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

TEAM ID: PNT2022TMID47570

IBM WATSON STUDIO DEPLOYMENT CODE

1.INSTALLING THE KERAS ,INSTALLING THE TENSORFLOW

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

Out[1]:
```
'C:\\Users\\ELCOT'
```

In [13]:
```
!pip install keras==2.2.4
!pip install tensorflow==2.8.0
```

```
Requirement already satisfied: keras==2.2.4 in c:\users\elcot\appdata\local\programs\pyth
on\python310\lib\site-packages (2.2.4)
[notice] A new release of pip available: 22.2.2 -> 22.3.1
[notice] To update, run: C:\Users\ELCOT\AppData\Local\Programs\Python\Python310\python.e
xe -m pip install --upgrade pip
Requirement already satisfied: keras-applications>=1.0.6 in c:\users\elcot\appdata\local
\programs\python\python310\lib\site-packages (from keras==2.2.4) (1.0.8)
Requirement already satisfied: keras-preprocessing>=1.0.5 in c:\users\elcot\appdata\loca
l\programs\python\python310\lib\site-packages (from keras==2.2.4) (1.1.2)
Requirement already satisfied: six>=1.9.0 in c:\users\elcot\appdata\local\programs\pytho
n\python310\lib\site-packages (from keras==2.2.4) (1.16.0)
Requirement already satisfied: pyyaml in c:\users\elcot\appdata\local\programs\python\py
thon310\lib\site-packages (from keras==2.2.4) (6.0)
Requirement already satisfied: h5py in c:\users\elcot\appdata\local\programs\python\pyth
on310\lib\site-packages (from keras==2.2.4) (3.7.0)
Requirement already satisfied: scipy>=0.14 in c:\users\elcot\appdata\local\programs\pyth
on\python310\lib\site-packages (from keras==2.2.4) (1.9.3)
Requirement already satisfied: numpy>=1.9.1 in c:\users\elcot\appdata\local\programs\pyt
hon\python310\lib\site-packages (from keras==2.2.4) (1.23.4)
Requirement already satisfied: tensorflow==2.8.0 in c:\users\elcot\appdata\local\program
s\python\python310\lib\site-packages (2.8.0)
Requirement already satisfied: protobuf>=3.9.2 in c:\users\elcot\appdata\local\programs
\python\python310\lib\site-packages (from tensorflow==2.8.0) (4.21.9)
Requirement already satisfied: opt-einsum>=2.3.2 in c:\users\elcot\appdata\local\program
s\python\python310\lib\site-packages (from tensorflow==2.8.0) (3.3.0)
Requirement already satisfied: tensorboard<2.9,>=2.8 in c:\users\elcot\appdata\local\pro
grams\python\python310\lib\site-packages (from tensorflow==2.8.0) (2.8.0)
Requirement already satisfied: tf-estimator-nightly==2.8.0.dev2021122109 in c:\users\elc
ot\appdata\local\programs\python\python310\lib\site-packages (from tensorflow==2.8.0)
(2.8.0.dev2021122109)
Requirement already satisfied: gast>=0.2.1 in c:\users\elcot\appdata\local\programs\pyth
on\python310\lib\site-packages (from tensorflow==2.8.0) (0.5.3)
Requirement already satisfied: setuptools in c:\users\elcot\appdata\local\programs\pytho
```

```
n\python310\lib\site-packages (from tensorflow==2.8.0) (63.2.0)
Collecting keras<2.9,>=2.8.0rc0
  Using cached keras-2.8.0-py2.py3-none-any.whl (1.4 MB)
Requirement already satisfied: astunparse>=1.6.0 in c:\users\elcot\appdata\local\program
s\python\python310\lib\site-packages (from tensorflow==2.8.0) (1.6.3)
Requirement already satisfied: google-pasta>=0.1.1 in c:\users\elcot\appdata\local\progr
ams\python\python310\lib\site-packages (from tensorflow==2.8.0) (0.2.0)
Requirement already satisfied: absl-py>=0.4.0 in c:\users\elcot\appdata\local\programs\p
ython\python310\lib\site-packages (from tensorflow==2.8.0) (1.3.0)
Requirement already satisfied: h5py>=2.9.0 in c:\users\elcot\appdata\local\programs\pyth
on\python310\lib\site-packages (from tensorflow==2.8.0) (3.7.0)
Requirement already satisfied: numpy>=1.20 in c:\users\elcot\appdata\local\programs\pyth
on\python310\lib\site-packages (from tensorflow==2.8.0) (1.23.4)
Requirement already satisfied: tensorflow-io-gcs-filesystem>=0.23.1 in c:\users\elcot\ap
pdata\local\programs\python\python310\lib\site-packages (from tensorflow==2.8.0) (0.27.
0)
Requirement already satisfied: typing-extensions>=3.6.6 in c:\users\elcot\appdata\local
\programs\python\python310\lib\site-packages (from tensorflow==2.8.0) (4.4.0)
Requirement already satisfied: grpcio<2.0,>=1.24.3 in c:\users\elcot\appdata\local\progr
ams\python\python310\lib\site-packages (from tensorflow==2.8.0) (1.50.0)
Requirement already satisfied: termcolor>=1.1.0 in c:\users\elcot\appdata\local\programs
\python\python310\lib\site-packages (from tensorflow==2.8.0) (2.1.0)
Requirement already satisfied: wrapt>=1.11.0 in c:\users\elcot\appdata\local\programs\py
thon\python310\lib\site-packages (from tensorflow==2.8.0) (1.14.1)
Requirement already satisfied: six>=1.12.0 in c:\users\elcot\appdata\local\programs\pyth
on\python310\lib\site-packages (from tensorflow==2.8.0) (1.16.0)
