Project Development Phase Delivery

# of Sprint 2

Date	01 November 2022
Team ID	PNT2022TMID05778
Project Name	Classification of Arrhythmia by Using Deep Learning with 2-D ECG Spectral Image Representation

Task 1:

Model Building:

Adding CNN Layers:

Code:

```
#ADDING CNN LAYERS

model.add(Conv2D(32,(3,3),input_shape=(64,64,3),activation='relu'))#con
volution layer model.add(MaxPooling2D(pool_size=(2,2)))#MaxPooling2D
for downsampling the input
 model.add(Conv2D(32,(3,3),activation='relu'))
model.add(MaxPooling2D(pool_size=(2,2)))
 model.add(Flatten())#flatten the dimension of the
image
```

Adding Dense Layers:

Code:

```
#ADDING DENSE LAYERS
 model.add(Dense(32))#deeply connected neural network
layers.
model.add(Dense(6,activation='softmax'))
```

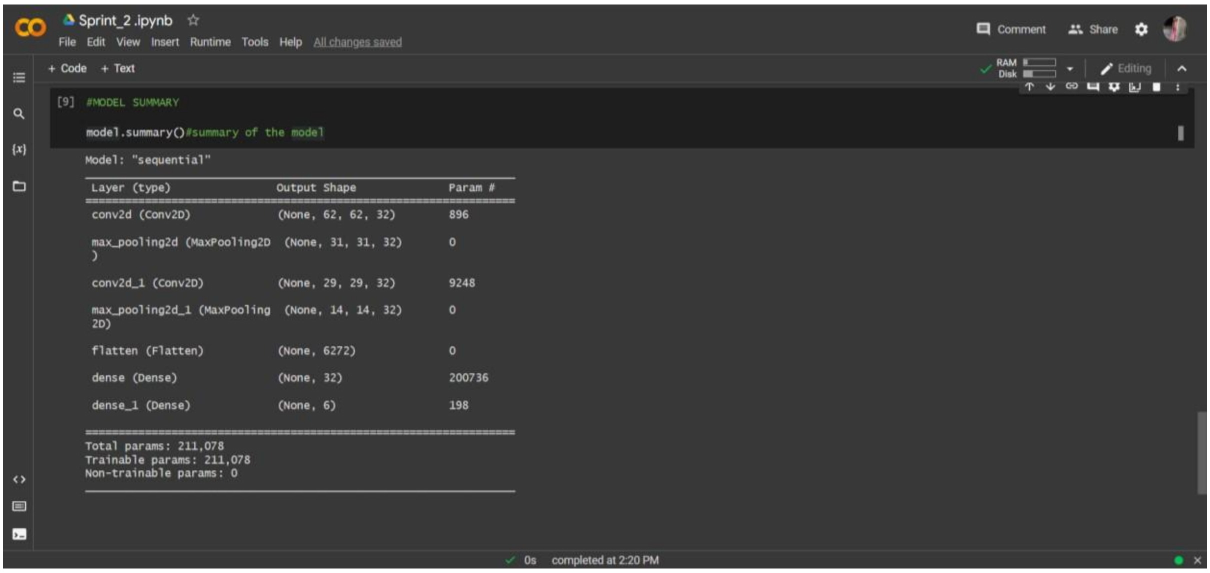
Model Summary:

Code:

```
#MODEL SUMMARY

model.summary()#summary of the model
```

Output:



```
[9] #MODEL SUMMARY

    model.summary()#summary of the model

    Model: "sequential"
    _________________________________________________________________
     Layer (type)                Output Shape              Param #
    =================================================================
     conv2d (Conv2D)             (None, 62, 62, 32)        896

     max_pooling2d (MaxPooling2D  (None, 31, 31, 32)       0
     )

     conv2d_1 (Conv2D)           (None, 29, 29, 32)        9248

     max_pooling2d_1 (MaxPooling  (None, 14, 14, 32)       0
     2D)

     flatten (Flatten)           (None, 6272)              0

     dense (Dense)               (None, 32)                200736

     dense_1 (Dense)             (None, 6)                 198

    =================================================================
    Total params: 211,078
    Trainable params: 211,078
    Non-trainable params: 0
    _________________________________________________________________
```

Configure the Learning Process:

Code:

```
#CONFIGURE THE LEARNING PROCESS
 model.compile(optimizer='adam',loss='categorical_crossentropy',metrics=
['accuracy'])
```

