

IBM Project Name: Real-Time Communication System Powered by AI for Specially Abled

TEAM ID: PNT2022TMID19449

Model Building

Import The Required Model Building Libraries

In [1]:

```
#import imagedatagenerator  
from keras.preprocessing.image import ImageDataGenerator
```

In [2]:

```
#training datagen  
train_datagen=ImageDataGenerator(rescale=1./255, shear_range=0.2, zoom_range=  
0.2, horizontal_flip=True)
```

In [3]:

```
#testing datagen  
test_datagen=ImageDataGenerator(rescale=1./255)
```

IMPORTING tensorflow

In [4]:

```
import tensorflow as tf  
import os
```

Initialize The Model

In [13]:

```
#create model  
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  
from tensorflow.keras.preprocessing.image import ImageDataGenerator
```

In [6]:

```
import numpy as np  
import matplotlib.pyplot as plt #to view graph in colab itself  
import IPython.display as display  
from PIL import Image  
import pathlib
```

Unzipping the dataset

In [7]:

```
!unzip '/content/conversation engine for deaf and dumb (1).zip'
```

Streaming output truncated to the last 5000 lines.

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inflating: Dataset/training_set/I/142.png  
inflating: Dataset/training_set/I/1420.png  
inflating: Dataset/training_set/I/1421.png  
inflating: Dataset/training_set/I/1422.png  
inflating: Dataset/training_set/I/1423.png  
extracting: Dataset/training_set/I/1424.png  
extracting: Dataset/training_set/I/1425.png  
extracting: Dataset/training_set/I/1426.png  
    inflating: Dataset/training_set/I/1427.png  
    inflating: Dataset/training_set/I/1428.png  
    inflating: Dataset/training_set/I/1429.png  
    inflating: Dataset/training_set/I/143.png  
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extracting: Dataset/training_set/I/1432.png  
extracting: Dataset/training_set/I/1433.png  
extracting: Dataset/training_set/I/1434.png  
    inflating: Dataset/training_set/I/1435.png  
extracting: Dataset/training_set/I/1436.png  
    inflating: Dataset/training_set/I/1437.png  
extracting: Dataset/training_set/I/1438.png  
    inflating: Dataset/training_set/I/1439.png  
    inflating: Dataset/training_set/I/144.png  
extracting: Dataset/training_set/I/1440.png  
extracting: Dataset/training_set/I/1441.png  
    inflating: Dataset/training_set/I/1442.png  
    inflating: Dataset/training_set/I/1443.png  
    inflating: Dataset/training_set/I/1444.png  
    inflating: Dataset/training_set/I/1445.png  
    inflating: Dataset/training_set/I/1446.png  
    inflating: Dataset/training_set/I/1447.png  
extracting: Dataset/training_set/I/1448.png  
extracting: Dataset/training_set/I/1449.png  
    inflating: Dataset/training_set/I/145.png  
extracting: Dataset/training_set/I/1450.png  
    inflating: Dataset/training_set/I/1451.png  
extracting: Dataset/training_set/I/1452.png  
    extracting: Dataset/training_set/I/1453.png  
extracting: Dataset/training set/I/1454.png
```

extracting: Dataset/training_set/I/1455.png
extracting: Dataset/training_set/I/1456.png
 inflating: Dataset/training_set/I/1457.png
 inflating: Dataset/training_set/I/1458.png
 inflating: Dataset/training_set/I/1459.png
 inflating: Dataset/training_set/I/146.png
 inflating: Dataset/training_set/I/1460.png
 inflating: Dataset/training_set/I/1461.png
 inflating: Dataset/training_set/I/1462.png
 inflating: Dataset/training_set/I/1463.png
 inflating: Dataset/training_set/I/1464.png
 inflating: Dataset/training_set/I/1465.png
 inflating: Dataset/training_set/I/1466.png
 inflating: Dataset/training_set/I/1467.png
extracting: Dataset/training_set/I/1468.png
extracting: Dataset/training_set/I/1469.png
 inflating: Dataset/training_set/I/147.png
extracting: Dataset/training_set/I/1470.png
 inflating: Dataset/training_set/I/1471.png
extracting: Dataset/training_set/I/1472.png
extracting: Dataset/training_set/I/1473.png
 inflating: Dataset/training_set/I/1474.png
 inflating: Dataset/training_set/I/1475.png
 inflating: Dataset/training_set/I/1476.png
 inflating: Dataset/training_set/I/1477.png
 inflating: Dataset/training_set/I/1478.png
 inflating: Dataset/training_set/I/1479.png
 inflating: Dataset/training_set/I/148.png
 inflating: Dataset/training_set/I/1480.png
 inflating: Dataset/training_set/I/1481.png
 inflating: Dataset/training_set/I/1482.png
extracting: Dataset/training_set/I/1483.png
 inflating: Dataset/training_set/I/1484.png
 inflating: Dataset/training_set/I/1485.png
extracting: Dataset/training_set/I/1486.png
extracting: Dataset/training_set/I/1487.png
 inflating: Dataset/training_set/I/1488.png
 inflating: Dataset/training_set/I/1489.png
 inflating: Dataset/training_set/I/149.png
 inflating: Dataset/training_set/I/1490.png
extracting: Dataset/training_set/I/1491.png
extracting: Dataset/training_set/I/1492.png
extracting: Dataset/training_set/I/1493.png