Requirement already satisfied: libclang>=9.0.1 in c:\users\elcot\appdata\local\programs
\python\python310\lib\site-packages (from tensorflow==2.8.0) (14.0.6)
Requirement already satisfied: flatbuffers>=1.12 in c:\users\elcot\appdata\local\program
s\python\python310\lib\site-packages (from tensorflow==2.8.0) (22.10.26)
Requirement already satisfied: keras-preprocessing>=1.1.1 in c:\users\elcot\appdata\loca
l\programs\python\python310\lib\site-packages (from tensorflow==2.8.0) (1.1.2)
Requirement already satisfied: wheel<1.0,>=0.23.0 in c:\users\elcot\appdata\local\progra
ms\python\python310\lib\site-packages (from astunparse>=1.6.0->tensorflow==2.8.0) (0.38.
2)
Requirement already satisfied: google-auth<3,>=1.6.3 in c:\users\elcot\appdata\local\pro
grams\python\python310\lib\site-packages (from tensorboard<2.9,>=2.8->tensorflow==2.8.0)
(2.14.1)
Requirement already satisfied: requests<3,>=2.21.0 in c:\users\elcot\appdata\local\progr
ams\python\python310\lib\site-packages (from tensorboard<2.9,>=2.8->tensorflow==2.8.0)
(2.28.1)
Requirement already satisfied: werkzeug>=0.11.15 in c:\users\elcot\appdata\local\program
s\python\python310\lib\site-packages (from tensorboard<2.9,>=2.8->tensorflow==2.8.0) (2.
2.2)
Requirement already satisfied: tensorboard-data-server<0.7.0,>=0.6.0 in c:\users\elcot\a
ppdata\local\programs\python\python310\lib\site-packages (from tensorboard<2.9,>=2.8->te
nsorflow==2.8.0) (0.6.1)
Requirement already satisfied: markdown>=2.6.8 in c:\users\elcot\appdata\local\programs
\python\python310\lib\site-packages (from tensorboard<2.9,>=2.8->tensorflow==2.8.0) (3.
4.1)
Requirement already satisfied: google-auth-oauthlib<0.5,>=0.4.1 in c:\users\elcot\appdat
a\local\programs\python\python310\lib\site-packages (from tensorboard<2.9,>=2.8->tensorf
low==2.8.0) (0.4.6)
Requirement already satisfied: tensorboard-plugin-wit>=1.6.0 in c:\users\elcot\appdata\l
ocal\programs\python\python310\lib\site-packages (from tensorboard<2.9,>=2.8->tensorflow
==2.8.0) (1.8.1)
Requirement already satisfied: cachetools<6.0,>=2.0.0 in c:\users\elcot\appdata\local\pr
ograms\python\python310\lib\site-packages (from google-auth<3,>=1.6.3->tensorboard<2.9,>
=2.8->tensorflow==2.8.0) (5.2.0)
Requirement already satisfied: pyasn1-modules>=0.2.1 in c:\users\elcot\appdata\local\pro
grams\python\python310\lib\site-packages (from google-auth<3,>=1.6.3->tensorboard<2.9,>=
2.8->tensorflow==2.8.0) (0.2.8)
```

```
Requirement already satisfied: rsa<5,>=3.1.4 in c:\users\elcot\appdata\local\programs\python\python310\lib\site-packages (from google-auth<3,>=1.6.3->tensorboard<2.9,>=2.8->tensorflow==2.8.0) (4.9)
Requirement already satisfied: requests-oauthlib>=0.7.0 in c:\users\elcot\appdata\local\programs\python\python310\lib\site-packages (from google-auth-oauthlib<0.5,>=0.4.1->tensorboard<2.9,>=2.8->tensorflow==2.8.0) (1.3.1)
Requirement already satisfied: urllib3<1.27,>=1.21.1 in c:\users\elcot\appdata\local\programs\python\python310\lib\site-packages (from requests<3,>=2.21.0->tensorboard<2.9,>=2.8->tensorflow==2.8.0) (1.26.12)
Requirement already satisfied: idna<4,>=2.5 in c:\users\elcot\appdata\local\programs\python\python310\lib\site-packages (from requests<3,>=2.21.0->tensorboard<2.9,>=2.8->tensorflow==2.8.0) (3.4)
Requirement already satisfied: charset-normalizer<3,>=2 in c:\users\elcot\appdata\local\programs\python\python310\lib\site-packages (from requests<3,>=2.21.0->tensorboard<2.9,>=2.8->tensorflow==2.8.0) (2.1.1)
Requirement already satisfied: certifi>=2017.4.17 in c:\users\elcot\appdata\local\programs\python\python310\lib\site-packages (from requests<3,>=2.21.0->tensorboard<2.9,>=2.8->tensorflow==2.8.0) (2022.9.24)
Requirement already satisfied: MarkupSafe>=2.1.1 in c:\users\elcot\appdata\local\programs\python\python310\lib\site-packages (from werkzeug>=0.11.15->tensorboard<2.9,>=2.8->tensorflow==2.8.0) (2.1.1)
Requirement already satisfied: pyasn1<0.5.0,>=0.4.6 in c:\users\elcot\appdata\local\programs\python\python310\lib\site-packages (from pyasn1-modules>=0.2.1->google-auth<3,>=1.6.3->tensorboard<2.9,>=2.8->tensorflow==2.8.0) (0.4.8)
Requirement already satisfied: oauthlib>=3.0.0 in c:\users\elcot\appdata\local\programs\python\python310\lib\site-packages (from requests-oauthlib>=0.7.0->google-auth-oauthlib<0.5,>=0.4.1->tensorboard<2.9,>=2.8->tensorflow==2.8.0) (3.2.2)
Installing collected packages: keras
  Attempting uninstall: keras
    Found existing installation: Keras 2.2.4
    Uninstalling Keras-2.2.4:
      Successfully uninstalled Keras-2.2.4
Successfully installed keras-2.8.0
[notice] A new release of pip available: 22.2.2 -> 22.3.1
[notice] To update, run: C:\Users\ELCOT\AppData\Local\Programs\Python\Python310\python.exe -m pip install --upgrade pip
```

