CM2

Default Network

Classify the data using a Fully Connected Deep Neural Network with the following setup.

• Two hidden layers with 20 hidden units each

• ReLU activation functions

• Softmax output layer for the classification decision

Binary classification is applied separately for 'Confirmed', 'Deaths' and 'Recovered' labels of the dataset.

The required Default model is designed as below and used for classification on the labels separately.

```
[ ]  def_net = Sequential()
     def_net.add(Dense(20,input_dim=13,activation='relu'))
     def_net.add(Dense(20, activation='relu'))
     def_net.add(Dense(2, activation='softmax'))

     def_net.compile(loss='categorical_crossentropy', optimizer='adam', metrics=['accuracy'])
```

Confirmed Target

```
[ ]  def_net_c = def_net.fit(X_train, y1_train, validation_split=0.1, batch_size=32,epochs=100)
     def_net.summary()
```

```
#evaluation
def_net_loss,def_net_accuracy=def_net.evaluate(X_test,y1_test)
```

Deaths Target

```
[ ]  def_netf_d = def_net.fit(X_train, y2_train, validation_split=0.1, batch_size=32,epochs=100)
     def_net.summary()
```

```
def_net_loss,def_net_accuracy=def_net.evaluate(X_test,y2_test)
```

Recovered Target

```
[ ]  def_netf_r = def_net.fit(X_train, y3_train, validation_split=0.1, batch_size=32,epochs=100)
     def_net.summary()
```

```
[ ]  def_net_loss,def_net_accuracy=def_net.evaluate(X_test,y3_test)
```

Loss Function – Categorical Cross Entropy is used as output layer has softmax activation and categorical cross entropy works well with softmax activation function for multiclass slassification problems.The output labels even though binary are converted to categorical and have been one-hot encoded to suit softmax at the ouput and lead to best results.

Optimizer – Adam optimizer is used as it is an extension to the classic stochastic gradient descent and is very robust to large datasets. It converges quickly and achieves good results.

The networks are trained for 100 epochs with batch-size of 32 and validation split of 0.1.

The accuracy values for the default network are as below.

Confirmed		Deaths		Recovered	
Training accuracy	Testing accuracy	Training accuracy	Testing accuracy	Training accuracy	Testing accuracy
96.87	95.04	92.41	89.67	93.68	92.56