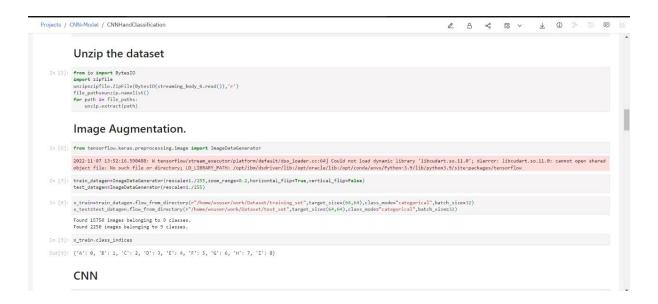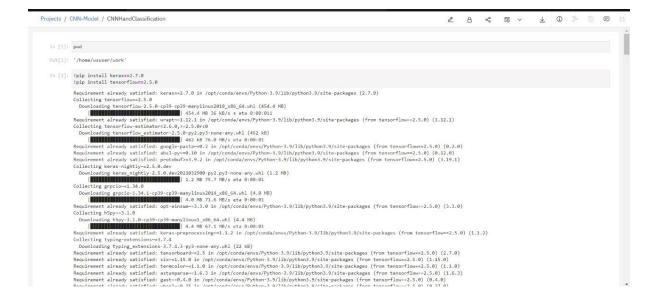# Sprint 2 (Obtain the dataset and train and model creation)

- Using the data set from the zip file and process that dataset into image augmentation and data generator
- Train the data gen and test data gen for the manipulating of the image
- Reshape the images in the target size store In x_train and x_test
- Implementing the Convolution neural networks for classification and using TensorFlow and keras forming a two dimensional layer as max pooling where it a pooling operation that selects the maximum element from the region of the feature map covered by the filter.
- Then the max pooling layer and flatten layer use activation functions **relu** in the hidden layer using filters=32 and max pooling layer =2,2 and then adding hidden layer
- Implementing activating functions providing SoftMax and output compile the model using optimizer -Adam loss

Unzip the dataset

```
In [5]: from io import BytesIO
        import zipfile
        unzip=zipfile.ZipFile(BytesIO(streaming_body_6.read()),'r')
        file_paths=unzip.namelist()
        for path in file_paths:
            unzip.extract(path)
```

Image Augmentation.

```
In [6]: from tensorflow.keras.preprocessing.image import ImageDataGenerator
```

```
2022-11-07 13:52:16.590488: W tensorflow/stream_executor/platform/default/dso_loader.cc:64] Could not load dynamic library 'libcudart.so.11.0'; dlerror: libcudart.so.11.0: cannot open shared object file: No such file or directory; LD_LIBRARY_PATH: /opt/ibm/dsdriver/lib:/opt/oracle/lib:/opt/conda/envs/Python-3.9/lib/python3.9/site-packages/tensorflow
```

```
In [7]: train_datagen=ImageDataGenerator(rescale=1./255,zoom_range=0.2,horizontal_flip=True,vertical_flip=False)
        test_datagen=ImageDataGenerator(rescale=1./255)
```

```
In [8]: x_train=train_datagen.flow_from_directory(r"/home/wsuser/work/Dataset/training_set",target_size=(64,64),class_mode="categorical",batch_size=32)
        x_test=test_datagen.flow_from_directory(r"/home/wsuser/work/Dataset/test_set",target_size=(64,64),class_mode="categorical",batch_size=32)
```

```
Found 15750 images belonging to 9 classes.
Found 2250 images belonging to 9 classes.
```

```
In [9]: x_train.class_indices
```

```
Out[9]: {'A': 0, 'B': 1, 'C': 2, 'D': 3, 'E': 4, 'F': 5, 'G': 6, 'H': 7, 'I': 8}
```

CNN

```
Successfully uninstalled tensorflow 2.7.1
ERROR: pip's dependency resolver does not currently take into account all the packages that are installed. This behaviour is the source of the following dependency conflicts.
tensorflow-text 2.7.3 requires tensorflow<2.8,>=2.7.0, but you have tensorflow 2.5.0 which is incompatible.
pytorch-lightning 1.6.5 requires typing-extensions>=4.0.0, but you have typing-extensions 3.7.4.3 which is incompatible.
autoai-ts-libs 1.1.9 requires tensorflow<2.8,>=2.7.0; python_version >= "3.9", but you have tensorflow 2.5.0 which is incompatible.
Successfully installed flatbuffers-1.12 grpcio-1.34.1 h5py-3.1.0 keras-nightly-2.5.0.dev2021032900 numpy-1.19.5 tensorflow-2.5.0 tensorflow-estimator-2.5.0 typing-extensions-3.7.4.3
```