extracting: Dataset/training_set/I/1494.png
extracting: Dataset/training_set/I/1495.png
 inflating: Dataset/training_set/I/1496.png
extracting: Dataset/training_set/I/1497.png
 extracting: Dataset/training_set/I/1498.png
extracting: Dataset/training_set/I/1499.png
 inflating: Dataset/training_set/I/15.png
 inflating: Dataset/training_set/I/150.png
 inflating: Dataset/training_set/I/1500.png
extracting: Dataset/training_set/I/1501.png
extracting: Dataset/training_set/I/1502.png
 inflating: Dataset/training_set/I/1503.png
 inflating: Dataset/training_set/I/1504.png
extracting: Dataset/training_set/I/1505.png

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inflating: Dataset/training_set/I/1558.png
inflating: Dataset/training_set/I/1559.png
inflating: Dataset/training_set/I/156.png
inflating: Dataset/training_set/I/1560.png
extracting: Dataset/training_set/I/1561.png
inflating: Dataset/training_set/I/1562.png
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inflating: Dataset/training_set/I/1564.png
inflating: Dataset/training_set/I/1565.png
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extracting: Dataset/training_set/I/1567.png
inflating: Dataset/training_set/I/1568.png
extracting: Dataset/training_set/I/1569.png
inflating: Dataset/training_set/I/157.png
extracting: Dataset/training_set/I/1570.png
extracting: Dataset/training_set/I/1571.png
extracting: Dataset/training_set/I/1572.png
extracting: Dataset/training_set/I/1573.png
extracting: Dataset/training_set/I/1574.png
extracting: Dataset/training_set/I/1575.png
extracting: Dataset/training_set/I/1576.png
extracting: Dataset/training_set/I/1577.png
inflating: Dataset/training_set/I/1578.png
inflating: Dataset/training_set/I/1579.png
inflating: Dataset/training_set/I/158.png
inflating: Dataset/training_set/I/1580.png
inflating: Dataset/training_set/I/1581.png
inflating: Dataset/training_set/I/1582.png
inflating: Dataset/training_set/I/1583.png
extracting: Dataset/training_set/I/1584.png
inflating: Dataset/training_set/I/1585.png
 inflating: Dataset/training_set/I/1586.png
inflating: Dataset/training_set/I/1587.png
extracting: Dataset/training_set/I/1588.png
inflating: Dataset/training_set/I/1589.png
inflating: Dataset/training_set/I/159.png
inflating: Dataset/training_set/I/1590.png
inflating: Dataset/training_set/I/1591.png
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inflating: Dataset/training_set/I/1594.png
inflating: Dataset/training_set/I/1595.png
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inflating: Dataset/training_set/I/1597.png
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inflating: Dataset/training_set/I/160.png
inflating: Dataset/training_set/I/1600.png
inflating: Dataset/training_set/I/1601.png
inflating: Dataset/training_set/I/1602.png
inflating: Dataset/training_set/I/1603.png
extracting: Dataset/training_set/I/1604.png
inflating: Dataset/training_set/I/1605.png
extracting: Dataset/training_set/I/1606.png
inflating: Dataset/training_set/I/1607.png
inflating: Dataset/training_set/I/1608.png

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extracting: Dataset/training_set/I/1665.png
inflating: Dataset/training_set/I/1666.png
extracting: Dataset/training_set/I/1667.png
extracting: Dataset/training_set/I/1668.png
inflating: Dataset/training_set/I/1669.png
inflating: Dataset/training_set/I/167.png
inflating: Dataset/training_set/I/1670.png
extracting: Dataset/training_set/I/1671.png
extracting: Dataset/training_set/I/1672.png
extracting: Dataset/training_set/I/1673.png
inflating: Dataset/training_set/I/1674.png
inflating: Dataset/training_set/I/1675.png
inflating: Dataset/training_set/I/1676.png
inflating: Dataset/training_set/I/1677.png
extracting: Dataset/training_set/I/1678.png
inflating: Dataset/training_set/I/1679.png
inflating: Dataset/training_set/I/168.png
inflating: Dataset/training_set/I/1680.png
extracting: Dataset/training_set/I/1681.png
inflating: Dataset/training_set/I/1682.png
extracting: Dataset/training_set/I/1683.png
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inflating: Dataset/training_set/I/169.png
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extracting: Dataset/training_set/I/1704.png
inflating: Dataset/training_set/I/1705.png
inflating: Dataset/training_set/I/1706.png
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inflating: Dataset/training_set/I/1708.png
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inflating: Dataset/training_set/I/1710.png

inflating: Dataset/training_set/I/1711.png
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extracting: Dataset/training_set/I/1723.png
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 inflating: Dataset/training_set/I/1729.png
 inflating: Dataset/training_set/I/173.png
 inflating: Dataset/training_set/I/1730.png
