

## **Hands on Activity III: Image data preparation and training of CNN classifier**

### Description of Activity

This activity aims to provide students with an idea of the data preparation process in machine learning by running prepared scripts to convert and resize real world CT image data. Students will then use the processed data to train a CNN classifier and test the classifier with unlabelled data.

After this activity, students should be able to:

1. Run script to process image data.
2. Run script to train a CNN classifier and use the result to classify unlabelled image data.

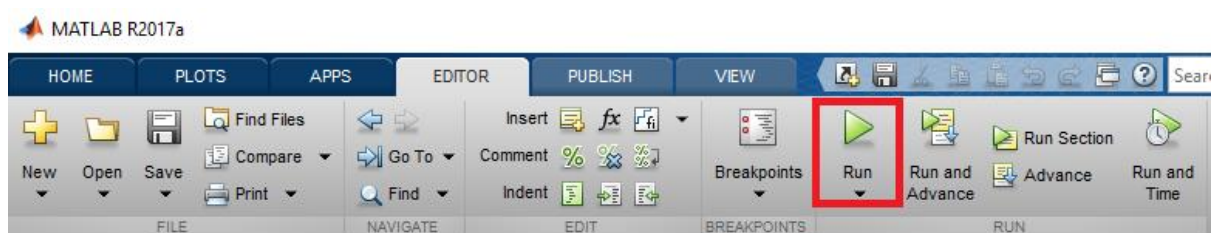
### Task 1: Image processing

- 1.1. Open the folders containing the raw image data, “SDH Fixed and Flipped (PNG)” and “SAH Fixed and Flipped (PNG)” to view its contents.
- 1.2. Note that the image files are not consistent in size (dimensions) and some have color. We want to ensure all images have the same dimensions and remove the color information to be consistent.
- 1.3. Ensure that the current folder path in MATLAB is correct.
- 1.4. To process the data, open “impro.m” in MATLAB.
- 1.5. Change the “imgPath” and “outPath” in lines 6, 7, 33 and 34 to match your folder directory:

```
imgPath = 'C:\Users\XXXX\Desktop\MLWorkshop\Part II\SAH Fixed and  
Flipped (PNG)\';  
outPath = 'C:\Users\XXXX\Desktop\MLWorkshop\Part II\Processed  
Data\SAH\';
```

In this case, if you have saved the workshop materials on the desktop, simply replace ‘XXXX’ with your user name.

- 1.6. The script uses the function “rgb2gray” to convert the images to grayscale and the function “imresize” to resize the images to 120 x 140 pixels.
- 1.7. Click “Run” to run the script.



- 1.8. Open the output folder if you wish to compare the processed images with the originals.

## Task 2: Train a CNN classifier and predict the class of unknown data

- 2.1. Open “CNN\_CT.m” in MATLAB.
- 2.2. Change the path directories in line 14 and 18 to match your folder directory. (Step 1.5 in Task 1).
- 2.3. The CNN script uses a sequence of “layers”, each being a function with its own setting to build the classifier. For more information on how to adjust values etc, please consult MATLAB’s online documentation.

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```
%% Define the Network Layers
% Define the convolutional neural network architecture.
layers = [imageInputLayer([120 140 1])
          convolution2dLayer(5,20)
          reluLayer
          maxPooling2dLayer(2,'Stride',2)
          fullyConnectedLayer(2)
          softmaxLayer
          classificationLayer()];
```

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- 2.4. Click “Run” to begin training the CNN classifier.
- 2.5. The accuracy result shown in the command window refers to the percentage of correctly classified images from the “testing data” which were not used to train the classifier.
- 2.6. To test the classifier with the unlabelled image data enter the following in the command window:

```
Test = classify(convnet, UnData)
```