Loading the dataset

```python
In [137... import os, types
         import pandas as pd
         from botocore.client import Config
         import ibm_boto3

         def __iter__(self): return 0

         # @hidden_cell
         # The following code accesses a file in your IBM Cloud Object Storage. It includes your credentials.
         # You might want to remove those credentials before you share the notebook.
         cos_client = ibm_boto3.client(service_name='s3',
             ibm_api_key_id='bu2-Fr134koAuABacUdHSAkX2QGbii41Mbpa9EoUgJx4',
             ibm_auth_endpoint="https://iam.cloud.ibm.com/oidc/token",
             config=Config(signature_version='oauth'),
             endpoint_url='https://s3.private.us.cloud-object-storage.appdomain.cloud')

         bucket = 'cnnmodel-donotdelete-pr-idhobzhssx2cyu'
         object_key = 'conversation engine for deaf and dumb.zip'

         streaming_body_6 = cos_client.get_object(Bucket=bucket, Key=object_key)['Body']

         # Your data file was loaded into a botocore.response.StreamingBody object.
         # Please read the documentation of ibm_boto3 and pandas to learn more about the possibilities to load the data.
         # ibm_boto3 documentation: https://ibm.github.io/ibm-cos-sdk-python/
         # pandas documentation: http://pandas.pydata.org/
```

```
Requirement already satisfied: termcolor~=1.1.0 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorflow==2.5.0) (1.1.0)
Requirement already satisfied: astunparse~=1.6.3 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorflow==2.5.0) (1.6.3)
Requirement already satisfied: gast==0.4.0 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorflow==2.5.0) (0.4.0)
Requirement already satisfied: wheel~=0.35 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorflow==2.5.0) (0.37.0)
Collecting flatbuffers~=1.12.0
  Downloading flatbuffers-1.12-py2.py3-none-any.whl (15 kB)
Collecting numpy~=1.19.2
  Downloading numpy-1.19.5-cp39-cp39-manylinux2010_x86_64.whl (14.9 MB)
     |████████████████████████████████| 14.9 MB 77.1 MB/s eta 0:00:01
Requirement already satisfied: google-auth-oauthlib<0.5,>=0.4.1 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorboard~=2.5->tensorflow==2.5.0) (0.4.4)
Requirement already satisfied: markdown>=2.6.8 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorboard~=2.5->tensorflow==2.5.0) (3.3.3)
Requirement already satisfied: tensorboard-data-server<0.7.0,>=0.6.0 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorboard~=2.5->tensorflow==2.5.0) (0.6.1)
Requirement already satisfied: tensorboard-plugin-wit>=1.6.0 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorboard~=2.5->tensorflow==2.5.0) (1.6.0)
Requirement already satisfied: werkzeug>=0.11.15 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorboard~=2.5->tensorflow==2.5.0) (2.0.2)
Requirement already satisfied: requests<3,>=2.21.0 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorboard~=2.5->tensorflow==2.5.0) (2.26.0)
Requirement already satisfied: setuptools>=41.0.0 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorboard~=2.5->tensorflow==2.5.0) (58.0.4)
Requirement already satisfied: google-auth<3,>=1.6.3 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorboard~=2.5->tensorflow==2.5.0) (1.23.0)
Requirement already satisfied: rsa<5,>=3.1.4 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from google-auth<3,>=1.6.3->tensorboard~=2.5->tensorflow==2.5.0) (4.7.2)
Requirement already satisfied: cachetools<5.0,>=2.0.0 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from google-auth<3,>=1.6.3->tensorboard~=2.5->tensorflow==2.5.0) (4.2.2)
Requirement already satisfied: pyasn1-modules>=0.2.1 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from google-auth<3,>=1.6.3->tensorboard~=2.5->tensorflow==2.5.0) (0.2.8)
Requirement already satisfied: requests-oauthlib>=0.7.0 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from google-auth-oauthlib<0.5,>=0.4.1->tensorboard~=2.5->tensorflow==2.5.0)
(1.3.0)
Requirement already satisfied: pyasn1<0.5.0,>=0.4.6 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from pyasn1-modules>=0.2.1->google-auth<3,>=1.6.3->tensorboard~=2.5->tensorflow=
=2.5.0) (0.4.8)
Requirement already satisfied: urllib3<1.27,>=1.21.1 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from requests<3,>=2.21.0->tensorboard~=2.5->tensorflow==2.5.0) (1.26.7)
Requirement already satisfied: certifi>=2017.4.17 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from requests<3,>=2.21.0->tensorboard~=2.5->tensorflow==2.5.0) (2022.9.24)
Requirement already satisfied: charset-normalizer~=2.0.0 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from requests<3,>=2.21.0->tensorboard~=2.5->tensorflow==2.5.0) (2.0.4)
Requirement already satisfied: idna<4,>=2.5 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from requests<3,>=2.21.0->tensorboard~=2.5->tensorflow==2.5.0) (3.3)
Requirement already satisfied: oauthlib>=3.0.0 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from requests-oauthlib>=0.7.0->google-auth-oauthlib<0.5,>=0.4.1->tensorboard~=2.5->te
nsorflow==2.5.0) (3.2.1)
Installing collected packages: numpy, grpcio, typing-extensions, tensorflow-estimator, keras-nightly, h5py, flatbuffers, tensorflow
  Attempting uninstall: numpy
    Found existing installation: numpy 1.20.3
    Uninstalling numpy-1.20.3:
      Successfully uninstalled numpy-1.20.3
  Attempting uninstall: grpcio
    Found existing installation: grpcio 1.42.0
    Uninstalling grpcio-1.42.0:
      Successfully uninstalled grpcio-1.42.0
```

```
In [1]: pwd
```

```
Out[1]: '/home/wsuser/work'
```

```
In [2]: !pip install keras==2.7.0
        !pip install tensorflow==2.5.0
```

```
Requirement already satisfied: keras==2.7.0 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (2.7.0)
Collecting tensorflow==2.5.0
  Downloading tensorflow-2.5.0-cp39-cp39-manylinux2010_x86_64.whl (454.4 MB)
     |████████████████████████████████| 454.4 MB 36 kB/s s eta 0:00:011
Requirement already satisfied: wrapt~=1.12.1 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorflow==2.5.0) (1.12.1)
Collecting tensorflow-estimator<2.6.0,>=2.5.0rc0
  Downloading tensorflow_estimator-2.5.0-py2.py3-none-any.whl (462 kB)
     |████████████████████████████████| 462 kB 76.0 MB/s eta 0:00:01
Requirement already satisfied: google-pasta~=0.2 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorflow==2.5.0) (0.2.0)
Requirement already satisfied: absl-py~=0.10 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorflow==2.5.0) (0.12.0)
Requirement already satisfied: protobuf>=3.9.2 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorflow==2.5.0) (3.19.1)
Collecting keras-nightly~=2.5.0.dev
  Downloading keras_nightly-2.5.0.dev2021032900-py2.py3-none-any.whl (1.2 MB)
     |████████████████████████████████| 1.2 MB 75.7 MB/s eta 0:00:01
Collecting grpcio~=1.34.0
  Downloading grpcio-1.34.1-cp39-cp39-manylinux2014_x86_64.whl (4.0 MB)
     |████████████████████████████████| 4.0 MB 71.6 MB/s eta 0:00:01
Requirement already satisfied: opt-einsum~=3.3.0 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorflow==2.5.0) (3.3.0)
Collecting h5py~=3.1.0
  Downloading h5py-3.1.0-cp39-cp39-manylinux1_x86_64.whl (4.4 MB)
     |████████████████████████████████| 4.4 MB 67.1 MB/s eta 0:00:01
Requirement already satisfied: keras-preprocessing~=1.1.2 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorflow==2.5.0) (1.1.2)
Collecting typing-extensions~=3.7.4
  Downloading typing_extensions-3.7.4.3-py3-none-any.whl (22 kB)
Requirement already satisfied: tensorboard~=2.5 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorflow==2.5.0) (2.7.0)
Requirement already satisfied: six~=1.15.0 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorflow==2.5.0) (1.15.0)
Requirement already satisfied: termcolor~=1.1.0 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorflow==2.5.0) (1.1.0)
Requirement already satisfied: astunparse~=1.6.3 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorflow==2.5.0) (1.6.3)
Requirement already satisfied: gast==0.4.0 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorflow==2.5.0) (0.4.0)
```

