Real-Time Communication System Powered By AI For Specially Abled

TEAM ID - 2022TMID21808

Image Preprocessing

Import ImageDataGenerator Library And Configure It

In [1]:
```
from tensorflow.keras.preprocessing.image import ImageDataGenerator
```

In [2]:
```
train_datagen=ImageDataGenerator(rescale=1./255,horizontal_flip=True,vertical_flip=True,zoom_range=0.2)
```

In [3]:
```
test_datagen=ImageDataGenerator(rescale=1./255)
```

Apply ImageDataGenerator Functionality To Train And Test Set

In [4]:
```
x_train=train_datagen.flow_from_directory(r"C:\Users\rajes\Desktop\Dataset\training_set",target_size=(64,64
                                          class_mode="categorical",batch_size=30)
```

```
Found 15750 images belonging to 9 classes.
```

In [5]:
```
x_test=test_datagen.flow_from_directory(r"C:\Users\rajes\Desktop\Dataset\test_set",target_size=(64,64),
                                                            class_mode="categorical",batch_size=30)
```

```
Found 2250 images belonging to 9 classes.
```

Model Building

Import The Required Model Building Libraries

In [6]:

```
from keras.models import Sequential
from keras.layers import Dense
from keras.layers import Convolution2D
from keras.layers import MaxPooling2D
from keras.layers import Dropout
from keras.layers import Flatten
```

Initialize The Model

In [7]:

```
model=Sequential()
```

Add The Convolution Layer

In [8]:

```
model.add(Convolution2D(32,(3,3),activation="relu",input_shape=(64,64,3)))
#No of feature detectors, size of feature detector, image size, activation function
```

Add The Pooling Layer

In [9]:

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

Add The Flatten Layer

In [10]:

```
model.add(Flatten())
```

Adding The Dense Layers

```
In [11]: model.add(Dense(500,activation='relu'))
         model.add(Dense(300,activation='relu'))
```

```
In [12]: model.add(Dense(9,activation="softmax"))
```

Compile The Model

```
In [13]: model.compile(loss="categorical_crossentropy",metrics=["accuracy"],optimizer='adam')
```

```
In [14]: len(x_train)

Out[14]: 525
```

```
In [15]: len(x_test)

Out[15]: 75
```

```
In [16]: x_train.class_indices

Out[16]: {'A': 0, 'B': 1, 'C': 2, 'D': 3, 'E': 4, 'F': 5, 'G': 6, 'H': 7, 'I': 8}
```

Fit And Save The Model

In [17]:
```
model.fit(x_train,epochs=8,validation_data=x_test,steps_per_epoch=len(x_train),validation_steps=len(x_test)
```

```
Epoch 1/8
525/525 [==============================] - 385s 722ms/step - loss: 0.3310 - accuracy: 0.8958 - val_loss:
0.2439 - val_accuracy: 0.9707
Epoch 2/8
525/525 [==============================] - 252s 480ms/step - loss: 0.0602 - accuracy: 0.9813 - val_loss:
0.3177 - val_accuracy: 0.9724
Epoch 3/8
525/525 [==============================] - 357s 681ms/step - loss: 0.0373 - accuracy: 0.9881 - val_loss:
0.2240 - val_accuracy: 0.9711
Epoch 4/8
525/525 [==============================] - 218s 416ms/step - loss: 0.0288 - accuracy: 0.9906 - val_loss:
0.2742 - val_accuracy: 0.9756
Epoch 5/8
525/525 [==============================] - 197s 376ms/step - loss: 0.0217 - accuracy: 0.9931 - val_loss:
0.1984 - val_accuracy: 0.9742
Epoch 6/8
525/525 [==============================] - 186s 353ms/step - loss: 0.0182 - accuracy: 0.9946 - val_loss:
0.1557 - val_accuracy: 0.9773
Epoch 7/8
525/525 [==============================] - 199s 378ms/step - loss: 0.0221 - accuracy: 0.9933 - val_loss:
0.3462 - val_accuracy: 0.9618
Epoch 8/8
525/525 [==============================] - 200s 381ms/step - loss: 0.0132 - accuracy: 0.9954 - val_loss:
0.3026 - val_accuracy: 0.9742
```

Out[17]:
```
<keras.callbacks.History at 0x18a25e01e80>
```

In [18]:
```
model.save("C:/Users/rajes/Downloads/signlanguage-new.h5")
```

Test the Model

Import The Packages And Load The Saved Model

In [19]:

```
from keras.models import load_model
import numpy as np
import h5py
import cv2
```

In [20]:

```
from tensorflow.keras.models import load_model
from tensorflow.keras.preprocessing import image
import numpy as np
```

In [21]:

```
model = load_model("C:/Users/rajes/Downloads/signlanguage-new.h5")
```

