

IMPORT LIBRARIES

In [156]:

```
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 cv2
```

unzip the file

In [1]:

```
!unzip '/content/drive/MyDrive/IBMPROJECT/conversation engine for deaf and
dumb.zip'
```

Streaming output truncated to the last 5000 lines.

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```

DATA AUGMENTATION

```
In [35]:
from keras.preprocessing.image import ImageDataGenerator
train_datagen=ImageDataGenerator(rescale = 1./255, shear_range=0.2,
zoom_range=0.2,horizontal_flip=True,vertical_flip=False)
test_datagen = ImageDataGenerator(rescale=1./255)
```

```
In [53]:
x_train =
train_datagen.flow_from_directory("/content/Dataset/training_set",
target_size=(64,64),batch_size=100,
                                class_mode='categorical',
color_mode ="grayscale")
Found 15750 images belonging to 9 classes.
```

```
In [54]:
x_test = test_datagen.flow_from_directory("/content/Dataset/test_set",
target_size=(64,64),batch_size=100,
                                class_mode='categorical',
color_mode ="grayscale")
Found 2250 images belonging to 9 classes.
```

```
In [55]:
len(x_train)
```

```
Out[55]:
158
```

```
In [56]:
len(x_test)
```

```
Out[56]:
23
```

```
In [57]:
x_train.class_indices
```

```
Out[57]:
{'A': 0, 'B': 1, 'C': 2, 'D': 3, 'E': 4, 'F': 5, 'G': 6, 'H': 7, 'I': 8}
```

MODEL BUILDING

```
In [40]:
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
```

```
In [101]:
```

```

#Creating the model
model=Sequential()
#Adding the layers
model.add(Convolution2D(32, (3,3), input_shape=(64,64,1), activation =
'relu'))
model.add(MaxPooling2D(pool_size=(2,2)))
model.add(Flatten())

#adding hidden layers
model.add(Dense(400, activation='relu'))
model.add(Dense(200, activation='relu'))
model.add(Dense(100, activation='relu'))

#Adding the output layer
model.add(Dense(9, activation='softmax'))

```

In [102]:

```

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

```

In [157]:

```

model.fit_generator(x_train, steps_per_epoch=30, epochs=10,
validation_data=x_test, validation_steps=50)

Epoch 1/10
/usr/local/lib/python3.7/dist-packages/ipykernel_launcher.py:1: UserWarning
: `Model.fit_generator` is deprecated and will be removed in a future versi
on. Please use `Model.fit`, which supports generators.
  """Entry point for launching an IPython kernel.
30/30 [=====] - ETA: 0s - loss: 0.0083 - accuracy:
0.9957
WARNING:tensorflow:Your input ran out of data; interrupting training. Make
sure that your dataset or generator can generate at least `steps_per_epoch
* epochs` batches (in this case, 50 batches). You may need to use the repea
t() function when building your dataset.
30/30 [=====] - 18s 587ms/step - loss: 0.0083 - ac
curacy: 0.9957 - val_loss: 0.2910 - val_accuracy: 0.9693
Epoch 2/10
30/30 [=====] - 12s 402ms/step - loss: 0.0081 - ac
curacy: 0.9980
Epoch 3/10
30/30 [=====] - 12s 400ms/step - loss: 0.0102 - ac
curacy: 0.9963
Epoch 4/10
30/30 [=====] - 12s 402ms/step - loss: 0.0049 - ac
curacy: 0.9993
Epoch 5/10
30/30 [=====] - 12s 402ms/step - loss: 0.0030 - ac
curacy: 0.9997
Epoch 6/10
30/30 [=====] - 12s 394ms/step - loss: 0.0019 - ac
curacy: 0.9997
Epoch 7/10
30/30 [=====] - 12s 401ms/step - loss: 0.0081 - ac
curacy: 0.9973
Epoch 8/10
30/30 [=====] - 12s 402ms/step - loss: 0.0124 - ac
curacy: 0.9960

```

```
Epoch 9/10
30/30 [=====] - 12s 401ms/step - loss: 0.0070 - ac
curacy: 0.9987
Epoch 10/10
30/30 [=====] - 12s 399ms/step - loss: 0.0089 - ac
curacy: 0.9973
```

Out[157]:

In [77]:

```
model.save('Real_time.h5')
```

TEST THE MODEL

In [104]:

```
from tensorflow.keras.models import load_model
from tensorflow.keras.preprocessing import image
import numpy as np
import cv2
```

In [105]:

```
model = load_model('/content/Real_time.h5')
```

In [151]:

```
img = image.load_img('/content/Dataset/test_set/H/107.png',target_size =
(100,100))
img
```

Out[151]:



In [149]:

```
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 [150]:

```
img=image.load_img("/content/Dataset/test_set/H/107.png")
detect(img)

1/1 [=====] - 0s 28ms/step
THE PREDICTED LETTER IS  H
```

In [155]:

```
img = image.load_img('/content/Dataset/test_set/A/110.png')
pred=detect(img)

1/1 [=====] - 0s 26ms/step
THE PREDICTED LETTER IS  A
```

In [158]:

```
img=image.load_img('/content/Dataset/test_set/E/111.png')
detect(img)
```

1/1 [=====] - 0s 30ms/step
THE PREDICTED LETTER IS E