3.IMPORTING LIBRARIES FOR IMAGE AUGMENTATION.

In [12]:
```
from keras.models import sequential # api,se,
from keras.layers import Dense # add layers
from keras.layers import convolution2D # con
from keras.layers import Maxpooling2D#
from keras.layers import Flatten
```

4.ADDING STREAMING_BODY_OBJECT FOR DATASET.ZIP

In [6]:
```
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 c
# You might want to remove those credentials before you share the notebook.
cos_client = ibm_boto3.client(service_name='s3',
    ibm_api_key_id='aqprHZFuH38ECUn869hHk4qyvS_iKJfrZAWUJJQ-mQKx',
    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 = 'realtimecommunicationforspecially-donotdelete-pr-rfqndcvwgch6fu'
object_key = 'Dataset.zip'

streaming_body_4 = 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 possibil
# ibm_boto3 documentation: https://ibm.github.io/ibm-cos-sdk-python/
# pandas documentation: http://pandas.pydata.org/
```

In [5]:
```
ls
```

In [ ]:
```
# Dataset/  test_set/  training_set
```

5.UNZIPPING THE DATASET

In [13]:
```
from io import BytesIO
import zipfile
unzip=zipfile.ZipFile(BytesIO(streaming_body_4.read()),'r')
file_paths=unzip.namelist()
for path in file_paths:
    unzip.extract(path)
```

In [130…
```
pwd
```

Out[130]:
```
'C:\\Users\\ELCOT'
```

In [15]:
```
#checking that the dataset is there are not
import os
filenamer = os.listdir('/home/wsuser/work/Dataset/training_set')
```

6.TRAINING AND TESTING IMAGES UNDER CLASSES

In [17]:
```
x_train=train_datagen.flow_from_directory('/content/Dataset/training_set',target_size=(64
                                          class_mode='categorical',color_mode="grayscale
```

Found 15750 images belonging to 9 classes.

In [18]:
```
x_test=test_datagen.flow_from_directory('/content/Dataset/test_set',target_size=(64,64),
                                          class_mode='categorical',color_mode="grayscale
```

Found 2250 images belonging to 9 classes.

7.TOTAL CLASSES UNDER TRAINING AND TESTING.

In [134…
```
x_train.class_indices
```

Out[134]:
```
{'A': 0, 'B': 1, 'C': 2, 'D': 3, 'E': 4, 'F': 5, 'G': 6, 'H': 7, 'I': 8}
```

In [136…
```
x_test.class_indices
```

Out[136]:
```
{'A': 0, 'B': 1, 'C': 2, 'D': 3, 'E': 4, 'F': 5, 'G': 6, 'H': 7, 'I': 8}
```

In [29]:
```
train_datagen=ImageDataGenerator(rescale=1./255,zoom_range=0.2,horizontal_flip=True,vert
```

In [30]:
```
test_datagen=ImageDataGenerator(rescale=1./255)
```

8.MODEL BUILDING USING CNN

In [32]:
```
model=Sequential()
```

In [33]:
```
model.add(Convolution2D(32,(3,3),input_shape=(64,64,3),activation='relu'))
```

In [34]:
```
model.add(MaxPooling2D(pool_size=(2,2)))
```

In [35]:
```
model.add(Flatten())
```

In [36]:
```
model.summary()
```

Model: "sequential_1" _____ Layer (type) Output Shape Param # === conv2d_1 (Conv2D) (None, 62, 62, 32) 896 _____ max_pooling2d_1 (MaxPooling2 (None, 31, 31, 32) 0 _____ flatten_1 (Flatten) (None, 30752) 0 === Total params: 896 Trainable params: 896 Non-trainable params: 0

9.ADDING LAYERS FOR MODEL TRAINING.

HIDDEN LAYERS

In [40]:
```
model.add(Dense(units = 300, activation='relu'))
#model.add(Dense(unit = 150,init = "uniform" activation='softmax'))
```

OUTPUT LAYERS

In [50]:
```
model.add(Dense(units = 5, activation='softmax'))
```

10.OPTIMIZING THE MODEL

In [52]:
```
model.compile(loss='categorical_crossentropy',optimizer='adam',metrics=['accuracy'])
```

In [139…
```
len(x_train)
```

Out[139]: 630

In [140…
```
len(x_test)
```

Out[140]: 90

11.FITTING THE MODEL

In [144…
```
#model.fit_generator(x_train,steps_per_epoch=len(x_train),validation_data=x_test,validat
# Fitting the Model Generator
model.fit_generator(x_train,steps_per_epoch=630,epochs=1,validation_data=x_test,validati
#model.fit(x_train, epochs=100, verbose=1)
```

12.SAVING THE MODEL

In [57]:
```
ls
```

Dataset/ test_set/ training_set/

In [147…
```
pwd
```

Out[147]: 'C:\\Users\\ELCOT'

In [60]:
```
model.save('Dataset.h5')
```

13.CONVERTING ZIP FILE TO TAR FILE FOR LOCAL USE.