Load The Test Image, Pre-Process It And Predict

In [22]:

```
img =image.load_img(r"C:\Users\rajes\Desktop\Dataset\test_set\A\8.png",target_size = (64,64,1))
img
```

Out[22]:

In [23]:

```
from skimage.transform import resize
def detect(frame):
    img=image.img_to_array(frame)
    img = resize(img,(64,64,1))
    img = np.expand_dims(img,axis=0)
    pred=np.argmax(model.predict(img))
    op=['A','B','C','D','E','F','G','H','I']
    print("THE PREDICTED LETTER IS ",op[pred])
```

In [24]:

```
from skimage.transform import resize
def detect(frame):
    img=resize(frame,(64,64,1))
    img=np.expand_dims(img,axis=0)
    if(np.max(img)>1):
        img=img/255.0
        prediction=model.predict(img)
        print(prediction)
        prediction=model.predict_classes(img)
        print(prediction)
```

In [25]:

```
frame=cv2.imread(r"C:\Users\rajes\Desktop\Dataset\test_set\A\8.png")
data=detect(frame)
```

In [26]:

```
type(img)
```

Out[26]:

```
PIL.Image.Image
```

In [27]:

```
x = image.img_to_array(img)
x
```

Out[27]:

```
array([[[0., 0., 0.],
        [0., 0., 0.],
        [0., 0., 0.],
        ...,
        [0., 0., 0.],
        [0., 0., 0.],
        [0., 0., 0.]],

       [[0., 0., 0.],
        [0., 0., 0.],
        [0., 0., 0.],
        ...,
        [0., 0., 0.],
        [0., 0., 0.],
        [0., 0., 0.]],

       [[0., 0., 0.],
        [0., 0., 0.],
        [0., 0., 0.],
        ...,
        [0., 0., 0.],
        [0., 0., 0.],
        [0., 0., 0.]],

       ...,

       [[0., 0., 0.],
        [0., 0., 0.],
        [0., 0., 0.],
        ...,
        [0., 0., 0.],
        [0., 0., 0.],
        [0., 0., 0.]],
       [[0., 0., 0.],
        [0., 0., 0.],
        [0., 0., 0.],
        ...,
        [0., 0., 0.],
        [0., 0., 0.],
        [0., 0., 0.]],

       [[0., 0., 0.],
        [0., 0., 0.],
        [0., 0., 0.],
        ...,
        [0., 0., 0.],
        [0., 0., 0.],
        [0., 0., 0.]]], dtype=float32)
```

```
In [28]: x.shape
```

```
Out[28]: (64, 64, 3)
```

```
In [29]: x=np.expand_dims(x,axis=0)
         x.shape
```

```
Out[29]: (1, 64, 64, 3)
```

```
In [30]: pred_prob = model.predict(x)
```

```
1/1 [==============================] - 1s 794ms/step
```

```
In [31]: pred_prob
```

```
Out[31]: array([[1., 0., 0., 0., 0., 0., 0., 0., 0.]], dtype=float32)
```

```
In [32]: class_name=["A","B","C","D","E","F","G","H","I"]
         pred_id = pred_prob.argmax(axis=1)[0]
```

In [33]:

```
pred_id
```

Out[33]:

```
0
```

In [34]:

```
print("the alphabet is  ",str(class_name[pred_id]))
```

```
the alphabet is   A
```

CNN Video Anlaysis

In [71]:

```
import cv2
```

In [72]:

```
img=cv2.imread(r"C:\Users\rajes\Desktop\Dataset\test_set\A\8.png",1)
```

