In [1]:
```
import tensorflow as tf
```

In [2]:
```
import cv2
```

In [3]:
```
import numpy as np
```

In [4]:
```
import keras
```

In [5]:
```
import os
```

In [6]:
```
features = []
target = []
for x in list(range(0,43)):
    ImageNamesList = os.listdir("D:/inmovidu_AI/TrafficData/myData" + "/" + str(x))
    for y in ImageNamesList:
        img = cv2.imread("D:/inmovidu_AI/TrafficData/myData" + "/" + str(x) + "/" +
        features.append(img)
        target.append(x)
    print("Loading Data In Folder",x)
```

```
Loading Data In Folder 0
Loading Data In Folder 1
Loading Data In Folder 2
Loading Data In Folder 3
Loading Data In Folder 4
Loading Data In Folder 5
Loading Data In Folder 6
Loading Data In Folder 7
Loading Data In Folder 8
Loading Data In Folder 9
Loading Data In Folder 10
Loading Data In Folder 11
Loading Data In Folder 12
Loading Data In Folder 13
Loading Data In Folder 14
Loading Data In Folder 15
Loading Data In Folder 16
Loading Data In Folder 17
Loading Data In Folder 18
Loading Data In Folder 19
Loading Data In Folder 20
Loading Data In Folder 21
Loading Data In Folder 22
Loading Data In Folder 23
Loading Data In Folder 24
Loading Data In Folder 25
Loading Data In Folder 26
Loading Data In Folder 27
Loading Data In Folder 28
Loading Data In Folder 29
Loading Data In Folder 30
Loading Data In Folder 31
Loading Data In Folder 32
Loading Data In Folder 33
Loading Data In Folder 34
```

```
Loading Data In Folder 35
Loading Data In Folder 36
Loading Data In Folder 37
Loading Data In Folder 38
Loading Data In Folder 39
Loading Data In Folder 40
Loading Data In Folder 41
Loading Data In Folder 42
```

In [7]:
```
type(features)
```

Out[7]:
```
list
```

In [8]:
```
type(target)
```

Out[8]:
```
list
```

In [9]:
```
features = np.array(features)
```

In [10]:
```
target = np.array(target)
```

In [11]:
```
type(features)
```

Out[11]:
```
numpy.ndarray
```

In [12]:
```
type(target)
```

Out[12]:
```
numpy.ndarray
```

In [13]:
```
features.shape
```

Out[13]:
```
(34790, 32, 32, 3)
```

In [14]:
```
target.shape
```

Out[14]:
```
(34790,)
```

In [15]:
```
from sklearn.model_selection import train_test_split
```

In [16]:
```
train_features,test_features,train_targets,test_targets = train_test_split(features,
```

In [17]:
```
def preprocessing(image):
    image = cv2.cvtColor(image,cv2.COLOR_BGR2GRAY)
    image = image/255
    return image
```

In [18]:
```
train_features = np.array(list(map(preprocessing,train_features)))
```

In [19]:
```
test_features = np.array(list(map(preprocessing,test_features)))
```

In [20]:
```
train_features.shape
```

Out[20]:
```
(27832, 32, 32)
```

In [21]:
```
train_features = train_features.reshape(27832,32,32,1)
```

In [22]:
```
train_features.shape
```

Out[22]:
```
(27832, 32, 32, 1)
```

In [23]:
```
from keras.preprocessing.image import ImageDataGenerator
```

In [24]:
```
dataGen = ImageDataGenerator(rotation_range = 10,height_shift_range = 0.1,width_shif
```

In [25]:
```
dataGen.fit(train_features)
```

In [26]:
```
batches = dataGen.flow(train_features,train_targets,batch_size = 20)
```