CNN

```
In [10]: from tensorflow.keras.models import Sequential
         from tensorflow.keras.layers import Dense,Convolution2D,MaxPooling2D,Flatten
```

```
In [11]: model=Sequential()
         model.add(Convolution2D(32,(3,3),input_shape=(64,64,3),activation='relu'))
         model.add(MaxPooling2D(pool_size=(2,2)))
         model.add(Flatten())
```

```
2022-11-07 13:52:20.325670: W tensorflow/stream_executor/platform/default/dso_loader.cc:64] Could not load dynamic library 'libcuda.so.1'; dlerror: libcuda.so.1: cannot open shared object fil
e: No such file or directory; LD_LIBRARY_PATH: /opt/ibm/dsdriver/lib:/opt/oracle/lib:/opt/conda/envs/Python-3.9/lib/python3.9/site-packages/tensorflow
2022-11-07 13:52:20.325705: W tensorflow/stream_executor/cuda/cuda_driver.cc:326] failed call to cuInit: UNKNOWN ERROR (303)
```

```
In [12]: model.summary()
```

```
Model: "sequential"
_____
Layer (type)                 Output Shape              Param #
=================================================================
conv2d (Conv2D)              (None, 62, 62, 32)        896

max_pooling2d (MaxPooling2D) (None, 31, 31, 32)        0

flatten (Flatten)            (None, 30752)             0
=================================================================
Total params: 896
Trainable params: 896
Non-trainable params: 0
_____
```