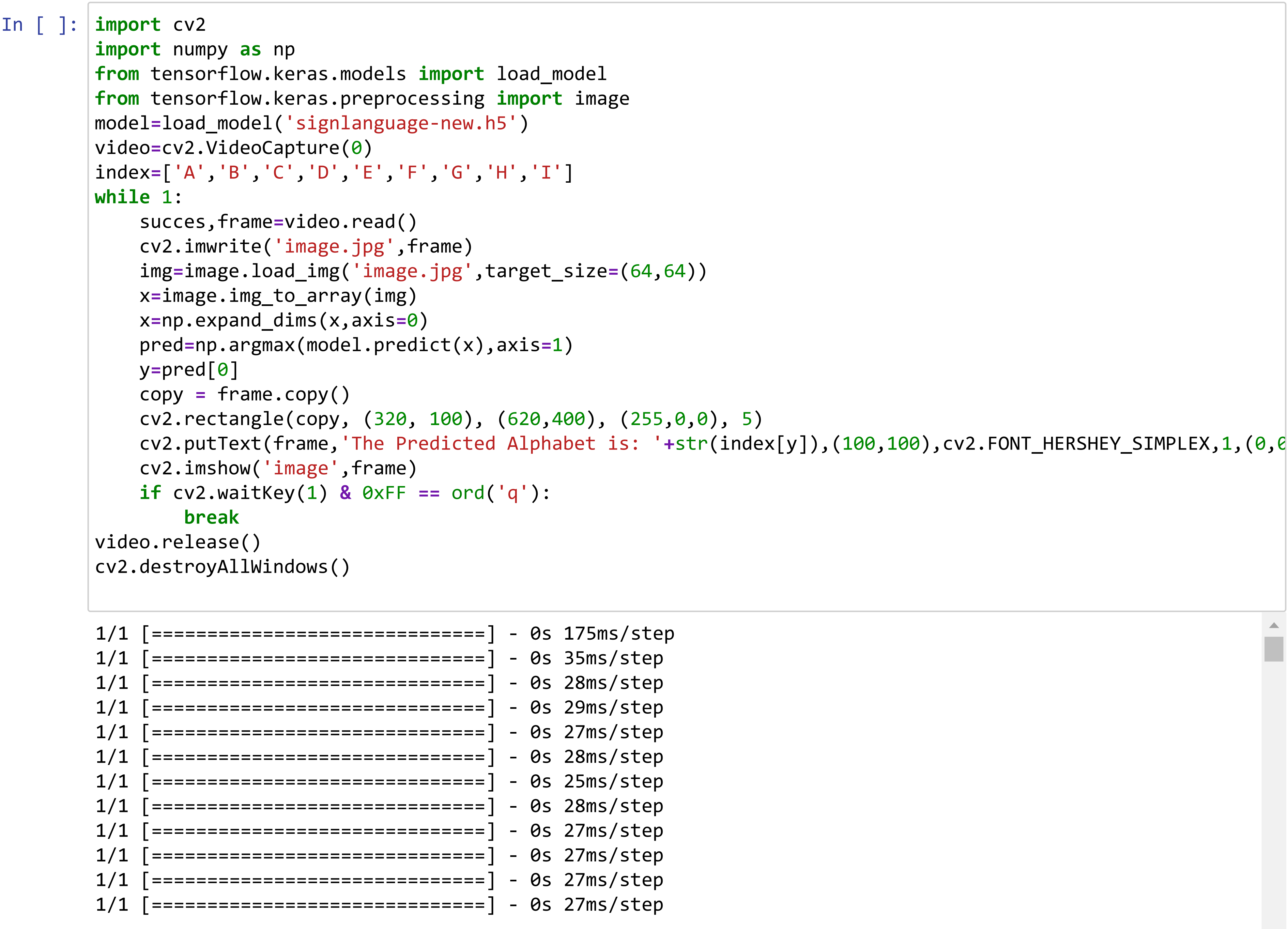
In [73]:

```
print(img.shape)
```

```
(64, 64, 3)
```

In [74]:

```
cv2.imshow('image',img)
cv2.waitKey(0)
cv2.destroyAllWindows()
```



```
In [ ]: import cv2
        import numpy as np
        from tensorflow.keras.models import load_model
        from tensorflow.keras.preprocessing import image
        model=load_model('signlanguage-new.h5')
        video=cv2.VideoCapture(0)
        index=['A','B','C','D','E','F','G','H','I']
        while 1:
            succes,frame=video.read()
            cv2.imwrite('image.jpg',frame)
            img=image.load_img('image.jpg',target_size=(64,64))
            x=image.img_to_array(img)
            x=np.expand_dims(x,axis=0)
            pred=np.argmax(model.predict(x),axis=1)
            y=pred[0]
            copy = frame.copy()
            cv2.rectangle(copy, (320, 100), (620,400), (255,0,0), 5)
            cv2.putText(frame,'The Predicted Alphabet is: '+str(index[y]),(100,100),cv2.FONT_HERSHEY_SIMPLEX,1,(0,0
            cv2.imshow('image',frame)
            if cv2.waitKey(1) & 0xFF == ord('q'):
                break
        video.release()
        cv2.destroyAllWindows()
```

```
1/1 [==============================] - 0s 175ms/step
1/1 [==============================] - 0s 35ms/step
1/1 [==============================] - 0s 28ms/step
1/1 [==============================] - 0s 29ms/step
1/1 [==============================] - 0s 27ms/step
1/1 [==============================] - 0s 28ms/step
1/1 [==============================] - 0s 25ms/step
1/1 [==============================] - 0s 28ms/step
1/1 [==============================] - 0s 27ms/step
1/1 [==============================] - 0s 27ms/step
1/1 [==============================] - 0s 27ms/step
1/1 [==============================] - 0s 27ms/step
```

```
1/1 [==============================] - 0s 26ms/step
1/1 [==============================] - 0s 26ms/step
1/1 [==============================] - 0s 24ms/step
1/1 [==============================] - 0s 28ms/step
1/1 [==============================] - 0s 26ms/step
1/1 [==============================] - 0s 28ms/step
1/1 [==============================] - 0s 30ms/step
```

```
In [ ]:
```