In [1]:

```
#Image Augmentation
from tensorflow.keras.preprocessing.image import ImageDataGenerator
rain_datagen = ImageDataGenerator(rescale=1./255,
                                  zoom_range=0.2,
                                  horizontal_flip=True)
```

In [2]:

```
#Create Model
#Importing req library
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Convolution2D, MaxPooling2D, Flatten, Dense
```

In [3]:

```
#Add Layers
model = Sequential() # Initializing sequential model
model.add(Convolution2D(32,(3,3),activation='relu',input_shape=(64,64,3))) # convolution
layer
model.add(MaxPooling2D(pool_size=(2, 2))) # Max pooling layer
model.add(Flatten()) # Flatten layer
model.add(Dense(300,activation='relu')) # Hidden layer 1
model.add(Dense(150,activation='relu')) # Hidden layer 2
model.add(Dense(4,activation='softmax')) # Output layer
```

In [4]:

```
#Compile the model
model.compile(optimizer='adam',loss='categorical_crossentropy',metrics=['accuracy'])
```

In [5]:

```
#Save the model
model.save('ECG.h5')
```

In [7]:

```
#Test the model
#Testing 1
from tensorflow.keras.preprocessing import image
import numpy as np
img = image.load_img('/content/fig_2113.png',target_size=(64,64)) # Reading image
x = image.img_to_array(img)
x = np.expand_dims(x,axis=0)
pred = np.argmax(model.predict(x))
op = ['Normal','Left Bundle Branch Block','Right Bundle Branch Block','Premature Atrial
Contraction','Premature Ventricular Contraction','Ventricular Fibrillation']
op[pred]
```

```
1/1 [==============================] - 0s 25ms/step
```

Out[7]:

```
'Normal'
```

In [9]:

```
#Test the model
#Testing 2
from tensorflow.keras.preprocessing import image
import numpy as np
img = image.load_img('/content/fig_5898.png',target_size=(64,64)) # Reading image
x = image.img_to_array(img)
x = np.expand_dims(x,axis=0)
pred = np.argmax(model.predict(x))
op = ['Left Bundle Branch Block','Normal','Right Bundle Branch Block','Premature Atrial
```

```
Contraction','Premature Ventricular Contraction','Ventricular Fibrillation']
op[pred]
```

```
1/1 [==============================] - 0s 27ms/step
```

Out[9]:

```
'Left Bundle Branch Block'
```

In [10]:

```
#Test the model
#Testing 3
from tensorflow.keras.preprocessing import image
import numpy as np
img = image.load_img('/content/fig_12.png',target_size=(64,64)) # Reading image
x = image.img_to_array(img)
x = np.expand_dims(x,axis=0)
pred = np.argmax(model.predict(x))
op = ['Right Bundle Branch Block','Normal','Left Bundle Branch Block','Premature Atrial
Contraction','Premature Ventricular Contraction','Ventricular Fibrillation']
op[pred]
```

```
1/1 [==============================] - 0s 25ms/step
```

Out[10]:

```
'Right Bundle Branch Block'
```

In [12]:

```
#Test the model
#Testing 4
from tensorflow.keras.preprocessing import image
import numpy as np
img = image.load_img('/content/fig_24.png',target_size=(64,64)) # Reading image
x = image.img_to_array(img)
x = np.expand_dims(x,axis=0)
pred = np.argmax(model.predict(x))
op = ['Premature Atrial Contraction','Normal','Left Bundle Branch Block','Right Bundle B
ranch Block','Premature Ventricular Contraction','Ventricular Fibrillation']
op[pred]
```

```
1/1 [==============================] - 0s 24ms/step
```

Out[12]:

```
'Premature Atrial Contraction'
```

In [13]:

```
#Test the model
#Testing 5
from tensorflow.keras.preprocessing import image
import numpy as np
img = image.load_img('/content/fig_5656.png',target_size=(64,64)) # Reading image
x = image.img_to_array(img)
x = np.expand_dims(x,axis=0)
pred = np.argmax(model.predict(x))
op = ['Premature Ventricular Contraction','Normal','Left Bundle Branch Block','Right Bun
dle Branch Block','Premature Atrial Contraction','Ventricular Fibrillation']
op[pred]
```

```
1/1 [==============================] - 0s 25ms/step
```

Out[13]:

```
'Premature Ventricular Contraction'
```

In [14]:

```
#Test the model
#Testing 6
from tensorflow.keras.preprocessing import image
```

```
import numpy as np
img = image.load_img('/content/VFEfig_122.png',target_size=(64,64)) # Reading image
x = image.img_to_array(img)
x = np.expand_dims(x,axis=0)
pred = np.argmax(model.predict(x))
op = ['Ventricular Fibrillation','Normal','Left Bundle Branch Block','Right Bundle Branc
h Block','Premature Atrial Contraction','Premature Ventricular Contraction']
op[pred]
```

```
1/1 [==============================] - 0s 31ms/step
```

Out[14]:

```
'Ventricular Fibrillation'
```

In [15]:

```
#Train the model
from tensorflow.keras.callbacks import EarlyStopping, ReduceLROnPlateau
```

In [16]:

```
early_stop = EarlyStopping(monitor='val_accuracy',
                           patience=5)

lr = ReduceLROnPlateau(monitor='val_accuaracy',
                       factor=0.5,
                       min_lr=0.00001)

callback = [early_stop,lr]
```