

# 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/692.png  
inflating: Dataset/training\_set/I/693.png  
extracting: Dataset/training\_set/I/694.png  
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extracting: Dataset/training\_set/I/696.png  
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inflating: Dataset/training\_set/I/698.png  
inflating: Dataset/training\_set/I/699.png  
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extracting: Dataset/training\_set/I/700.png  
inflating: Dataset/training\_set/I/701.png  
inflating: Dataset/training\_set/I/702.png  
inflating: Dataset/training\_set/I/703.png  
inflating: Dataset/training\_set/I/704.png  
extracting: Dataset/training\_set/I/705.png  
inflating: Dataset/training\_set/I/706.png  
inflating: Dataset/training\_set/I/707.png  
inflating: Dataset/training\_set/I/708.png  
inflating: Dataset/training\_set/I/709.png  
inflating: Dataset/training\_set/I/71.png  
inflating: Dataset/training\_set/I/710.png

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inflating: Dataset/training\_set/I/866.png  
inflating: Dataset/training\_set/I/867.png  
extracting: Dataset/training\_set/I/868.png  
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inflating: Dataset/training\_set/I/883.png  
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inflating: Dataset/training\_set/I/885.png  
extracting: Dataset/training\_set/I/886.png  
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inflating: Dataset/training\_set/I/888.png  
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inflating: Dataset/training\_set/I/890.png  
inflating: Dataset/training\_set/I/891.png  
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inflating: Dataset/training\_set/I/899.png  
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inflating: Dataset/training\_set/I/90.png  
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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  
inflating: Dataset/training\_set/I/906.png  
inflating: Dataset/training\_set/I/907.png  
inflating: Dataset/training\_set/I/908.png  
inflating: Dataset/training\_set/I/909.png  
inflating: Dataset/training\_set/I/91.png  
inflating: Dataset/training\_set/I/910.png  
extracting: Dataset/training\_set/I/911.png  
extracting: Dataset/training\_set/I/912.png  
inflating: Dataset/training\_set/I/913.png  
inflating: Dataset/training\_set/I/914.png  
extracting: Dataset/training\_set/I/915.png  
inflating: Dataset/training\_set/I/916.png



[illegible]

```
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
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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',
target_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)))
```

### Add The Flatten Layer

```
In [18]:
model.add(Flatten())
```

### Adding The Dense Layers

```
In [19]:
#1st hidden layer
model.add(Dense(units=512, activation='relu'))
#2nd hidden layer
model.add(Dense(units=261, activation='relu'))
```

```
In [20]:
#output layer
model.add(Dense(units=9, activation='softmax'))
```

### Compile The Model

```
In [22]:
model.compile(loss='categorical_crossentropy', optimizer='adam', metrics=['accuracy'])
```

### Fit The Model

```
In [23]:
model.fit_generator(x_train, steps_per_epoch=len(x_train), epochs=10, validation_data=x_test, validation_steps=len(x_test))

/usr/local/lib/python3.7/dist-packages/ipykernel_launcher.py:1: UserWarning
: `Model.fit_generator` is deprecated and will be removed in a future version. Please use `Model.fit`, which supports generators.
    """Entry point for launching an IPython kernel.
Epoch 1/10
79/79 [=====] - 90s 1s/step - loss: 0.3965 - accuracy: 0.8746 - val_loss: 0.2797 - val_accuracy: 0.9529
Epoch 2/10
```

```
79/79 [=====] - 86s 1s/step - loss: 0.0419 - accur
acy: 0.9884 - val_loss: 0.2846 - val_accuracy: 0.9751
Epoch 3/10
79/79 [=====] - 84s 1s/step - loss: 0.0195 - accur
acy: 0.9947 - val_loss: 0.3436 - val_accuracy: 0.9751
Epoch 4/10
79/79 [=====] - 87s 1s/step - loss: 0.0083 - accur
acy: 0.9982 - val_loss: 0.3722 - val_accuracy: 0.9751
Epoch 5/10
79/79 [=====] - 83s 1s/step - loss: 0.0066 - accur
acy: 0.9983 - val_loss: 0.4095 - val_accuracy: 0.9756
Epoch 6/10
79/79 [=====] - 88s 1s/step - loss: 0.0072 - accur
acy: 0.9979 - val_loss: 0.3874 - val_accuracy: 0.9756
Epoch 7/10
79/79 [=====] - 86s 1s/step - loss: 0.0059 - accur
acy: 0.9985 - val_loss: 0.3891 - val_accuracy: 0.9747
Epoch 8/10
79/79 [=====] - 86s 1s/step - loss: 0.0027 - accur
acy: 0.9992 - val_loss: 0.4429 - val_accuracy: 0.9756
Epoch 9/10
79/79 [=====] - 84s 1s/step - loss: 0.0073 - accur
acy: 0.9981 - val_loss: 0.4907 - val_accuracy: 0.9756
Epoch 10/10
79/79 [=====] - 85s 1s/step - loss: 0.0048 - accur
acy: 0.9987 - val_loss: 0.4866 - val_accuracy: 0.9702
```

Out[23]:

Save The Model

In [27]:

```
model.save('aslpng2.h5')
```