In [27]:
```
len(batches)
```

Out[27]:
```
1392
```

In [28]:
```
images,labels = next(batches)
```

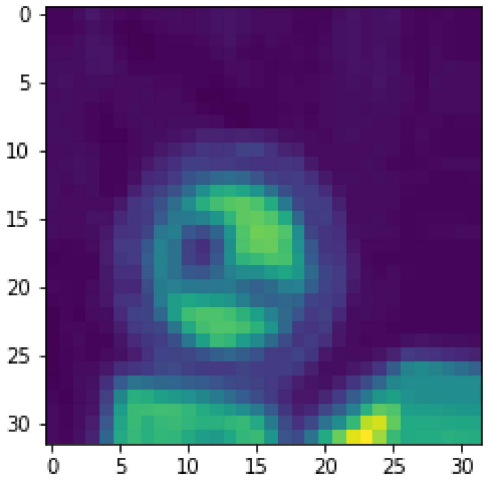
In [29]:
```
images.shape
```

Out[29]:
```
(20, 32, 32, 1)
```

In [30]:
```
images = images.reshape(20,32,32)
```

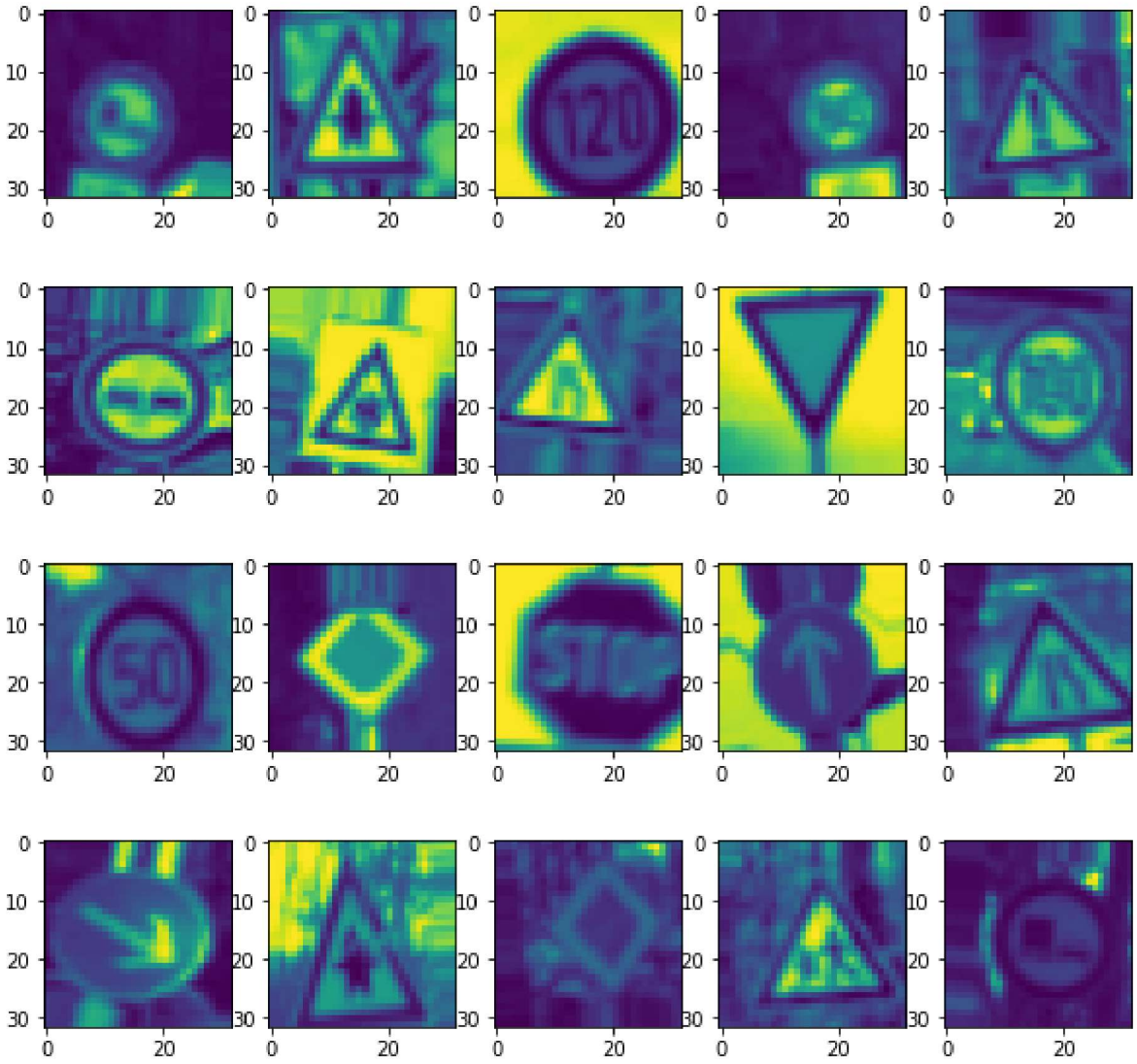
In [31]:
```
import matplotlib.pyplot as plt
```

