FINAL OUTPUT

Import datagenerator to train and test

In [83]:
```python
from tensorflow.keras.preprocessing.image import ImageDataGenerator
```

In [84]:
```python
train_datagen = ImageDataGenerator(rescale = 1./255,shear_range=0.2,zoom_range= 0.2,horizontal_flip=True,vertical_flip=False)
```

In [85]:
```python
test_datagen = ImageDataGenerator(rescale = 1./255)
```

In [82]:
```python
import tensorflow as tf
import os
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Dense, Conv2D, Flatten, Dropout, MaxPooling2D
from tensorflow.keras.preprocessing.image import ImageDataGenerator
import numpy as np
import matplotlib.pyplot as plt
import IPython.display as display
from PIL import Image
import pathlib
```

Apply ImageDataGenerator Functionality To Train And Test set

In [86]:
```python
from google.colab import drive
```

```
In [87]:  from tensorflow.keras.preprocessing.image import ImageDataGenerator
          print("This dataset has been created and uploaded by IBM-TeamID-IBM-Project-50210-1660899973")
```

This dataset has been created and uploaded by IBM-TeamID-IBM-Project-50210-1660899973

```
In [88]:  x_train= train_datagen.flow_from_directory(r"/content/drive/MyDrive/dataset/dataset/training_set",target_size=(64,64),class_mode="categorical",batch_s
```

Found 10324 images belonging to 9 classes.

```
In [89]:  x_test = test_datagen.flow_from_directory(r"/content/drive/MyDrive/dataset/dataset/test_set",target_size= (64,64),class_mode= "categorical",batch_size
```

Found 2280 images belonging to 9 classes.

```
In [90]:  x_train.class_indices
```

Out[90]: {'A': 0, 'B': 1, 'C': 2, 'D': 3, 'E': 4, 'F': 5, 'G': 6, 'H': 7, 'I': 8}

```
In [51]:  x_test.class_indices
```

Out[51]: {'A': 0, 'B': 1, 'C': 2, 'D': 3, 'E': 4, 'F': 5, 'G': 6, 'H': 7, 'I': 8}

MODEL BUILDING

```
In [91]:  from keras.models import Sequential
          from keras.layers import Dense
          from keras.layers import Convolution2D
          from tensorflow.keras.layers import Conv2D, MaxPooling2D
          from keras.layers import Dropout
          from keras.layers import Flatten
```

```python
In [92]:  model=Sequential()

In [93]:  model.add(Convolution2D(32,(3,3), input_shape=(64,64,1), activation = 'relu'))

In [94]:  model.add(MaxPooling2D(pool_size=(2,2)))

In [95]:  model.add(Flatten())

In [96]:  model.add(Dense( units=512, activation='relu'))

In [97]:  model.add(Dense(units=9, activation='softmax'))

In [98]:  model.compile(loss='categorical_crossentropy', optimizer='adam', metrics=['accuracy'])

In [99]:  model.save('Realtime.h5')

In [ ]:   a=len(x_train)
          b=len(x_test)
```