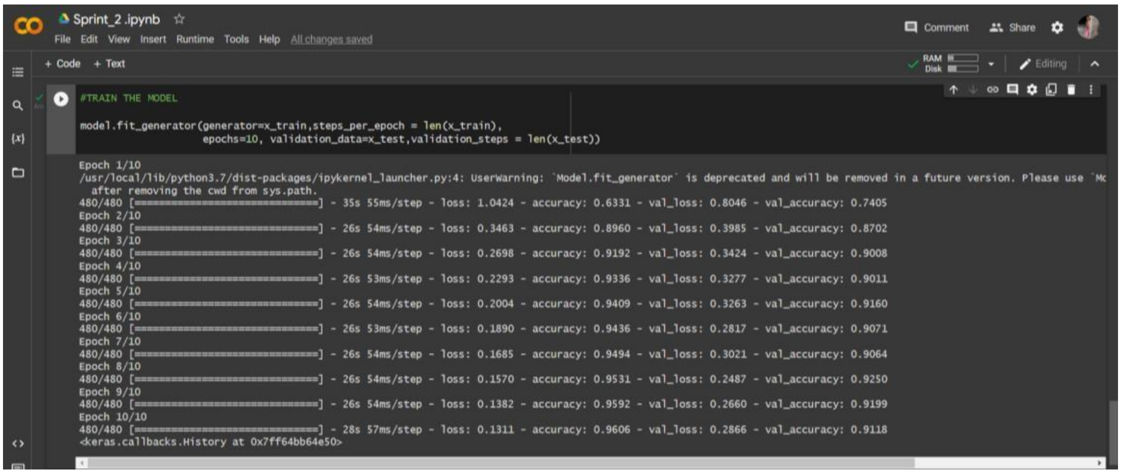
Train the Model:

Code:

```
#TRAIN THE MODEL

model.fit_generator(generator=x_train,steps_per_epoch = len(x_train),
epochs=10, validation_data=x_test,validation_steps = len(x_test))
```

Output:



```
#TRAIN THE MODEL

model.fit_generator(generator=x_train,steps_per_epoch = len(x_train),
                    epochs=10, validation_data=x_test,validation_steps = len(x_test))

Epoch 1/10
/usr/local/lib/python3.7/dist-packages/ipykernel_launcher.py:4: UserWarning: `Model.fit_generator` is deprecated and will be removed in a future version. Please use `Mc
  after removing the cwd from sys.path.
480/480 [==============================] - 35s 55ms/step - loss: 1.0424 - accuracy: 0.6331 - val_loss: 0.8046 - val_accuracy: 0.7405
Epoch 2/10
480/480 [==============================] - 26s 54ms/step - loss: 0.3463 - accuracy: 0.8960 - val_loss: 0.3985 - val_accuracy: 0.8702
Epoch 3/10
480/480 [==============================] - 26s 54ms/step - loss: 0.2698 - accuracy: 0.9192 - val_loss: 0.3424 - val_accuracy: 0.9008
Epoch 4/10
480/480 [==============================] - 26s 53ms/step - loss: 0.2293 - accuracy: 0.9336 - val_loss: 0.3277 - val_accuracy: 0.9011
Epoch 5/10
480/480 [==============================] - 26s 54ms/step - loss: 0.2004 - accuracy: 0.9409 - val_loss: 0.3263 - val_accuracy: 0.9160
Epoch 6/10
480/480 [==============================] - 26s 53ms/step - loss: 0.1890 - accuracy: 0.9436 - val_loss: 0.2817 - val_accuracy: 0.9071
Epoch 7/10
480/480 [==============================] - 26s 54ms/step - loss: 0.1685 - accuracy: 0.9494 - val_loss: 0.3021 - val_accuracy: 0.9064
Epoch 8/10
480/480 [==============================] - 26s 54ms/step - loss: 0.1570 - accuracy: 0.9531 - val_loss: 0.2487 - val_accuracy: 0.9250
Epoch 9/10
480/480 [==============================] - 26s 54ms/step - loss: 0.1382 - accuracy: 0.9592 - val_loss: 0.2660 - val_accuracy: 0.9199
Epoch 10/10
480/480 [==============================] - 28s 57ms/step - loss: 0.1311 - accuracy: 0.9606 - val_loss: 0.2866 - val_accuracy: 0.9118
<keras.callbacks.History at 0x7ff64bb64e50>
```