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 inflating: Dataset/training_set/I/1735.png
extracting: Dataset/training_set/I/1736.png
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extracting: Dataset/training_set/I/1739.png
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 inflating: Dataset/training_set/I/1741.png
 inflating: Dataset/training_set/I/1742.png
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 inflating: Dataset/training_set/I/1747.png
 inflating: Dataset/training_set/I/1748.png
extracting: Dataset/training_set/I/1749.png
 inflating: Dataset/training_set/I/175.png
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 inflating: Dataset/training_set/I/184.png
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 inflating: Dataset/training_set/I/186.png
 inflating: Dataset/training_set/I/187.png

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

extracting: Dataset/training_set/I/444.png
inflating: Dataset/training_set/I/445.png
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extracting: Dataset/training_set/I/447.png
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inflating: Dataset/training_set/I/463.png
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inflating: Dataset/training_set/I/466.png
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extracting: Dataset/training_set/I/484.png
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inflating: Dataset/training_set/I/486.png
inflating: Dataset/training_set/I/487.png
extracting: Dataset/training_set/I/488.png
inflating: Dataset/training_set/I/489.png
extracting: Dataset/training_set/I/49.png
extracting: Dataset/training_set/I/490.png
extracting: Dataset/training_set/I/491.png
extracting: Dataset/training_set/I/492.png
extracting: Dataset/training_set/I/493.png
inflating: Dataset/training_set/I/494.png
extracting: Dataset/training_set/I/495.png

extracting: Dataset/training_set/I/496.png
extracting: Dataset/training_set/I/497.png
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extracting: Dataset/training_set/I/542.png
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 inflating: Dataset/training_set/I/545.png
 inflating: Dataset/training_set/I/546.png

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inflating: Dataset/training_set/I/65.png
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inflating: Dataset/training_set/I/676.png
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inflating: Dataset/training_set/I/681.png
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inflating: Dataset/training_set/I/693.png
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inflating: Dataset/training_set/I/699.png
extracting: Dataset/training_set/I/7.png
extracting: Dataset/training_set/I/70.png

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inflating: Dataset/training_set/I/754.png  
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inflating: Dataset/training_set/I/760.png  
    inflating: Dataset/training_set/I/760.png  
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inflating: Dataset/training_set/I/762.png  
inflating: Dataset/training_set/I/763.png  
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inflating: Dataset/training_set/I/766.png  
inflating: Dataset/training_set/I/767.png  
inflating: Dataset/training_set/I/768.png  
inflating: Dataset/training_set/I/769.png  
inflating: Dataset/training_set/I/770.png  
inflating: Dataset/training_set/I/771.png  
inflating: Dataset/training_set/I/772.png  
inflating: Dataset/training_set/I/773.png  
inflating: Dataset/training_set/I/774.png  
inflating: Dataset/training_set/I/775.png  
inflating: Dataset/training_set/I/776.png  
inflating: Dataset/training_set/I/777.png  
inflating: Dataset/training_set/I/778.png  
inflating: Dataset/training_set/I/779.png  
inflating: Dataset/training_set/I/780.png  
inflating: Dataset/training_set/I/781.png  
inflating: Dataset/training_set/I/782.png  
inflating: Dataset/training_set/I/783.png  
inflating: Dataset/training_set/I/784.png  
inflating: Dataset/training_set/I/785.png  
inflating: Dataset/training_set/I/786.png  
inflating: Dataset/training_set/I/787.png  
inflating: Dataset/training_set/I/788.png  
inflating: Dataset/training_set/I/789.png  
inflating: Dataset/training_set/I/790.png  
inflating: Dataset/training_set/I/791.png  
inflating: Dataset/training_set/I/792.png  
inflating: Dataset/training_set/I/793.png  
extracting: Dataset/training_set/I/794.png  
inflating: Dataset/training_set/I/795.png  
inflating: Dataset/training_set/I/796.png  
inflating: Dataset/training_set/I/797.png  
inflating: Dataset/training_set/I/798.png  
inflating: Dataset/training_set/I/799.png  
inflating: Dataset/training_set/I/800.png  
inflating: Dataset/training_set/I/801.png  
inflating: Dataset/training_set/I/802.png
```