In [67]:
```
#converting the model to tar
!tar -zcvf image.Classification.model_new.tgz Dataset.h5
```

Dataset.h5

In [70]:
```
ls -1
```

Dataset/ Dataset.h5 image.Classification.model_new.tgz test_set/ training_set/

14.INSTALLING WATSON MACHINE LEARNING CLIENT SOFTWARE

In [149…
```
#installing the machine learning repository
!pip install watson_machine_learning_client --upgrade
```

```
Collecting watson_machine_learning_client
  Downloading watson_machine_learning_client-1.0.391-py3-none-any.whl (538 kB)
     ------------------------------------ 538.9/538.9 kB 1.8 MB/s eta 0:00:00
```

```
Collecting boto3
  Downloading boto3-1.26.11-py3-none-any.whl (132 kB)
     ------------------------------------ 132.5/132.5 kB 1.3 MB/s eta 0:00:00
Collecting ibm-cos-sdk
  Downloading ibm-cos-sdk-2.12.0.tar.gz (55 kB)
     ------------------------------------ 55.6/55.6 kB 412.8 kB/s eta 0:00:00
  Preparing metadata (setup.py): started
  Preparing metadata (setup.py): finished with status 'done'
Collecting pandas
  Downloading pandas-1.5.1-cp310-cp310-win_amd64.whl (10.4 MB)
     ---------------------------------------- 10.4/10.4 MB 1.1 MB/s eta 0:00:00
Requirement already satisfied: requests in c:\users\elcot\appdata\local\programs\python
\python310\lib\site-packages (from watson_machine_learning_client) (2.28.1)
Requirement already satisfied: urllib3 in c:\users\elcot\appdata\local\programs\python\p
ython310\lib\site-packages (from watson_machine_learning_client) (1.26.12)
Requirement already satisfied: certifi in c:\users\elcot\appdata\local\programs\python\p
ython310\lib\site-packages (from watson_machine_learning_client) (2022.9.24)
Collecting lomond
  Downloading lomond-0.3.3-py2.py3-none-any.whl (35 kB)
Collecting tabulate
  Downloading tabulate-0.9.0-py3-none-any.whl (35 kB)
Collecting tqdm
  Downloading tqdm-4.64.1-py2.py3-none-any.whl (78 kB)
     ------------------------------------ 78.5/78.5 kB 874.7 kB/s eta 0:00:00
Collecting botocore<1.30.0,>=1.29.11
  Downloading botocore-1.29.11-py3-none-any.whl (9.9 MB)
     ---------------------------------------- 9.9/9.9 MB 1.5 MB/s eta 0:00:00
Collecting jmespath<2.0.0,>=0.7.1
  Downloading jmespath-1.0.1-py3-none-any.whl (20 kB)
Collecting s3transfer<0.7.0,>=0.6.0
  Downloading s3transfer-0.6.0-py3-none-any.whl (79 kB)
     ---------------------------------------- 79.6/79.6 kB 1.1 MB/s eta 0:00:00
Collecting ibm-cos-sdk-core==2.12.0
  Downloading ibm-cos-sdk-core-2.12.0.tar.gz (956 kB)
     ------------------------------------ 956.8/956.8 kB 1.7 MB/s eta 0:00:00
  Preparing metadata (setup.py): started
  Preparing metadata (setup.py): finished with status 'done'
Collecting ibm-cos-sdk-s3transfer==2.12.0
  Downloading ibm-cos-sdk-s3transfer-2.12.0.tar.gz (135 kB)
     ------------------------------------ 135.7/135.7 kB 1.1 MB/s eta 0:00:00
  Preparing metadata (setup.py): started
  Preparing metadata (setup.py): finished with status 'done'
Collecting jmespath<2.0.0,>=0.7.1
  Downloading jmespath-0.10.0-py2.py3-none-any.whl (24 kB)
Requirement already satisfied: python-dateutil<3.0.0,>=2.8.2 in c:\users\elcot\appdata\l
ocal\programs\python\python310\lib\site-packages (from ibm-cos-sdk-core==2.12.0->ibm-cos