Hidden Layers

```
In [13]: model.add(Dense(units=300,kernel_initializer = "uniform",activations= "relu" ))
         model.add(Dense(units=150,kernel_initializer="uniform",activation="relu"))
```

```
In [13]:  model.add(Dense(units=300,kernel_initializer = "uniform",activation= "relu" ))
          model.add(Dense(units=150,kernel_initializer="uniform",activation="relu"))
```

Output Layers

```
In [14]:  model.add(Dense(units=9,activation="softmax"))
```

Compiling the model

```
In [15]:  model.compile(optimizer="adam",loss="categorical_crossentropy",metrics=["accuracy"])
```

```
In [16]:  model.fit_generator(x_train,steps_per_epoch=493,epochs=20,validation_data=x_test,validation_steps=71)
```

```
/opt/conda/envs/Python-3.9/lib/python3.9/site-packages/tensorflow/python/keras/engine/training.py:1940: UserWarning: `Model.fit_generator` is deprecated and will be removed in a future versio
n. Please use `Model.fit`, which supports generators.
  warnings.warn('`Model.fit_generator` is deprecated and '
Epoch 1/20
493/493 [==============================] - 69s 140ms/step - loss: 0.1718 - accuracy: 0.9422 - val_loss: 0.2556 - val_accuracy: 0.9676
Epoch 2/20
493/493 [==============================] - 68s 137ms/step - loss: 0.0245 - accuracy: 0.9919 - val_loss: 0.4197 - val_accuracy: 0.9716
Epoch 3/20
493/493 [==============================] - 67s 136ms/step - loss: 0.0196 - accuracy: 0.9931 - val_loss: 0.3413 - val_accuracy: 0.9751
Epoch 4/20
493/493 [==============================] - 68s 139ms/step - loss: 0.0140 - accuracy: 0.9957 - val_loss: 0.3298 - val_accuracy: 0.9760
Epoch 5/20
493/493 [==============================] - 68s 137ms/step - loss: 0.0133 - accuracy: 0.9957 - val_loss: 0.3155 - val_accuracy: 0.9769
Epoch 6/20
493/493 [==============================] - 67s 135ms/step - loss: 0.0104 - accuracy: 0.9971 - val_loss: 0.1956 - val_accuracy: 0.9809
Epoch 7/20
493/493 [==============================] - 68s 137ms/step - loss: 0.0117 - accuracy: 0.9966 - val_loss: 0.3471 - val_accuracy: 0.9729
Epoch 8/20
493/493 [==============================] - 66s 133ms/step - loss: 0.0090 - accuracy: 0.9966 - val_loss: 0.3655 - val_accuracy: 0.9760
Epoch 9/20
```

```
In [13]:  model.add(Dense(units=300,kernel_initializer = "uniform",activation= "relu" ))
          model.add(Dense(units=150,kernel_initializer="uniform",activation="relu"))
```

Output Layers

```
In [14]:  model.add(Dense(units=9,activation="softmax"))
```

Compiling the model

```
In [15]:  model.compile(optimizer="adam",loss="categorical_crossentropy",metrics=["accuracy"])
```