[illegible]

extracting: Dataset/training_set/I/855.png
inflating: Dataset/training_set/I/856.png
inflating: Dataset/training_set/I/857.png
inflating: Dataset/training_set/I/858.png
inflating: Dataset/training_set/I/859.png
extracting: Dataset/training_set/I/86.png
inflating: Dataset/training_set/I/860.png
inflating: Dataset/training_set/I/861.png
inflating: Dataset/training_set/I/862.png
extracting: Dataset/training_set/I/863.png
inflating: Dataset/training_set/I/864.png
inflating: Dataset/training_set/I/865.png
inflating: Dataset/training_set/I/866.png
inflating: Dataset/training_set/I/867.png
extracting: Dataset/training_set/I/868.png
inflating: Dataset/training_set/I/869.png
inflating: Dataset/training_set/I/87.png
inflating: Dataset/training_set/I/870.png
inflating: Dataset/training_set/I/871.png
inflating: Dataset/training_set/I/872.png
inflating: Dataset/training_set/I/873.png
inflating: Dataset/training_set/I/874.png
inflating: Dataset/training_set/I/875.png
inflating: Dataset/training_set/I/876.png
inflating: Dataset/training_set/I/877.png
inflating: Dataset/training_set/I/878.png
inflating: Dataset/training_set/I/879.png
inflating: Dataset/training_set/I/88.png
inflating: Dataset/training_set/I/880.png
inflating: Dataset/training_set/I/881.png
inflating: Dataset/training_set/I/882.png
inflating: Dataset/training_set/I/883.png
inflating: Dataset/training_set/I/884.png
inflating: Dataset/training_set/I/885.png
extracting: Dataset/training_set/I/886.png
extracting: Dataset/training_set/I/887.png
inflating: Dataset/training_set/I/888.png
inflating: Dataset/training_set/I/889.png
inflating: Dataset/training_set/I/89.png
inflating: Dataset/training_set/I/890.png
inflating: Dataset/training_set/I/891.png
inflating: Dataset/training_set/I/892.png
inflating: Dataset/training_set/I/893.png
inflating: Dataset/training_set/I/894.png
inflating: Dataset/training_set/I/895.png
inflating: Dataset/training_set/I/896.png
inflating: Dataset/training_set/I/897.png
inflating: Dataset/training_set/I/898.png
inflating: Dataset/training_set/I/899.png
inflating: Dataset/training_set/I/9.png
inflating: Dataset/training_set/I/90.png
inflating: Dataset/training_set/I/900.png
inflating: Dataset/training_set/I/901.png
inflating: Dataset/training_set/I/902.png
inflating: Dataset/training_set/I/903.png
inflating: Dataset/training_set/I/904.png
extracting: Dataset/training_set/I/905.png