-sdk->watson_machine_learning_client) (2.8.2)
Requirement already satisfied: charset-normalizer<3,>=2 in c:\users\elcot\appdata\local
\programs\python\python310\lib\site-packages (from requests->watson_machine_learning_cli
ent) (2.1.1)
Requirement already satisfied: idna<4,>=2.5 in c:\users\elcot\appdata\local\programs\pyt
hon\python310\lib\site-packages (from requests->watson_machine_learning_client) (3.4)
Requirement already satisfied: six>=1.10.0 in c:\users\elcot\appdata\local\programs\pyth
on\python310\lib\site-packages (from lomond->watson_machine_learning_client) (1.16.0)
Requirement already satisfied: numpy>=1.21.0 in c:\users\elcot\appdata\local\programs\py
thon\python310\lib\site-packages (from pandas->watson_machine_learning_client) (1.23.4)
Collecting pytz>=2020.1
  Downloading pytz-2022.6-py2.py3-none-any.whl (498 kB)
     ------------------------------------ 498.1/498.1 kB 1.6 MB/s eta 0:00:00
Requirement already satisfied: colorama in c:\users\elcot\appdata\local\programs\python
\python310\lib\site-packages (from tqdm->watson_machine_learning_client) (0.4.5)
Building wheels for collected packages: ibm-cos-sdk, ibm-cos-sdk-core, ibm-cos-sdk-s3tra
```

```
nsfer
  Building wheel for ibm-cos-sdk (setup.py): started
  Building wheel for ibm-cos-sdk (setup.py): finished with status 'done'
  Created wheel for ibm-cos-sdk: filename=ibm_cos_sdk-2.12.0-py3-none-any.whl size=73934
sha256=158b8507199c8b3c59fba6bfadd5f7abce465515e0c21db908850b768b090feb
  Stored in directory: c:\users\elcot\appdata\local\pip\cache\wheels\de\cf\fb\8c86f4e3a6
62cd34ea63c37835a1ff53896c3231011e3f2db1
  Building wheel for ibm-cos-sdk-core (setup.py): started
  Building wheel for ibm-cos-sdk-core (setup.py): finished with status 'done'
  Created wheel for ibm-cos-sdk-core: filename=ibm_cos_sdk_core-2.12.0-py3-none-any.whl
size=562958 sha256=6b89556e1edca187c6578b0b6ff56e552c44c327802680f10bb24e1a94df488d
  Stored in directory: c:\users\elcot\appdata\local\pip\cache\wheels\dc\24\3d\8387c624d6
1a8465622f1ed4ca6cff5f27fbc93c508dfb9b00
  Building wheel for ibm-cos-sdk-s3transfer (setup.py): started
  Building wheel for ibm-cos-sdk-s3transfer (setup.py): finished with status 'done'
  Created wheel for ibm-cos-sdk-s3transfer: filename=ibm_cos_sdk_s3transfer-2.12.0-py3-n
one-any.whl size=89776 sha256=5d7f8ca6e2315741a4064d27f9966efae0afa2124d52e7e529879fa327
7a3a6f
  Stored in directory: c:\users\elcot\appdata\local\pip\cache\wheels\a0\40\08\833fc119b6
06353772e9b925bd2f3fb9be600171ec2a287ce2
Successfully built ibm-cos-sdk ibm-cos-sdk-core ibm-cos-sdk-s3transfer
Installing collected packages: pytz, tqdm, tabulate, lomond, jmespath, pandas, ibm-cos-s
dk-core, botocore, s3transfer, ibm-cos-sdk-s3transfer, ibm-cos-sdk, boto3, watson_machin
e_learning_client
Successfully installed boto3-1.26.11 botocore-1.29.11 ibm-cos-sdk-2.12.0 ibm-cos-sdk-cor
e-2.12.0 ibm-cos-sdk-s3transfer-2.12.0 jmespath-0.10.0 lomond-0.3.3 pandas-1.5.1 pytz-20
22.6 s3transfer-0.6.0 tabulate-0.9.0 tqdm-4.64.1 watson_machine_learning_client-1.0.391
[notice] A new release of pip available: 22.2.2 -> 22.3.1
[notice] To update, run: C:\Users\ELCOT\AppData\Local\Programs\Python\Python310\python.e
xe -m pip install --upgrade pip
```

