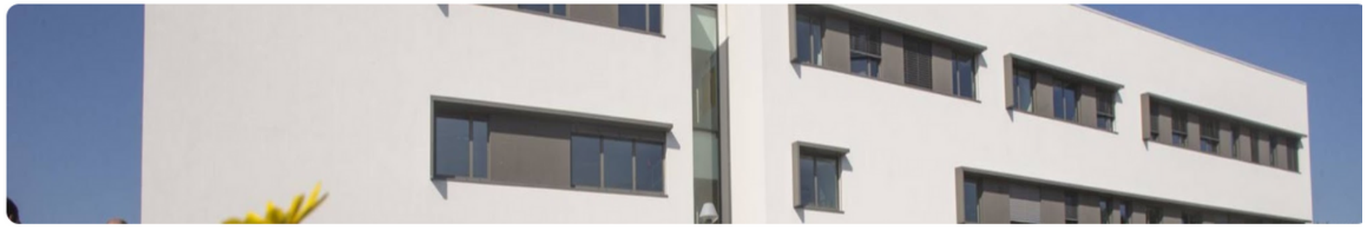
Classification



Detection

To know more about it

Manini presentation



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MANINI Napari Plugin Part 2

Aucune vue • il y a 3 heures

MANINI Napari Plugin Part 1

3 vues • il y a 1 jour

Thanks you for your attention