In [32]:
```
plt.imshow(images[0])
plt.show()
```



In [33]:
```
plt.figure(figsize = (10,10))
for i in range(20):
    plt.subplot(4,5,i+1)
    plt.imshow(images[i])
plt.show
```

Out[33]:
```
<function matplotlib.pyplot.show(close=None, block=None)>
```



In [34]:
```
from tensorflow.keras.utils import to_categorical
```

In [35]:
```
train_targets = to_categorical(train_targets)
```

In [36]:
```
train_targets.shape
```

Out[36]:
```
(27832, 43)
```

In [37]:
```
train_features.shape
```

Out[37]:
```
(27832, 32, 32, 1)
```

Step-1 Specifying The Architecture

In [38]:
```
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Dense,Flatten,Conv2D,MaxPooling2D,Dropout
```

In [39]:
```
model = Sequential()
model.add(Conv2D(60,(3,3),activation = "relu",input_shape = (32,32,1)))

model.add(Conv2D(60,(3,3),activation = "relu"))

model.add(MaxPooling2D((2,2)))

model.add(Conv2D(30,(3,3),activation = "relu"))

model.add(Conv2D(30,(3,3),activation = "relu"))

model.add(Conv2D(30,(3,3),activation = "relu"))

model.add(MaxPooling2D((2,2)))

model.add(Dropout(0.5))

model.add(Flatten())

model.add(Dense(500,activation = "relu"))

model.add(Dense(43,activation = "softmax"))
```

Step:2 Compiling The Model

In [40]:
```
from tensorflow.keras.optimizers import Adam
```

In [41]:
```
model.compile(Adam(learning_rate = 0.001),loss = "categorical_crossentropy",metrics
```

step:3 Train The Model

In [42]:
```
#generate new images combine with original images train on the combined images
```