Length of training and testing data

```python
In [ ]:   print(a)
          print(b)
```

```
In [ ]:  print(a)
         print(b)

216
48
```
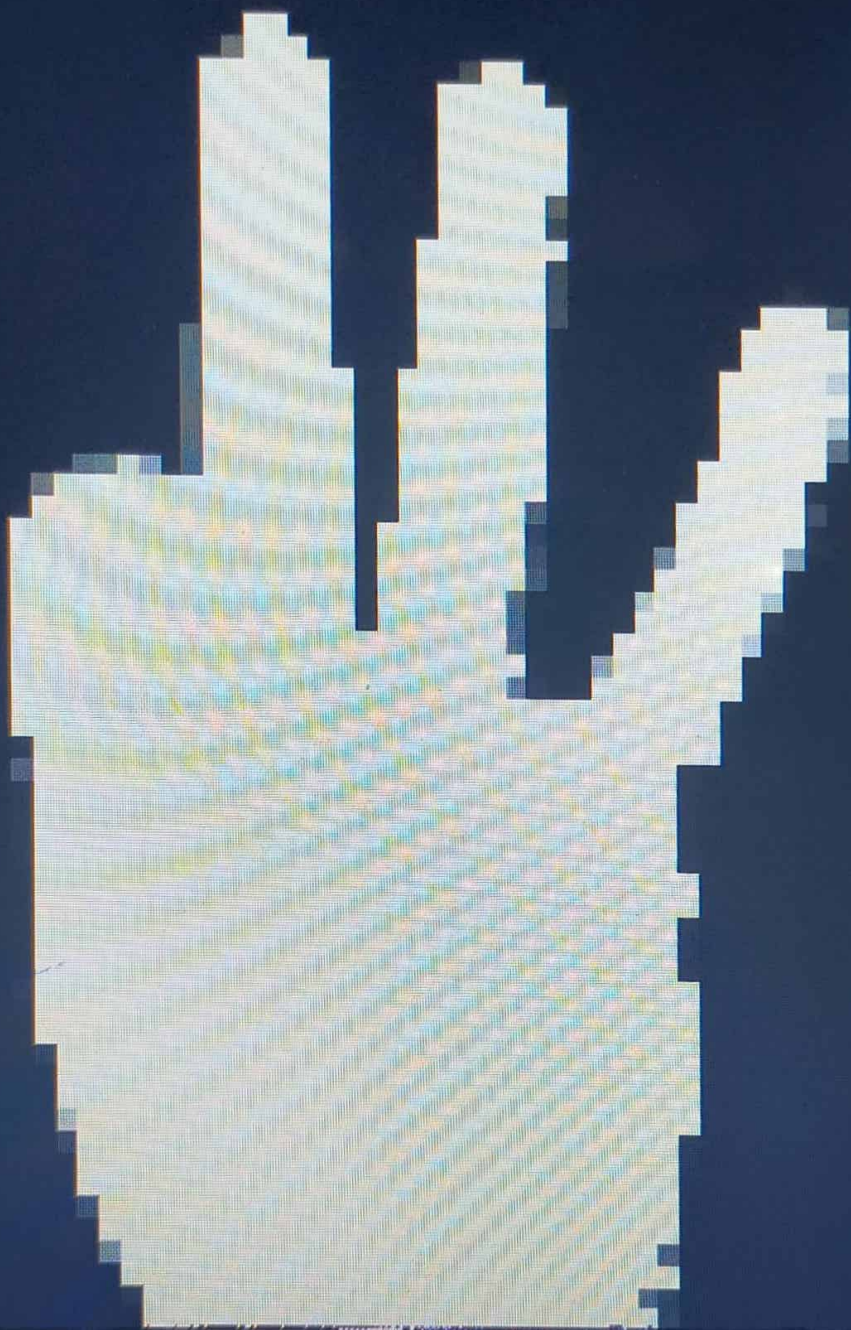
TEST THE MODEL

```
In [31]:  from tensorflow.keras.models import load_model
          from tensorflow.keras.preprocessing import image
          import numpy as np
          import cv2
```

```
In [32]:  img = image.load_img('/content/drive/MyDrive/dataset/dataset/test_set/F/107.png',target_size = (500,500))
          img
```

```
In [102...]
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 [101...]
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):
        prediction=model.predict(img)
        print(prediction)
        prediction=model.predict_classes(img)
        print(prediction)
```

```
In [39]:
arr= image.img_to_array(img)
```

```
In [34]:
frame=cv2.imread('/content/drive/MyDrive/dataset/dataset/test_set/F/107.png')
data=detect(frame)
from google.colab.patches import cv2_imshow
cv2_imshow(frame)
cv2.waitKey(0)
cv2.destroyAllWindows()
```

```
1/1 [==============================] - 0s 285ms/step
THE PREDICTED LETTER IS  I
```

THE PREDICTED LETTER IS I

In [79]:
```python
frame=cv2.imread('/content/drive/MyDrive/dataset/dataset/test_set/C/12.png')
data=detect(frame)
from google.colab.patches import cv2_imshow
cv2_imshow(frame)
cv2.waitKey(0)
cv2.destroyAllWindows()
```

```
1/1 [==============================] - 0s 78ms/step
THE PREDICTED LETTER IS  A
```


In [103_
```python
frame=cv2.imread('/content/drive/MyDrive/dataset/dataset/training_set/D/1008.png')
data=detect(frame)
from google.colab.patches import cv2_imshow
cv2_imshow(frame)
cv2.waitKey(0)
cv2.destroyAllWindows()
```

```
1/1 [==============================] - 0s 75ms/step
THE PREDICTED LETTER IS  E
```