

MAHENDRA ENGINEERING COLLEGE FOR WOMEN
NAME : AASHA.R
CLASS :ECE IV YEAR
SUB : IBM
REG NO : 61419106002

```
Import numpy as np
```

```
import pandas as pd
```

```
from PIL import ImageFile
```

```
from tqdm import tqdm
```

```
import h5py
```

```
import cv2
```

```
import matplotlib.pyplot as plt
```

```
%matplotlib inline
```

```
import seaborn as sns
```

```
from sklearn.model_selection import train_test_split
```

```
from sklearn.metrics import confusion_matrix
```

```
from sklearn.metrics import plot_confusion_matrix
```

```
from tensorflow.keras.utils import to_categorical
```

```
from tensorflow.keras.preprocessing import image as keras_image
```

```
from tensorflow.keras.models import Sequential, load_model
```

```
from tensorflow.keras.layers import Dense
```

```
from tensorflow.keras.layers import Activation, Dropout
```

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```
from tensorflow.keras.layers import Conv2D, MaxPooling2D, GlobalMaxPooling2D
```

```
from tensorflow.keras.callbacks import ReduceLROnPlateau, ModelCheckpoint
```

```
from tensorflow.keras.layers import LeakyReLU
```

```
def model():
```

```
    model = Sequential()
```

```
    model.add(Conv2D(128, (3, 3), input_shape=x_train.shape[1:]))
```

```
    model.add(LeakyReLU(alpha=0.02))
```

```
    model.add(MaxPooling2D(pool_size=(2, 2)))
```

```
    model.add(Dropout(0.25))
```

```
    model.add(Conv2D(128, (3, 3)))
```

```
    model.add(LeakyReLU(alpha=0.02))
```

```
    model.add(MaxPooling2D(pool_size=(2, 2)))
```

```
    model.add(Dropout(0.25))
```

```
    model.add(GlobalMaxPooling2D())
```

```
    model.add(Dense(512))
```

```
    model.add(LeakyReLU(alpha=0.02))
```

```
    model.add(Dropout(0.5))
```

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```
model.add(Dense(10))
```

```
model.add(Activation('softmax'))
```

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

```
return model
```

```
model = model()
```

```
# To save the best model
```

```
checkpointer = ModelCheckpoint(filepath='weights.best.model.hdf5', verbose=2, save_best_only=True)
```

```
# To reduce learning rate dynamically
```

```
lr_reduction = ReduceLROnPlateau(monitor='val_loss', patience=5, verbose=2, factor=0.2)
```

```
# Train the model
```

```
history = model.fit(x_train, y_train, epochs=75, batch_size=32, verbose=2,
```

```
    validation_data=(x_valid, y_valid),
```

```
    callbacks=[checkpointer,
```

```
data_generator = keras_image.ImageDataGenerator(shear_range=0.3,
```

```
    zoom_range=0.3,
```

```
    rotation_range=30,
```

```
    horizontal_flip=True)
```

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```
dg_history = model.fit_generator(data_generator.flow(x_train, y_train, batch_size=64),  
                                steps_per_epoch = len(x_train)//64, epochs=7, verbose=2,  
                                validation_data=(x_valid, y_valid),  
                                callbacks=[checkpointer,lr_reduction])
```