

Date	12 November 2022
Team ID	PNT2022TMID46648
Project Name	Real-Time Communication System Powered by AI for Specially Abled
Marks	8

## IMPORT LIBRARIES

```

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
import zipfile

```

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

Streaming output truncated to the last 5000 lines.

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extracting: Dataset/training\_set/I/1673.png  
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inflating: Dataset/training\_set/I/1677.png  
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inflating: Dataset/training\_set/I/1682.png  
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inflating: Dataset/training\_set/I/1685.png  
inflating: Dataset/training\_set/I/1686.png  
inflating: Dataset/training\_set/I/1687.png  
inflating: Dataset/training\_set/I/1688.png  
inflating: Dataset/training\_set/I/1689.png  
inflating: Dataset/training\_set/I/169.png  
inflating: Dataset/training\_set/I/1690.png  
inflating: Dataset/training\_set/I/1691.png  
inflating: Dataset/training\_set/I/1692.png  
inflating: Dataset/training\_set/I/1693.png  
inflating: Dataset/training\_set/I/1694.png  
inflating: Dataset/training\_set/I/1695.png  
inflating: Dataset/training\_set/I/1696.png



inflating: Dataset/training\_set/I/1697.png  
inflating: Dataset/training\_set/I/1698.png  
inflating: Dataset/training\_set/I/1699.png  
inflating: Dataset/training\_set/I/17.png inflating:  
Dataset/training\_set/I/170.png inflating:  
Dataset/training\_set/I/1700.png  
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inflating: Dataset/training\_set/I/1702.png  
extracting: Dataset/training\_set/I/1703.png  
extracting: Dataset/training\_set/I/1704.png  
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inflating: Dataset/training\_set/I/1706.png  
inflating: Dataset/training\_set/I/1707.png  
inflating: Dataset/training\_set/I/1708.png  
inflating: Dataset/training\_set/I/1709.png  
inflating: Dataset/training\_set/I/171.png  
inflating: Dataset/training\_set/I/1710.png  
inflating: Dataset/training\_set/I/1711.png  
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inflating: Dataset/training\_set/I/1747.png

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[illegible]

[illegible]

[illegible]

Dataset/training\_set/I/370.png inflating:  
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Dataset/training\_set/I/379.png inflating:  
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Dataset/training\_set/I/381.png inflating:  
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Dataset/training\_set/I/383.png inflating:  
Dataset/training\_set/I/384.png extracting:  
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Dataset/training\_set/I/386.png extracting:  
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Dataset/training\_set/I/402.png extracting:  
Dataset/training\_set/I/403.png extracting:  
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inflating: Dataset/training\_set/I/470.png

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inflating:  
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Dataset/training\_set/I/517.png inflating:  
Dataset/training\_set/I/518.png inflating:  
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Dataset/training\_set/I/52.png inflating:



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inflating: Dataset/training\_set/I/572.png  
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extracting: Dataset/training\_set/I/574.png  
extracting: Dataset/training\_set/I/575.png  
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extracting: Dataset/training\_set/I/579.png  
inflating: Dataset/training\_set/I/58.png  
inflating:  
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Dataset/training\_set/I/581.png inflating:  
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Dataset/training\_set/I/611.png inflating:  
Dataset/training\_set/I/612.png inflating:  
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Dataset/training\_set/I/617.png inflating:  
Dataset/training\_set/I/618.png inflating:  
Dataset/training\_set/I/619.png inflating:  
Dataset/training\_set/I/62.png inflating:

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Dataset/training_set/I/670.png	inflating:
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Dataset/training_set/I/673.png	inflating:
Dataset/training_set/I/674.png	inflating:
Dataset/training_set/I/675.png	inflating:
Dataset/training_set/I/676.png	inflating:
Dataset/training_set/I/677.png	extracting:
Dataset/training_set/I/678.png	inflating:
Dataset/training_set/I/679.png	inflating:
Dataset/training_set/I/68.png	inflating:
Dataset/training_set/I/680.png	inflating:
Dataset/training_set/I/681.png	inflating:
Dataset/training_set/I/682.png	extracting:
Dataset/training_set/I/683.png	inflating:
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Dataset/training_set/I/688.png	inflating:
Dataset/training_set/I/689.png	inflating:
Dataset/training_set/I/69.png	inflating:
Dataset/training_set/I/690.png	inflating:
Dataset/training_set/I/691.png	inflating:
Dataset/training_set/I/692.png	inflating:
Dataset/training_set/I/693.png	extracting:
Dataset/training_set/I/694.png	inflating:
Dataset/training_set/I/695.png	extracting:
Dataset/training_set/I/696.png	extracting:
Dataset/training_set/I/697.png	inflating:
Dataset/training_set/I/698.png	inflating:
Dataset/training_set/I/699.png	extracting:
Dataset/training_set/I/7.png	extracting:
Dataset/training_set/I/70.png	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:
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Dataset/training_set/I/709.png	inflating:
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Dataset/training_set/I/718.png	inflating:
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Dataset/training_set/I/72.png	inflating:

Dataset/training\_set/I/720.png inflating:  
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Dataset/training\_set/I/729.png inflating:  
Dataset/training\_set/I/73.png inflating:  
Dataset/training\_set/I/730.png extracting:  
Dataset/training\_set/I/731.png inflating:  
Dataset/training\_set/I/732.png inflating:  
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Dataset/training\_set/I/735.png inflating:  
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extracting: Dataset/training\_set/I/740.png  
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inflating: Dataset/training\_set/I/763.png  
inflating: Dataset/training\_set/I/764.png  
extracting: Dataset/training\_set/I/765.png  
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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/77.png  
inflating: Dataset/training\_set/I/770.png

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inflating: Dataset/training\_set/I/885.png  
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extracting: Dataset/training\_set/I/887.png  
inflating: Dataset/training\_set/I/888.png  
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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 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 inflating:  
Dataset/training\_set/I/917.png inflating:  
Dataset/training\_set/I/918.png inflating:  
Dataset/training\_set/I/919.png inflating:  
Dataset/training\_set/I/92.png inflating:



[illegible]

```

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

```

## DATA AUGMENTATION

```

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)

```

```

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.

```

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.

```
len(x_train)
```

```
158
```

```
len(x_test)
```

```
x_train.class_indices
```

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

## MODEL BUILDING

```
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
```

```
#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'))
```

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

```
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 deprecate
d and will be removed in a future version. 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 generato
r can generate at least `steps_per_epoch * epochs` batches (in this case, 50 batches). You may need to use the re
peat() function when building your dataset.
```

```
30/30 [=====] - 18s 587ms/step - loss: 0.0083 - accuracy: 0.9957 - val_loss:
0.2910 - val_accuracy: 0.9693
```

```
Epoch 2/10
```

```
30/30 [=====] - 12s 402ms/step - loss: 0.0081 - accuracy: 0.9980
```

```
Epoch 3/10
```

```
30/30 [=====] - 12s 400ms/step - loss: 0.0102 - accuracy: 0.9963
```

```
Epoch 4/10
```

```
30/30 [=====] - 12s 402ms/step - loss: 0.0049 - accuracy: 0.9993
```

```
Epoch 5/10
```

```
30/30 [=====] - 12s 402ms/step - loss: 0.0030 - accuracy: 0.9997
```

```
Epoch 6/10
```

```
30/30 [=====] - 12s 394ms/step - loss: 0.0019 - accuracy: 0.9997
```

```
Epoch 7/10
```

```
30/30 [=====] - 12s 401ms/step - loss: 0.0081 - accuracy: 0.9973
```

```
Epoch 8/10
```

```
30/30 [=====] - 12s 402ms/step - loss: 0.0124 - accuracy: 0.9960
```

```
Epoch 9/10
```

```
30/30 [=====] - 12s 401ms/step - loss: 0.0070 - accuracy: 0.9987
```

Epoch 10/10

30/30 [=====] - 12s 399ms/step - loss: 0.0089 - accuracy: 0.9973

model.save('Real\_time.h5')

## TEST THE MODEL

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

```
model = load_model('/content/Real_time.h5')
img = image.load_img('/content/Dataset/test_set/H/107.png', target_size=(100,100))
img = cv2.imread(img)
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])

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

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

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

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

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

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