Save the Model:

Code:

```
#SAVE THE MODEL
model.save('ECG.h5')
```

Test the Model:

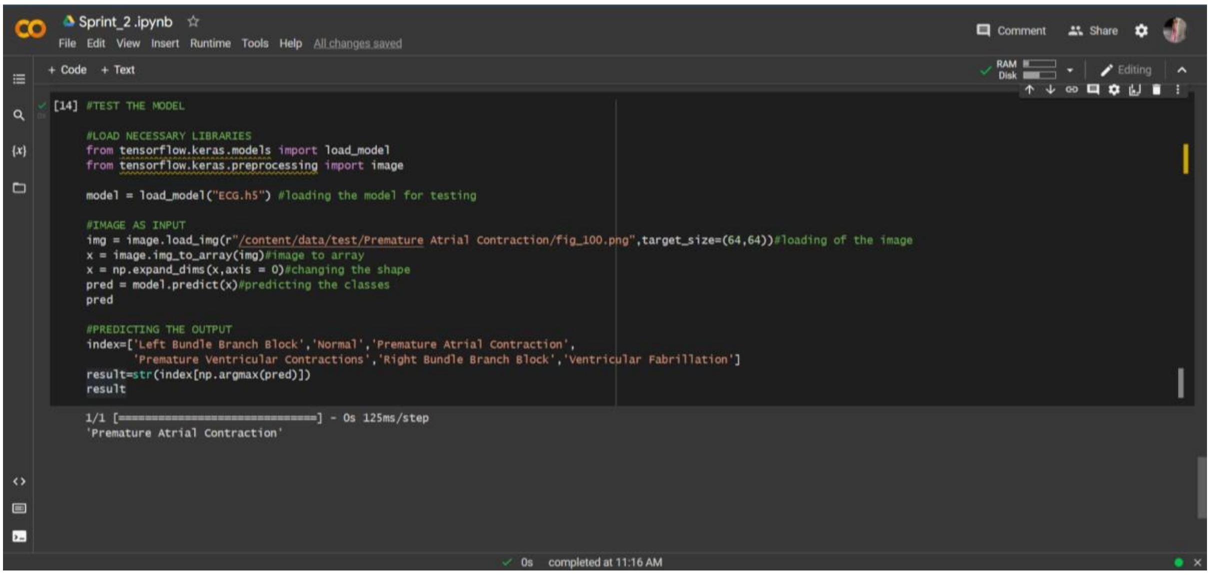
Code:

```
#TEST THE MODEL

#LOAD NECESSARY LIBRARIES from
tensorflow.keras.models import load_model from
tensorflow.keras.preprocessing import image
 model = load_model("ECG.h5") #loading the model for
testing
#IMAGE AS INPUT img = image.load_img(r"/content/data/test/Premature
Atrial Contractio/ fig_100.png",target_size=(64,64))#loading of the
image x = image.img_to_array(img)#image to array x =
np.expand_dims(x,axis = 0)#changing the shape pred =
model.predict(x)#predicting the classes pred

#PREDICTING THE OUTPUT index=['Left Bundle Branch
Block','Normal','Premature Atrial Contractio n',
       'Premature Ventricular Contractions','Right Bundle Branch Block'
,'Ventricular Fabrillation']
result=str(index[np.argmax(pred)]) result
```

Output:



```
[14] #TEST THE MODEL

     #LOAD NECESSARY LIBRARIES
     from tensorflow.keras.models import load_model
     from tensorflow.keras.preprocessing import image

     model = load_model("ECG.h5") #loading the model for testing

     #IMAGE AS INPUT
     img = image.load_img(r"/content/data/test/Premature Atrial Contraction/fig_100.png",target_size=(64,64))#loading of the image
     x = image.img_to_array(img)#image to array
     x = np.expand_dims(x,axis = 0)#changing the shape
     pred = model.predict(x)#predicting the classes
     pred

     #PREDICTING THE OUTPUT
     index=['Left Bundle Branch Block','Normal','Premature Atrial Contraction',
            'Premature Ventricular Contractions','Right Bundle Branch Block','Ventricular Fabrillation']
     result=str(index[np.argmax(pred)])
     result

     1/1 [==============================] - 0s 125ms/step
     'Premature Atrial Contraction'
```