15.IMPORTING APICLIENT FOR DEPLOYING

In [75]:
```
from ibm_watson_machine_learning import APIClient
url_credentials = {
    "url": "https://us-south.ml.cloud.ibm.com",
    "apikey": "sqLVTXSP3nnAKfzJ1rKRKCpNzS_XZ8_HXa9FRwV7BvOP"
}
client = APIClient(url_credentials)
```

In [76]:
```
client = APIClient(url_credentials)
```

16.CREATING API_CLIENT SPACE ID.

In [78]:
```
def guid_from_space_name(client, space_name):
    space = client.spaces.get_details()
    return(next(item for item in space['resources'] if item['entity']['name'] == space_na
```

In [80]:
```
space_uid = guid_from_space_name(client, 'Image Classification')
print("space UID = " + space_uid)
```

space UID = d90f421e-9169-47e7-a58c-0e7bb0e65685

In [152…
```
clience_uid)t.set.default_space(spa
```

Out[152]: 'SUCCESS'

In [83]:
```
client.software_specifications.list()
```

NAME ASSET_ID TYPE default_py3.6 0062b8c9-8b7d-44a0-a9b9-46c416adcbd9 base kernel-spark3.2-scala2.12 020d69ce-7ac1-5e68-ac1a-31189867356a base pytorch-onnx_1.3-py3.7-edt 069ea134-3346-5748-b513-49120e15d288 base scikit-learn_0.20-py3.6 09c5a1d0-9c1e-4473-a344-eb7b665ff687 base spark-mllib_3.0-scala_2.12 09f4cff0-90a7-5899-b9ed-1ef348aebdee base pytorch-onnx_rt22.1-py3.9 0b848dd4-e681-5599-be41-b5f6fccc6471 base ai-function_0.1-py3.6 0cdb0f1e-5376-4f4d-92dd-da3b69aa9bda base shiny-r3.6 0e6e79df-875e-4f24-8ae9-62dcc2148306 base tensorflow_2.4-py3.7-horovod 1092590a-307d-563d-9b62-4eb7d64b3f22 base pytorch_1.1-py3.6 10ac12d6-6b30-4ccd-8392-3e922c096a92 base tensorflow_1.15-py3.6-ddl 111e41b3-de2d-5422-a4d6-bf776828c4b7 base autoai-kb_rt22.2-py3.10 125b6d9a-5b1f-5e8d-972a-b251688ccf40 base runtime-22.1-py3.9 12b83a17-24d8-5082-900f-0ab31fbfd3cb base scikit-learn_0.22-py3.6 154010fa-5b3b-4ac1-82af-4d5ee5abbc85 base default_r3.6 1b70aec3-ab34-4b87-8aa0-a4a3c8296a36 base pytorch-onnx_1.3-py3.6 1bc6029a-cc97-56da-b8e0-39c3880dbbe7 base kernel-spark3.3-r3.6 1c9e5454-f216-59dd-a20e-474a5cdf5988 base pytorch-onnx_rt22.1-py3.9-edt 1d362186-7ad5-5b59-8b6c-9d0880bde37f base tensorflow_2.1-py3.6 1eb25b84-d6ed-5dde-b6a5-3fbdf1665666 base spark-mllib_3.2 20047f72-0a98-58c7-9ff5-a77b012eb8f5 base tensorflow_2.4-py3.8-horovod 217c16f6-178f-56bf-824a-b19f20564c49 base runtime-22.1-py3.9-cuda 26215f05-08c3-5a41-a1b0-da66306ce658 base do_py3.8 295addb5-9ef9-547e-9bf4-92ae3563e720 base autoai-ts_3.8-py3.8 2aa0c932-798f-5ae9-abd6-15e0c2402fb5 base tensorflow_1.15-py3.6 2b73a275-7cbf-420b-a912-eae7f436e0bc base kernel-spark3.3-py3.9 2b7961e2-e3b1-5a8c-a491-482c8368839a base pytorch_1.2-py3.6 2c8ef57d-2687-4b7d-acce-01f94976dac1 base spark-mllib_2.3 2e51f700-bca0-4b0d-88dc-5c6791338875 base pytorch-onnx_1.1-py3.6-edt 32983cea-3f32-4400-8965-dde874a8d67e base spark-mllib_3.0-py37 36507ebe-8770-55ba-ab2a-eafe787600e9 base spark-mllib_2.4 390d21f8-e58b-4fac-9c55-d7ceda621326 base autoai-ts_rt22.2-py3.10 396b2e83-0953-5b86-9a55-7ce1628a406f base xgboost_0.82-py3.6 39e31acd-5f30-41dc-ae44-60233c80306e base pytorch-onnx_1.2-py3.6-edt 40589d0e-7019-4e28-8daa-fb03b6f4fe12 base pytorch-onnx_rt22.2-py3.10 40e73f55-783a-5535-b3fa-0c8b94291431 base default_r36py38 41c247d3-45f8-5a71-b065-8580229facf0 base autoai-ts_rt22.1-py3.9 4269d26e-07ba-5d40-8f66-2d495b0c71f7 base autoai-obm_3.0 42b92e18-d9ab-567f-988a-4240ba1ed5f7 base pmml-3.0_4.3 493bcb95-16f1-5bc5-bee8-81b8af80e9c7 base spark-mllib_2.4-r_3.6 49403dff-92e9-4c87-a3d7-a42d0021c095 base xgboost_0.90-py3.6 4ff8d6c2-1343-4c18-85e1-689c965304d3 base pytorch-onnx_1.1-py3.6 50f95b2a-bc16-43bb-bc94-b0bed208c60b base autoai-ts_3.9-py3.8 52c57136-80fa-572e-8728-a5e7cbb42cde base spark-mllib_2.4-scala_2.11 55a70f99-7320-4be5-9fb9-9edb5a443af5 base spark-mllib_3.0 5c1b0ca2-4977-5c2e-9439-ffd44ea8ffe9 base autoai-obm_2.0 5c2e37fa-80b8-5e77-840f-d912469614ee base spss-modeler_18.1 5c3cad7e-507f-4b2a-a9a3-ab53a21dee8b base cuda-py3.8 5d3232bf-c86b-5df4-a2cd-7bb870a1cd4e base autoai-kb_3.1-py3.7 632d4b22-10aa-5180-88f0-f52dfb6444d7 base pytorch-onnx_1.7-py3.8 634d3cdc-b562-5bf9-a2d4-ea90a478456b base Note: Only first 50 records were displayed. To display more use 'limit' parameter.

In [86]:
```
software_spec_uid = client.software_specifications.get_uid_by_name("tensorflow")
software_spec_uid
```

17.STORING THE MODEL_ID FOR DATASET.H5

In [88]:
```
#store the model
model_details = client.repository.store_model(model='Image-classification-model_new.tgz'
    client.repository.ModelMetaNames.NAME:'CNN',
    client.repository.ModelMetaNames.TYPE:"keras_2.2.4",
    client.repository.ModelMetaNames.SOFTWARE_SPEC_UID:software_spec_uid}
                                              )
model_id = client.repository.get_model_uid(model_details)
```

In [153…
```
model_id
```

In [90]:
```
model.save('Dataset.h5')
```

18.DOWNLOADING THE TAR FILE ON CLIENT REPOSITORY

In [92]:
```
client.repository.download(model_id, 'my_model.tar.gz')
```

19.TEST THE MODEL

In [94]:
```
import numpy as np
from tensorflow.keras.models import load_model
from keras.preprocessing import image
```

20.LOADING THE DATASET

In [96]:
```
#Load the model
model=load_model('Dataset.h5')
```

21.ADDING STREAMING_BODY FOR TEST IMAGE.

