# Deep Learning CS737 Assignment

## COVID 19 CT Data Classification

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## I. Dataset Preparation

| Train | | Test | |
|---|---|---|---|
| COVID | Non-COVID | COVID | Non-COVID |
| 700 | 700 | 302 | 284 |
| 1400 | | 586 | |

- Training data as well as Test data are imported in Colaboratory through Google Drive.

- There are two categories defined:
  a) COVID with label 0
  b) Non-COVID with label 1

- Each image is normalized using OpenCV's normalize () function.
- After normalization, each image is flattened using flatten () function of NumPy.
- These labels and flatten images are stored in two lists.
- These two lists are converted into NumPy arrays.
- All above steps are done over train data and test data.
- Now, out train data and test data are ready to work with.

## II. Architecture Used

- Architecture/Model used is Multi-Layer Perceptron.
- It is good in learning non-linear models.
- It is implemented with the help of Scikit-learn MLP classifier which uses multi-layer perceptron algorithm that trains using Backpropagation.
- For classification loss function is cross-entropy.
- There are multiple parameters used which are: -
    - **hidden_layer_sizes**: (100,100,100). It means there will be 100 neurons in $1^{st}$,$2^{nd}$ and $3^{rd}$ hidden layer.
    - **activation**: relu. It means for hidden layers relu activation function is used. And for output layer by default logistic is used if it is binary classification and if multi-class then softmax.
    - **solver**: sgd. It means for weight optimization stochastic gradient descent is used.
    - **max_iter:** 30. It denotes number of epochs.
    - **shuffle:** True. It means samples are shuffles after each iteration.
    - **early_stopping:** True. If true, then use early stopping to terminate training when validation score is not improving.
    - **momentum:** 0.5. It denoted what will be the momentum for gradient descent update.

## III. Metrics

*Table 1 : Performance Metrics*

| Accuracy | Precision Score | Recall Score | F1 Score |
|---|---|---|---|
| 0.5870 | 0.5544 | 0.7535 | 0.6388 |

- **Confusion Matrix:** $\begin{matrix} 130 & 172 \\ 70 & 214 \end{matrix}$

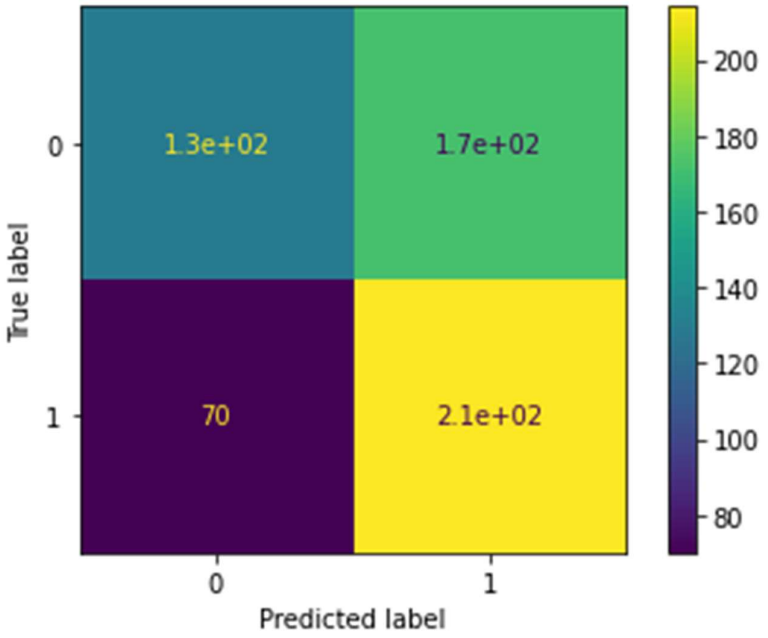


*Figure 1 : Confusion Matrix*