IMPORTING LIBRARY

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
import plotly.express as px
import os
import tensorflow as tf
from tensorflow.keras.preprocessing import image_dataset_from_directory
from tensorflow.keras.applications import DenseNet121
from sklearn.preprocessing import LabelBinarizer
from tensorflow.keras.layers import Dense, GlobalAveragePooling2D, Dropout, MaxPooling2D, Conv2D, Flatten
from tensorflow.keras.models import Sequential
from IPython.display import clear_output
import warnings
warnings.filterwarnings('ignore')
```

IMPORTING DATASET FROM KAGGLE

```
!pip install kaggle
```

```
    Requirement already satisfied: kaggle in /usr/local/lib/python3.10/dist-packages (1.5.13)
    Requirement already satisfied: six>=1.10 in /usr/local/lib/python3.10/dist-packages (from kaggle) (1.16.0)
    Requirement already satisfied: certifi in /usr/local/lib/python3.10/dist-packages (from kaggle) (2023.5.7)
    Requirement already satisfied: python-dateutil in /usr/local/lib/python3.10/dist-packages (from kaggle) (2.8.2)
    Requirement already satisfied: requests in /usr/local/lib/python3.10/dist-packages (from kaggle) (2.27.1)
    Requirement already satisfied: tqdm in /usr/local/lib/python3.10/dist-packages (from kaggle) (4.65.0)
    Requirement already satisfied: python-slugify in /usr/local/lib/python3.10/dist-packages (from kaggle) (8.0.1)
    Requirement already satisfied: urllib3 in /usr/local/lib/python3.10/dist-packages (from kaggle) (1.26.16)
    Requirement already satisfied: text-unidecode>=1.3 in /usr/local/lib/python3.10/dist-packages (from python-slugify->kaggle) (1.3)
    Requirement already satisfied: charset-normalizer~=2.0.0 in /usr/local/lib/python3.10/dist-packages (from requests->kaggle) (2.0.12)
    Requirement already satisfied: idna<4,>=2.5 in /usr/local/lib/python3.10/dist-packages (from requests->kaggle) (3.4)
```

```
!mkdir ~/.kaggle
```

```
!cp kaggle.json ~/.kaggle
```

```
!chmod 600 ~/.kaggle/kaggle.json
```

```
!kaggle datasets download -d odins0n/ucf-crime-dataset
```

```
    Downloading ucf-crime-dataset.zip to /content
    100% 11.0G/11.0G [02:13<00:00, 150MB/s]
    100% 11.0G/11.0G [02:13<00:00, 88.8MB/s]
```