In [98]:
```
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 c
# You might want to remove those credentials before you share the notebook.
cos_client = ibm_boto3.client(service_name='s3',
    ibm_api_key_id='aqprHZFuH38ECUn869hHk4qyvS_iKJfrZAWUJJQ-mQKx',
    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 = 'realtimecommunicationforspecially-donotdelete-pr-rfqndcvwgch6fu'
object_key = '1.png'

streaming_body_5 = 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 possibil
# ibm_boto3 documentation: https://ibm.github.io/ibm-cos-sdk-python/
# pandas documentation: http://pandas.pydata.org/
```

22.TESTING ON SEVERAL TESTING IMAGES

In [100…
```
img = image.load_img(streaming_body_5,target_size=(64, 64))
#img=image.load_img("/home/wsuser/work/1",target_size=(64,64))
```

In [101…
```
ls
```

In [102…
```
img=image.load_img(r"/home/wsuser/work/Dataset/test_set/A/1.png")
```

In [103…
```
img
```

In [104…
```
img1=image.load_ing(r"/home/wsuser/work/Dataset/test_set/C/1.png")
```

In [105…
```
img1
```

In [106…
```
x=image.img_to_array(img)
```

In [107…
```
x
```

In [108…
```
x1=np.expand_dims(x,axis=1)
```

In [109…
```
x1
```

In [110…
```
y=np.argmax(model.predoct(x),axis=1)
```

In [111…
```
y
```

In [112…
```
x_train.class_indices
```

In [113…
```
index=['A','B','C','D','E','F','G','H','I']
```

In [114…
```
index[y[0]]
```

In [115…
```
img=image.load_img(r"/home/wsuser/work/Dataset/test_set/A/90.png",target_size=(64,64))
x=image.ing_to_array(img)
x=np.expand_dims(x,axis=0)
y=fnp.argmax(model.predict(x),axis=1)
index=['A','B','C','D','E','F','G','H','I']
index[y[0]]]
```

In [116…
```
img=image.load_img( "/home/wsuser/work/Dataset/test_set/D/1.png",target_size=(64,64))
x=image.ing_to_array(img)
x=np.expand_dims(x,axis=0)
y=np.argmax(model.predict(x)
index=['A','B','C','D','E','F','G','H','I']
index[y[0]]
```

In [117…
```
img=image.load_img(r"/content/drive/MyDrive/IBM_PROJECT/Dataset/test_set/G/1.png",target_
x=image.ing_to_array(img)
x=np.expand_dims(x,axisme)
y=np.argmax(model.predict(x), axis=1)
index=['A','B','C','D','E','F','G','H','I']
index[y[0]]
```

In [1]:
```
img=image.load_img(r"/content/drive/MyDrive/IBM_PROJECT/Dataset/test_set/D/1.png",target_
x-image.ing_to_array(img)
x=np.expand_dims(x,axisme)
y=np.argmax(model.predict(x), axis=1)
index=['A','B','C','D','E','F','G','H','I']
index[y[0]]
```

In [122…
```
!tar -zcvf Dataset-classification-model.tgz specially.h5
```

In [5]:
```
import cv2
```

In [6]:
```
!pip install keras==2.2.4
```

```
Collecting keras==2.2.4
  Using cached Keras-2.2.4-py2.py3-none-any.whl (312 kB)
Requirement already satisfied: keras-preprocessing>=1.0.5 in c:\users\elcot\appdata\loca
l\programs\python\python310\lib\site-packages (from keras==2.2.4) (1.1.2)
Requirement already satisfied: h5py in c:\users\elcot\appdata\local\programs\python\pyth
on310\lib\site-packages (from keras==2.2.4) (3.7.0)
Requirement already satisfied: keras-applications>=1.0.6 in c:\users\elcot\appdata\local
\programs\python\python310\lib\site-packages (from keras==2.2.4) (1.0.8)
Requirement already satisfied: numpy>=1.9.1 in c:\users\elcot\appdata\local\programs\pyt
hon\python310\lib\site-packages (from keras==2.2.4) (1.23.4)
Requirement already satisfied: pyyaml in c:\users\elcot\appdata\local\programs\python\py
thon310\lib\site-packages (from keras==2.2.4) (6.0)
Requirement already satisfied: six>=1.9.0 in c:\users\elcot\appdata\local\programs\pytho
n\python310\lib\site-packages (from keras==2.2.4) (1.16.0)
Requirement already satisfied: scipy>=0.14 in c:\users\elcot\appdata\local\programs\pyth
on\python310\lib\site-packages (from keras==2.2.4) (1.9.3)
Installing collected packages: keras
  Attempting uninstall: keras
    Found existing installation: keras 2.8.0
    Uninstalling keras-2.8.0:
      Successfully uninstalled keras-2.8.0
Successfully installed keras-2.2.4
```

```
ERROR: pip's dependency resolver does not currently take into account all the packages t
hat are installed. This behaviour is the source of the following dependency conflicts.
tensorflow 2.8.0 requires keras<2.9,>=2.8.0rc0, but you have keras 2.2.4 which is incomp
atible.

[notice] A new release of pip available: 22.2.2 -> 22.3.1
[notice] To update, run: C:\Users\ELCOT\AppData\Local\Programs\Python\Python310\python.e
xe -m pip install --upgrade pip
```