In [43]:
```

```

```
model.fit_generator(dataGen.flow(train_features,train_targets,batch_size = 20),epoch
```

```
C:\Users\Sai Varshith\.conda\envs\tensorflow\lib\site-packages\tensorflow\python\ker
as\engine\training.py:1940: UserWarning: `Model.fit_generator` is deprecated and wil
l be removed in a future version. Please use `Model.fit`, which supports generators.
  warnings.warn('`Model.fit_generator` is deprecated and '
Epoch 1/20
1392/1392 [==============================] - 44s 31ms/step - loss: 2.0682 - accurac
y: 0.4155
Epoch 2/20
1392/1392 [==============================] - 42s 30ms/step - loss: 0.7005 - accurac
y: 0.7866
Epoch 3/20
1392/1392 [==============================] - 46s 33ms/step - loss: 0.4341 - accurac
y: 0.8666
Epoch 4/20
1392/1392 [==============================] - 41s 29ms/step - loss: 0.3264 - accurac
y: 0.8986
Epoch 5/20
1392/1392 [==============================] - 44s 32ms/step - loss: 0.2527 - accurac
y: 0.9222
Epoch 6/20
1392/1392 [==============================] - 49s 35ms/step - loss: 0.2229 - accurac
y: 0.9329
Epoch 7/20
1392/1392 [==============================] - 45s 32ms/step - loss: 0.1900 - accurac
y: 0.9403
Epoch 8/20
1392/1392 [==============================] - 41s 29ms/step - loss: 0.1765 - accurac
y: 0.9449
Epoch 9/20
1392/1392 [==============================] - 41s 29ms/step - loss: 0.1641 - accurac
y: 0.9507
Epoch 10/20
1392/1392 [==============================] - 41s 30ms/step - loss: 0.1652 - accurac
y: 0.95080s - loss: 0.1654 - accu
Epoch 11/20
1392/1392 [==============================] - 42s 30ms/step - loss: 0.1459 - accurac
y: 0.9552
Epoch 12/20
1392/1392 [==============================] - 42s 30ms/step - loss: 0.1354 - accurac
y: 0.9597
Epoch 13/20
1392/1392 [==============================] - 42s 30ms/step - loss: 0.1348 - accurac
y: 0.9590
Epoch 14/20
1392/1392 [==============================] - 41s 29ms/step - loss: 0.1238 - accurac
y: 0.9640
Epoch 15/20
1392/1392 [==============================] - 41s 29ms/step - loss: 0.1193 - accurac
y: 0.9650
Epoch 16/20
1392/1392 [==============================] - 41s 29ms/step - loss: 0.1176 - accurac
y: 0.9653
Epoch 17/20
1392/1392 [==============================] - 41s 29ms/step - loss: 0.1069 - accurac
y: 0.9679
Epoch 18/20
1392/1392 [==============================] - 41s 30ms/step - loss: 0.1150 - accurac
y: 0.9651
Epoch 19/20
1392/1392 [==============================] - 41s 29ms/step - loss: 0.1004 - accurac
y: 0.9696
```

```
Epoch 20/20
1392/1392 [==============================] - 41s 30ms/step - loss: 0.1037 - accurac
y: 0.9698
```

Out[43]:
```
<tensorflow.python.keras.callbacks.History at 0x1b1b0d56460>
```

In [44]:
```
ModelInJson = model.to_json()
```

In [45]:
```
abc = open("D:/Datasets/inmovidu_AI_Traffic.json","w")
abc.write(ModelInJson)
abc.close()
```

In [46]:
```
model.save_weights("D:/Datasets/inmovidu_AI_Trafficweights.h5")
```

In [47]:
```
from keras.models import model_from_json
```

In [48]:
```
abc = open("D:/Datasets/inmovidu_AI_Traffic.json","r")
loaded_data = abc.read()
loaded_model = model_from_json(loaded_data)
loaded_model.load_weights("D:/Datasets/inmovidu_AI_Trafficweights.h5")
```

Step:4 Testing The Model By Using It For Predictions

In [49]:
```
capt = cv2.VideoCapture(0)
```

In [50]:
```
def preprocessing(image):
    image = cv2.cvtColor(image,cv2.COLOR_BGR2GRAY)
    image = image/255
    return image
```