```
!unzip ucf-crime-dataset.zip
```

```
        inflating: Train/Vandalism/Vandalism049_x264_6840.png
        inflating: Train/Vandalism/Vandalism049_x264_6850.png
        inflating: Train/Vandalism/Vandalism049_x264_6860.png
        inflating: Train/Vandalism/Vandalism049_x264_6870.png
        inflating: Train/Vandalism/Vandalism049_x264_6880.png
        inflating: Train/Vandalism/Vandalism049_x264_6890.png
        inflating: Train/Vandalism/Vandalism049_x264_690.png
        inflating: Train/Vandalism/Vandalism049_x264_6900.png
        inflating: Train/Vandalism/Vandalism049_x264_6910.png
        inflating: Train/Vandalism/Vandalism049_x264_6920.png
        inflating: Train/Vandalism/Vandalism049_x264_6930.png
        inflating: Train/Vandalism/Vandalism049_x264_6940.png
        inflating: Train/Vandalism/Vandalism049_x264_6950.png
        inflating: Train/Vandalism/Vandalism049_x264_6960.png
        inflating: Train/Vandalism/Vandalism049_x264_6970.png
        inflating: Train/Vandalism/Vandalism049_x264_6980.png
        inflating: Train/Vandalism/Vandalism049_x264_6990.png
        inflating: Train/Vandalism/Vandalism049_x264_70.png
        inflating: Train/Vandalism/Vandalism049_x264_700.png
        inflating: Train/Vandalism/Vandalism049_x264_7000.png
        inflating: Train/Vandalism/Vandalism049_x264_7010.png
        inflating: Train/Vandalism/Vandalism049_x264_7020.png
        inflating: Train/Vandalism/Vandalism049_x264_7030.png
        inflating: Train/Vandalism/Vandalism049_x264_7040.png
        inflating: Train/Vandalism/Vandalism049_x264_7050.png
        inflating: Train/Vandalism/Vandalism049_x264_7060.png
        inflating: Train/Vandalism/Vandalism049_x264_7070.png
        inflating: Train/Vandalism/Vandalism049_x264_7080.png
        inflating: Train/Vandalism/Vandalism049_x264_7090.png
        inflating: Train/Vandalism/Vandalism049_x264_710.png
        inflating: Train/Vandalism/Vandalism049_x264_7100.png
        inflating: Train/Vandalism/Vandalism049_x264_7110.png
        inflating: Train/Vandalism/Vandalism049_x264_7120.png
        inflating: Train/Vandalism/Vandalism049_x264_7130.png
        inflating: Train/Vandalism/Vandalism049_x264_7140.png
        inflating: Train/Vandalism/Vandalism049_x264_7150.png
        inflating: Train/Vandalism/Vandalism049_x264_7160.png
        inflating: Train/Vandalism/Vandalism049_x264_7170.png
        inflating: Train/Vandalism/Vandalism049_x264_7180.png
        inflating: Train/Vandalism/Vandalism049_x264_7190.png
```

TRAINING AND TESTING DATA SEPERATION

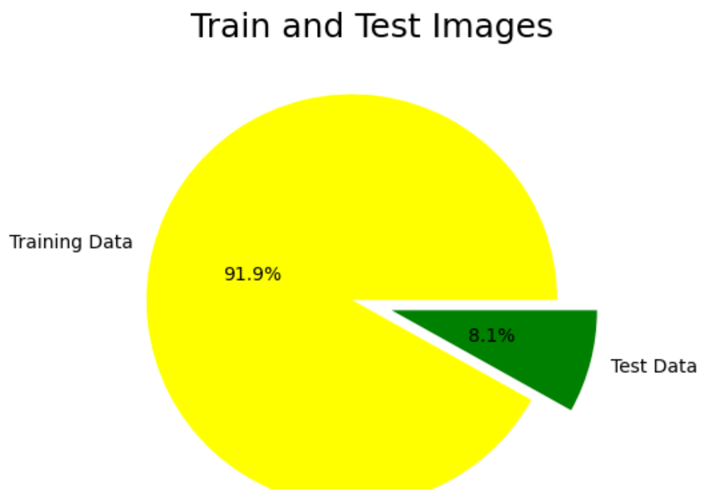
```
train_dir = "/content/Train"
test_dir = "/content/Test"
SEED = 12
IMG_HEIGHT = 64
IMG_WIDTH = 64
BATCH_SIZE = 128
EPOCHS = 5
LR = 0.00003
crime_types=os.listdir(train_dir)
n=len(crime_types)
print("Number of crime categories : ",n)
```

```
     Number of crime categories :  14
```

DATAVISUALIZATION OF THE DATASET

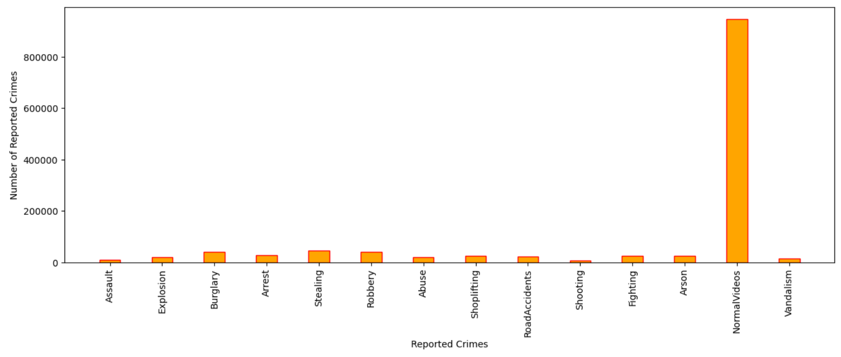
```
crimes={}
train=test=0
for clss in crime_types:
    num=len(os.listdir (os.path.join(train_dir,clss)))
    train+=num
    test+=len(os.listdir (os.path.join(test_dir,clss)))
    crimes[clss]=num
```

```
plt.figure(figsize=(8, 5))
plt.pie(x=np.array([train, test]), autopct="%.1f%%", explode=[0.1, 0.1], labels=["Training Data", "Test Data"], pctdistance=0.5,colors=["yel
plt.title("Train and Test Images", fontsize=18);
```



```
plt.figure(figsize=(15,5))
plt.bar(list(crimes.keys()), list (crimes.values()), width=0.4, align="center",edgecolor=["red"],color=["orange"])
plt.xticks(rotation=90)


plt.xlabel("Reported Crimes")
plt.ylabel("Number of Reported Crimes")
plt.show()
```



TRAIN SET ,TEST SET AND VAL SET