[illegible]


```

inflating: Dataset/training_set/I/958.png
inflating: Dataset/training_set/I/959.png
inflating: Dataset/training_set/I/96.png
inflating: Dataset/training_set/I/960.png
inflating: Dataset/training_set/I/961.png
inflating: Dataset/training_set/I/962.png
inflating: Dataset/training_set/I/963.png
inflating: Dataset/training_set/I/964.png
inflating: Dataset/training_set/I/965.png
inflating: Dataset/training_set/I/966.png
inflating: Dataset/training_set/I/967.png
inflating: Dataset/training_set/I/968.png
inflating: Dataset/training_set/I/969.png
inflating: Dataset/training_set/I/97.png
inflating: Dataset/training_set/I/970.png
inflating: Dataset/training_set/I/971.png
inflating: Dataset/training_set/I/972.png
extracting: Dataset/training_set/I/973.png
inflating: Dataset/training_set/I/974.png
inflating: Dataset/training_set/I/975.png
inflating: Dataset/training_set/I/976.png
inflating: Dataset/training_set/I/977.png
inflating: Dataset/training_set/I/978.png
inflating: Dataset/training_set/I/979.png
inflating: Dataset/training_set/I/98.png
inflating: Dataset/training_set/I/980.png
    inflating: Dataset/training_set/I/981.png
inflating: Dataset/training_set/I/982.png
extracting: Dataset/training_set/I/983.png
inflating: Dataset/training_set/I/984.png
inflating: Dataset/training_set/I/985.png
inflating: Dataset/training_set/I/986.png
inflating: Dataset/training_set/I/987.png
inflating: Dataset/training_set/I/988.png
inflating: Dataset/training_set/I/989.png
inflating: Dataset/training_set/I/99.png
inflating: Dataset/training_set/I/990.png
inflating: Dataset/training_set/I/991.png
inflating: Dataset/training_set/I/992.png
extracting: Dataset/training_set/I/993.png
inflating: Dataset/training_set/I/994.png
inflating: Dataset/training_set/I/995.png
extracting: Dataset/training_set/I/996.png
inflating: Dataset/training_set/I/997.png
inflating: Dataset/training_set/I/998.png
inflating: Dataset/training_set/I/999.png

```

Applying ImageDataGenerator to training set

In [8]:

```

x_train=train_datagen.flow_from_directory('/content/Dataset/training_set',t
arget_size=(64,64),batch_size=200,

```

```

class_mode='categorical',color_mode="grayscale")

```

Found 15750 images belonging to 9 classes.

Applying ImageDataGenerator to test set

```
In [9]:
x_test=test_datagen.flow_from_directory('/content/Dataset/test_set',target_
size=(64,64),batch_size=200,
```

```
class_mode='categorical',color_mode="grayscale")
```

Found 2250 images belonging to 9 classes.

```
In [10]:
a=len(x_train)
b=len(x_test)
```

Length of training set

```
In [11]:
print(a)
```

79

Length of test set

```
In [12]:
print(b)
```

12

Add Layers

```
In [15]:
#create model
model=Sequential()
```

Add The Convolution Layer

```
In [16]:
model.add(Convolution2D(32,(3,3),input_shape=(64,64,1),activation='relu'))
```

Add Pooling Layer

```
In [17]:
model.add(MaxPooling2D(pool_size=(2,2)))
```