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

TEAM ID: PNT2022TMID30475

```python
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

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!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/G/480.png
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extracting: Dataset/training_set/G/483.png
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extracting: Dataset/training_set/G/487.png
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inflating: Dataset/training_set/G/490.png
inflating: Dataset/training_set/G/491.png
inflating: Dataset/training_set/G/492.png
inflating: Dataset/training_set/G/493.png
inflating: Dataset/training_set/G/494.png
inflating: Dataset/training_set/G/495.png
inflating: Dataset/training_set/G/496.png
inflating: Dataset/training_set/G/497.png
inflating: Dataset/training_set/G/498.png
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inflating: Dataset/training_set/G/500.png

inflating: Dataset/training_set/G/501.png

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inflating: Dataset/training_set/I/533.png

extracting: Dataset/training_set/I/534.png

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inflating: Dataset/training_set/I/540.png

extracting: Dataset/training_set/I/541.png

extracting: Dataset/training_set/I/542.png

inflating: Dataset/training_set/I/543.png

inflating: Dataset/training_set/I/544.png

inflating: Dataset/training_set/I/545.png
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inflating: Dataset/training_set/I/568.png

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inflating: Dataset/training_set/I/612.png
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extracting: Dataset/training_set/I/887.png

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  inflating: Dataset/training_set/I/904.png

extracting: Dataset/training_set/I/905.png
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inflating: Dataset/training_set/I/923.png

inflating: Dataset/training_set/I/924.png

inflating: Dataset/training_set/I/925.png

inflating: Dataset/training_set/I/926.png

inflating: Dataset/training_set/I/927.png

inflating: Dataset/training_set/I/928.png

inflating: Dataset/training_set/I/929.png

inflating: Dataset/training_set/I/93.png

inflating: Dataset/training_set/I/930.png

inflating: Dataset/training_set/I/931.png

inflating: Dataset/training_set/I/932.png

inflating: Dataset/training_set/I/933.png

inflating: Dataset/training_set/I/934.png

inflating: Dataset/training_set/I/935.png

inflating: Dataset/training_set/I/936.png

inflating: Dataset/training_set/I/937.png

inflating: Dataset/training_set/I/938.png

inflating: Dataset/training_set/I/939.png

inflating: Dataset/training_set/I/94.png

inflating: Dataset/training_set/I/940.png

inflating: Dataset/training_set/I/941.png

inflating: Dataset/training_set/I/942.png

inflating: Dataset/training_set/I/943.png

inflating: Dataset/training_set/I/944.png

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inflating: Dataset/training_set/I/946.png

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inflating: Dataset/training_set/I/948.png

inflating: Dataset/training_set/I/949.png

inflating: Dataset/training_set/I/95.png

inflating: Dataset/training_set/I/950.png

inflating: Dataset/training_set/I/951.png

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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

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)

23

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

```python
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 deprecated 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 generator can generate at least `steps_per_epoch * epochs` batches (in this case, 50

batches). You may need to use the repeat() 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


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
```