```
IMG_SHAPE=(64,64)
#Apply Image_Dataset_from_directory Functionality To Train Set And Test Set
train_set=image_dataset_from_directory(
    train_dir,
    label_mode="categorical",
    batch_size=BATCH_SIZE,
    image_size=IMG_SHAPE,
    shuffle=True,
    seed=SEED,
    validation_split=0.2,
    subset="training",
)
```

```
val_set=image_dataset_from_directory(
    train_dir,
    label_mode="categorical",
    batch_size=BATCH_SIZE,
    image_size=IMG_SHAPE,
    shuffle=True,
    seed=SEED,
    validation_split =0.2,
    subset="validation",
)


test_set=image_dataset_from_directory(
    test_dir,
    label_mode="categorical",
    class_names=None,
    batch_size=BATCH_SIZE,
    image_size=IMG_SHAPE,
    shuffle=False,
    seed=SEED,
)
```

```
Found 1266345 files belonging to 14 classes.
Using 1013076 files for training.
Found 1266345 files belonging to 14 classes.
Using 253269 files for validation.
Found 111308 files belonging to 14 classes.
```

Create Transfer Learning Function

```
# Create Transfer Learning Function
INPUT_SHAPE=(64,64,3)
def transfer_learning():
    base_model=DenseNet121(include_top=False, input_shape=INPUT_SHAPE, weights="imagenet")

    thr=149

    for layers in base_model.layers[:thr]:
        layers.trainable=False

    for layers in base_model.layers[thr:]:
        layers.trainable=False

    return base_model
```

```
model=create_model()

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

Adding Dense Layers

```
# Adding Dense Layers

def create_model():
    model=Sequential()

    base_model=transfer_learning()
    model.add(base_model)

    model.add(GlobalAveragePooling2D())

    model.add(Dense(256, activation="relu"))
    model.add(Dropout(0.2))

    model.add(Dense(512, activation="relu"))
    model.add(Dropout (0.2))

    model.add(Dense(1024, activation="relu"))

    model.add(Dense (n, activation="softmax"))

    model.summary()

    return model


# Configure The Learning Process

model=create_model()

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

```
Model: "sequential_1"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 densenet121 (Functional)    (None, 2, 2, 1024)        7037504

 global_average_pooling2d_1   (None, 1024)             0
 (GlobalAveragePooling2D)

 dense_4 (Dense)             (None, 256)               262400

 dense_5 (Dense)             (None, 512)               131584

 dense_6 (Dense)             (None, 1024)              525312

 dense_7 (Dense)             (None, 14)                14350

=================================================================
Total params: 7,971,150
Trainable params: 933,646
Non-trainable params: 7,037,504
_________________________________________________________________
```

Train the model

```
# Train The Model
history = model.fit(x = train_set,
                    validation_data=val_set,
                    epochs = 5)
```

Saving the model

```
# Save model
model.save('crime.h5')
```

Load the saved model using load_model

```
#Load the saved model using load_model

from tensorflow.keras.models import load_model
model=load_model('crime.h5')


model.load_weights('crime.h5')
```

y_prediction

```
y_true = np.array([])
for x, y in test_set:
    y_true = np.concatenate([y_true, np.argmax(y.numpy(), axis=-1)])
```

```
y_pred=model.predict(test_set)
```

```
     870/870 [==============================] - 1038s 1s/step
```

Testing

```
from tensorflow.keras.preprocessing import image

# Testing 1
img = image.load_img("/content/Test/Burglary/Burglary005_x264_1030.png",target_size=(64,64)) # Reading image
x = image.img_to_array(img) # Converting Image into array
x = np.expand_dims(x,axis=0) # expanding Dimensions
pred = np.argmax (model.predict(x)) # Predicting the higher probablity Index
op = ['Fighthing', 'Arrest', 'Vandalism', 'Assault', 'Stealing' , 'Arson', 'Normalvideos', 'Burglary', 'Explosion', 'Robbery','Abuse', 'shoot
op[pred] # tist indexing with output
```

```
     1/1 [==============================] - 0s 40ms/step
     'Burglary'
```

```
# Testing 2
img = image.load_img("/content/Test/Fighting/Fighting003_x264_1020.png",target_size=(64,64)) # Reading image
x = image.img_to_array(img) # Converting Image into array
x = np.expand_dims(x,axis=0) # expanding Dimensions
pred = np.argmax (model.predict(x)) # Predicting the higher probablity Index
op = ['Fighthing', 'Arrest', 'Vandalism', 'Assault', 'Stealing' , 'Arson', 'Normalvideos', 'Burglary', 'Explosion', 'Robbery','Abuse', 'shoot
op[pred] # tist indexing with output
```

```
     1/1 [==============================] - 0s 41ms/step
     'Robbery'
```

✓ 18m 8s completed at 2:40 PM