23.IBM DEPLOYMENT

In [7]:
```
!pip install watson-machine-learning-client
```

```
Requirement already satisfied: watson-machine-learning-client in c:\users\elcot\appdata
\local\programs\python\python310\lib\site-packages (1.0.391)
Requirement already satisfied: pandas in c:\users\elcot\appdata\local\programs\python\py
thon310\lib\site-packages (from watson-machine-learning-client) (1.5.1)
Requirement already satisfied: tabulate in c:\users\elcot\appdata\local\programs\python
\python310\lib\site-packages (from watson-machine-learning-client) (0.9.0)
Requirement already satisfied: boto3 in c:\users\elcot\appdata\local\programs\python\pyt
hon310\lib\site-packages (from watson-machine-learning-client) (1.26.11)
Requirement already satisfied: certifi in c:\users\elcot\appdata\local\programs\python\p
ython310\lib\site-packages (from watson-machine-learning-client) (2022.9.24)
Requirement already satisfied: tqdm in c:\users\elcot\appdata\local\programs\python\pyth
on310\lib\site-packages (from watson-machine-learning-client) (4.64.1)
Requirement already satisfied: urllib3 in c:\users\elcot\appdata\local\programs\python\p
ython310\lib\site-packages (from watson-machine-learning-client) (1.26.12)
Requirement already satisfied: ibm-cos-sdk in c:\users\elcot\appdata\local\programs\pyth
on\python310\lib\site-packages (from watson-machine-learning-client) (2.12.0)
Requirement already satisfied: lomond in c:\users\elcot\appdata\local\programs\python\py
thon310\lib\site-packages (from watson-machine-learning-client) (0.3.3)
Requirement already satisfied: requests in c:\users\elcot\appdata\local\programs\python
\python310\lib\site-packages (from watson-machine-learning-client) (2.28.1)
Requirement already satisfied: botocore<1.30.0,>=1.29.11 in c:\users\elcot\appdata\local
\programs\python\python310\lib\site-packages (from boto3->watson-machine-learning-clien
t) (1.29.11)
Requirement already satisfied: jmespath<2.0.0,>=0.7.1 in c:\users\elcot\appdata\local\pr
ograms\python\python310\lib\site-packages (from boto3->watson-machine-learning-client)
```

```
(0.10.0)
Requirement already satisfied: s3transfer<0.7.0,>=0.6.0 in c:\users\elcot\appdata\local
\programs\python\python310\lib\site-packages (from boto3->watson-machine-learning-clien
t) (0.6.0)
Requirement already satisfied: ibm-cos-sdk-s3transfer==2.12.0 in c:\users\elcot\appdata
\local\programs\python\python310\lib\site-packages (from ibm-cos-sdk->watson-machine-lea
rning-client) (2.12.0)
Requirement already satisfied: ibm-cos-sdk-core==2.12.0 in c:\users\elcot\appdata\local
\programs\python\python310\lib\site-packages (from ibm-cos-sdk->watson-machine-learning-
client) (2.12.0)
Requirement already satisfied: python-dateutil<3.0.0,>=2.8.2 in c:\users\elcot\appdata\l
ocal\programs\python\python310\lib\site-packages (from ibm-cos-sdk-core==2.12.0->ibm-cos
-sdk->watson-machine-learning-client) (2.8.2)
Requirement already satisfied: idna<4,>=2.5 in c:\users\elcot\appdata\local\programs\pyt
hon\python310\lib\site-packages (from requests->watson-machine-learning-client) (3.4)
Requirement already satisfied: charset-normalizer<3,>=2 in c:\users\elcot\appdata\local
\programs\python\python310\lib\site-packages (from requests->watson-machine-learning-cli
ent) (2.1.1)
Requirement already satisfied: six>=1.10.0 in c:\users\elcot\appdata\local\programs\pyth
on\python310\lib\site-packages (from lomond->watson-machine-learning-client) (1.16.0)
Requirement already satisfied: numpy>=1.21.0 in c:\users\elcot\appdata\local\programs\py
thon\python310\lib\site-packages (from pandas->watson-machine-learning-client) (1.23.4)
Requirement already satisfied: pytz>=2020.1 in c:\users\elcot\appdata\local\programs\pyt
hon\python310\lib\site-packages (from pandas->watson-machine-learning-client) (2022.6)
Requirement already satisfied: colorama in c:\users\elcot\appdata\local\programs\python
\python310\lib\site-packages (from tqdm->watson-machine-learning-client) (0.4.5)
[notice] A new release of pip available: 22.2.2 -> 22.3.1
[notice] To update, run: C:\Users\ELCOT\AppData\Local\Programs\Python\Python310\python.e
xe -m pip install --upgrade pip
```

In [127…
```
from ibm_watson_machine learning import APIClient
wml_credentials={
"url":"https://us-south.ml.cloud.ibm.com",
"apikey":"x91CJTUTrrIfLvrXsKf8yLyI1KHb3JV0Y7Qrwy1zilb2"
}
client=APIClient(wml_credentials)
```

CLIENT

In [9]:
```
def guid_space_name(client,animal_deploy):
space-client.spaces.get_details()
return(next(item for item in space[' resources'] if iten['entity']['name']= animal_deplo
```

In [19]:
```
space_uid-guid_space_name(client,'animal_deploy")
print("Space UID "+space_uid)
```

In [18]:
```
client.set.default_space(space_uid)
```

In [17]:
```
client,software specifications.list(200)
```

In [16]:
```
software_space_uid=client.software_specifications.get_uid_by_name('tensorflow_rt22.1-py3
```

In [15]:
```
software_space_uid
```

In [14]:
```
model_details=client.repository.store_model(model='Dataset.tgz',meta_props={
client.repository.ModelMetaNames.NAME: "CNN Model Building",
client.repository.ModelMetaNames.TYPE: 'tensorflow_2.7',
```

```
client.repository.ModelMetaNames.SOFTWARE_SPEC_UID: software_space_uid
})
```

In [11]:
```
model_id=client.repository.get_model_id(model_details)
```

In [13]:
```
model_id
```