**Queen Mary University of London**

**School of Engineering and Materials Science**

**EMS741 U/P Deep Learning for data and Image analysis.**

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# Introduction

## Background

This project or coursework is as the result of running deep learning models to classify medical images from OCT for plague pigs. The initial research focusses on trying to correlate the blockage of arteries and the production of plaque in pigs and 5 pigs were tested. The researchers used OCT and classified the plagues into 5 categories namely 1, 2,3,4 and 5. The paper by Krams et al. (2022) used the same images generated by the paper by Krams et al. to develop a deep learning model to classify the images. The deep learning model they used was using difference convnets and hyperparameters to optimize the images. Eventually, they trained the model, and it was able to classify the images with accuracy of 92.4% on the training data set and 79% on the training set with the loss of x and y respectively. While on completely new data, the test dataset, they got accuracy of tx and ty loss.

In this coursework, the goal is to improve the model by Krams et al. to an even higher accuracy and lower loss. This can be done by tweaking the hyper parameters and finding the best model out of all the models trained. From the preliminary test run, the model was estimated to take about 3 hours on CPU with 100 epochs. The test was carried out for different epochs, dropout, transfer layers. We also compared the performance with different learning rate strategies.

# Methods

## Data Preprocessing

The data for this training was provided by Krams et al. and were structured into *training, validation* and *test* datasets. For each dataset, there are five folders label 1, 2, 3, 4 and 5 that each represent the labels for the plagues *TCFA, FCA, PIT, normal* and *IT* respectively. The data is distributed as 518 for training, 148 for validation and 74 for test. The dataset has been provided with augmentation already performed on it and the image is in grayscale.

## Hyperparameters Tuning

### Model transfer learning

In this project, we shall focus on the best model that has been trained by Krams et al. and change it from there. This means some of the hyperparameters will remain the same and we shall be tuning starting with the most obvious and increase the complexity.

## Hyper parameter tuning

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **No** | **ConvNetUsed** | **Trainable Layers** | **Hardward used** | **No. Image Channels** | **Dropout** | **Data Augmentation** | **Learning Rate** |
| 1 | DenseNet121 | 15 | GPU | 1 | 0.3 | Rot; zoom; flit; width shear; height shear;noise | 0.0001 |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Learning Rate** | **Epochs** | **Optimization**  **Algorithm** | **Performance**  **Metrics** | **Loss**  **Function** | **Fully Connected Layers** |
| 0.0001 | 200 | Adam | Acc; Confusion Matrix | Categorical\_Entropyloss | 1 |

### Performance Metrics

To be able to compare with Krams et al. 2022, we shall be using both the accuracy and the confusion matrix to compute and represent the performance of the model.

### Accuracy

I will be using accuracy to compute the performance of the model on the training, validation and test sets.

The formula for the accuracy is computed by;

### Confusion Matrix

The formula for the confusion matrix is gotten by?

# Results

Discussions