In [51]:
```
def getClassName(classNo):
    if classNo == 0: return 'Speed Limit 20km/hr'
    elif classNo == 1: return 'Speed Limit 30km/hr'
    elif classNo == 2: return 'Speed Limit 50km/hr'
    elif classNo == 3: return 'Speed Limit 60km/hr'
    elif classNo == 4: return 'Speed Limit 70km/hr'
    elif classNo == 5: return 'Speed Limit 80km/hr'
    elif classNo == 6: return 'End of Speed Limit of 80km/hr'
    elif classNo == 7: return 'Speed Limit 100km/hr'
    elif classNo == 8: return 'Speed Limit 120km/hr'
    elif classNo == 9: return 'No Passing'
    elif classNo == 10: return 'No Passing for vehicles over 3.5 metric tons'
    elif classNo == 11: return 'Right of way at the next intersection'
    elif classNo == 12: return 'PriorityRoad'
    elif classNo == 13: return 'yeild'
    elif classNo == 14: return 'stop'
    elif classNo == 15: return 'No Vehciles'
    elif classNo == 16: return 'Vehciles over 3.5 metric tons prohibited'
    elif classNo == 17: return 'No Entry'
    elif classNo == 18: return 'General Caution'
    elif classNo == 19: return 'Dangerous Curve To The Left'
```

```
    elif classNo == 20: return 'Dangerous Curve To The Right'
    elif classNo == 21: return 'Double Curve'
    elif classNo == 22: return 'Bumpy Road'
    elif classNo == 23: return 'Slippery Road'
    elif classNo == 24: return 'Road Narrows On The Right'
    elif classNo == 25: return 'Road Work'
    elif classNo == 26: return 'Traffic Signals'
    elif classNo == 27: return 'Pedestrians'
    elif classNo == 28: return 'Children Crossing'
    elif classNo == 29: return 'Bicycle Crossing'
    elif classNo == 30: return 'beware of Ice/snow'
    elif classNo == 31: return 'Wild Animals Crossing'
    elif classNo == 32: return 'End Of all speed And Passing Limits'
    elif classNo == 33: return 'Turn Right a head'
    elif classNo == 34: return 'Turn Left A Head'
    elif classNo == 35: return 'ahead only'
    elif classNo == 36: return 'Go Straight or right'
    elif classNo == 37: return 'Go straight or left'
    elif classNo == 38: return 'KeepRight'
    elif classNo == 39: return 'KeepLeft'
    elif classNo == 40: return 'RoundAbout Mandatory'
    elif classNo == 41: return 'End Of No Passing'
    elif classNo == 42: return 'End Of No Passing by vehcles over 3.5 metric tons'
```

In [ ]:

```
while True:
    success,image = capt.read()
    imagearr=np.asarray(image)
    imagearr = cv2.resize(imagearr,(32,32))
    imagearr = preprocessing(imagearr)
    imagearr = imagearr.reshape(1,32,32,1)
    predictions = loaded_model.predict(imagearr)
    neuronindex = loaded_model.predict_classes(imagearr)
    cv2.putText(image,"Class:",(20,35),cv2.FONT_HERSHEY_SIMPLEX,1,(0,0,255),2)
    cv2.putText(image,"Probability:",(20,75),cv2.FONT_HERSHEY_SIMPLEX,1,(0,0,255),2)
    MaxProbabilityValue = np.amax(predictions)
    if MaxProbabilityValue>0.75:
        cv2.putText(image,getClassName(neuronindex),(120,35),cv2.FONT_HERSHEY_COMPLE
        cv2.putText(image,str(MaxProbabilityValue*100) + "%",(170,75),cv2.FONT_HERSH
    cv2.imshow("ModelPrediction",image)
    AsciiValue = cv2.waitKey(1)
    if AsciiValue == ord('q'):
        cv2.destroyAllWindows()
        break
```

```
C:\Users\Sai Varshith\.conda\envs\tensorflow\lib\site-packages\tensorflow\python\ker
as\engine\sequential.py:455: UserWarning: `model.predict_classes()` is deprecated an
d will be removed after 2021-01-01. Please use instead:* `np.argmax(model.predict
(x), axis=-1)`,   if your model does multi-class classification   (e.g. if it uses a
`softmax` last-layer activation).* `(model.predict(x) > 0.5).astype("int32")`,   if
your model does binary classification   (e.g. if it uses a `sigmoid` last-layer acti
vation).
  warnings.warn('`model.predict_classes()` is deprecated and '
```

In [ ]:

In [ ]:

In [ ]:

In [ ]:

In [ ]:

In [ ]:

In [ ]:

In [ ]: