

# Model Training for Real Time Communication through AI for Specially Abled

## Loading the Dataset & Image Data Generation

```
In [1]:
pwd

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

In [2]:
!pip install tensorflow==2.7.1
Collecting tensorflow==2.7.1
  Downloading tensorflow-2.7.1-cp39-cp39-manylinux2010_x86_64.whl (495.2 MB)
    |████████████████████████████████████████| 495.2 MB 29 kB/s s eta 0:00:01
Requirement already satisfied: h5py>=2.9.0 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorflow==2.7.1) (3.2.1)
Requirement already satisfied: wheel<1.0,>=0.32.0 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorflow==2.7.1) (0.37.0)
Requirement already satisfied: numpy>=1.14.5 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorflow==2.7.1) (1.20.3)
Requirement already satisfied: six>=1.12.0 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorflow==2.7.1) (1.15.0)
Requirement already satisfied: google-pasta>=0.1.1 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorflow==2.7.1) (0.2.0)
Requirement already satisfied: typing-extensions>=3.6.6 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorflow==2.7.1) (4.1.1)
Requirement already satisfied: astunparse>=1.6.0 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorflow==2.7.1) (1.6.3)
Requirement already satisfied: keras-preprocessing>=1.1.1 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorflow==2.7.1) (1.1.2)
Collecting libclang>=9.0.1
  Downloading libclang-14.0.6-py2.py3-none-manylinux2010_x86_64.whl (14.1 MB)
    |████████████████████████████████████████| 14.1 MB 29.9 MB/s eta 0:00:01
Requirement already satisfied: keras<2.8,>=2.7.0rc0 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorflow==2.7.1) (2.7.0)
Requirement already satisfied: termcolor>=1.1.0 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorflow==2.7.1) (1.1.0)
Requirement already satisfied: absl-py>=0.4.0 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorflow==2.7.1) (0.12.0)
Requirement already satisfied: tensorflow-estimator<2.8,~=2.7.0rc0 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorflow==2.7.1) (2.7.0)
```

Requirement already satisfied: wrapt>=1.11.0 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorflow==2.7.1) (1.12.1)

Requirement already satisfied: gast<0.5.0,>=0.2.1 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorflow==2.7.1) (0.4.0)

Requirement already satisfied: flatbuffers<3.0,>=1.12 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorflow==2.7.1) (2.0)

Requirement already satisfied: grpcio<2.0,>=1.24.3 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorflow==2.7.1) (1.42.0)

Requirement already satisfied: tensorboard~=2.6 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorflow==2.7.1) (2.7.0)

Requirement already satisfied: opt-einsum>=2.3.2 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorflow==2.7.1) (3.3.0)

Requirement already satisfied: protobuf>=3.9.2 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorflow==2.7.1) (3.19.1)

Requirement already satisfied: tensorflow-io-gcs-filesystem>=0.21.0 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorflow==2.7.1) (0.23.1)

Requirement already satisfied: werkzeug>=0.11.15 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorboard~=2.6->tensorflow==2.7.1) (2.0.2)

Requirement already satisfied: markdown>=2.6.8 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorboard~=2.6->tensorflow==2.7.1) (3.3.3)

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~=2.6->tensorflow==2.7.1) (0.4.4)

Requirement already satisfied: requests<3,>=2.21.0 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorboard~=2.6->tensorflow==2.7.1) (2.26.0)

Requirement already satisfied: tensorboard-plugin-wit>=1.6.0 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorboard~=2.6->tensorflow==2.7.1) (1.6.0)

Requirement already satisfied: google-auth<3,>=1.6.3 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorboard~=2.6->tensorflow==2.7.1) (1.23.0)

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~=2.6->tensorflow==2.7.1) (0.6.1)

Requirement already satisfied: setuptools>=41.0.0 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorboard~=2.6->tensorflow==2.7.1) (58.0.4)

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~=2.6->tensorflow==2.7.1) (0.2.8)

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~=2.6->tensorflow==2.7.1) (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~=2.6->tensorflow==2.7.1) (4.2.2)

```

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~=2.6->tensorflow==2.7.1) (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~=2.6->tensorflow==2.7.1)
(0.4.8)
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~=2.6-
>tensorflow==2.7.1) (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~=2.6->tensorflow==2.7.1) (2.0.4)
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~=2.6->tensorflow==2.7.1) (1.26.7)
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~=2.6-
>tensorflow==2.7.1) (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~=2.6->tensorflow==2.7.1) (3.2.1)
Installing collected packages: libclang, tensorflow
  Attempting uninstall: tensorflow
    Found existing installation: tensorflow 2.7.2
    Uninstalling tensorflow-2.7.2:
      Successfully uninstalled tensorflow-2.7.2
Successfully installed libclang-14.0.6 tensorflow-2.7.1

```

In [3]:

```
from tensorflow.keras.preprocessing.image import ImageDataGenerator
```

```

2022-11-09 13:34:01.056483: 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 [4]:

```

# Training Datagen
train_datagen =
ImageDataGenerator(rescale=1/255,zoom_range=0.2,horizontal_flip=True,vertical
_flip=False)
# Testing Datagen
test_datagen = ImageDataGenerator(rescale=1/255)

```

In [5]:

```

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='mT4yG1S3H9nBBV3UAwsgkb5FH89r-koWMhH4gnnWTjhN',
                              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 = 'imageclassification-donotdelete-pr-u5ptdijnvogkjw6'
object_key = 'Dataset.zip'

streaming_body_2 = 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/

```

In [7]:

```

# Unzip the Dataset Zip File
from io import BytesIO
import zipfile
unzip = zipfile.ZipFile(BytesIO(streaming_body_2.read()), 'r')
file_paths = unzip.namelist()
for path in file_paths:
    unzip.extract(path)

```

In [8]:

```

%%bash
ls Dataset

test_set
training_set

```

In [9]:

```

# Training Dataset
x_train=train_datagen.flow_from_directory(r'/home/wsuser/work/Dataset/trainin
g_set',target_size=(64,64), class_mode='categorical',batch_size=900)
# Testing Dataset
x_test=test_datagen.flow_from_directory(r'/home/wsuser/work/Dataset/test_set'
,target_size=(64,64), class_mode='categorical',batch_size=900)

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

```

In [10]:

```

print("Len x-train : ", len(x_train))
print("Len x-test : ", len(x_test))

Len x-train : 18
Len x-test : 3

```

In [11]:

```
# The Class Indices in Training Dataset
x_train.class_indices
```

Out[11]:

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

## Model Creation

In [12]:

```
# Importing Libraries
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Convolution2D, MaxPooling2D, Flatten, Dense
```

In [13]:

```
# Creating Model
model=Sequential()

2022-11-09 13:34:42.826857: 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 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
2022-11-09 13:34:42.826944: W
tensorflow/stream_executor/cuda/cuda_driver.cc:269] failed call to cuInit:
UNKNOWN ERROR (303)
```

In [14]:

```
# Adding Layers
model.add(Convolution2D(32, (3, 3), activation='relu', input_shape=(64, 64, 3)))
model.add(MaxPooling2D(pool_size=(2, 2)))
model.add(Flatten())

# Adding Hidden Layers
model.add(Dense(300, activation='relu'))
model.add(Dense(150, activation='relu'))

# Adding Output Layer
model.add(Dense(9, activation='softmax'))
```

In [15]:

```
# Compiling the Model
model.compile(loss='categorical_crossentropy', optimizer='adam', metrics=['accu
racy'])
```

In [16]:

```
# Fitting the Model Generator
model.fit_generator(x_train, steps_per_epoch=len(x_train), epochs=10, validation
_data=x_test, validation_steps=len(x_test))

/tmp/wsuser/ipykernel_164/1042518445.py:2: UserWarning: `Model.fit_generator`
is deprecated and will be removed in a future version. Please use
`Model.fit`, which supports generators.

model.fit_generator(x_train, steps_per_epoch=len(x_train), epochs=10, validation
_data=x_test, validation_steps=len(x_test))
```

```

Epoch 1/10
18/18 [=====] - 74s 4s/step - loss: 1.3704 -
accuracy: 0.5568 - val_loss: 0.4835 - val_accuracy: 0.8809
Epoch 2/10
18/18 [=====] - 74s 4s/step - loss: 0.3403 -
accuracy: 0.8987 - val_loss: 0.2734 - val_accuracy: 0.9187
Epoch 3/10
18/18 [=====] - 74s 4s/step - loss: 0.1527 -
accuracy: 0.9580 - val_loss: 0.2531 - val_accuracy: 0.9444
Epoch 4/10
18/18 [=====] - 75s 4s/step - loss: 0.0862 -
accuracy: 0.9771 - val_loss: 0.2031 - val_accuracy: 0.9622
Epoch 5/10
18/18 [=====] - 73s 4s/step - loss: 0.0526 -
accuracy: 0.9865 - val_loss: 0.2335 - val_accuracy: 0.9640
Epoch 6/10
18/18 [=====] - 75s 4s/step - loss: 0.0343 -
accuracy: 0.9923 - val_loss: 0.2349 - val_accuracy: 0.9724
Epoch 7/10
18/18 [=====] - 73s 4s/step - loss: 0.0252 -
accuracy: 0.9944 - val_loss: 0.2387 - val_accuracy: 0.9738
Epoch 8/10
18/18 [=====] - 74s 4s/step - loss: 0.0176 -
accuracy: 0.9962 - val_loss: 0.2614 - val_accuracy: 0.9693
Epoch 9/10
18/18 [=====] - 74s 4s/step - loss: 0.0152 -
accuracy: 0.9968 - val_loss: 0.2669 - val_accuracy: 0.9724
Epoch 10/10
18/18 [=====] - 74s 4s/step - loss: 0.0145 -
accuracy: 0.9970 - val_loss: 0.2757 - val_accuracy: 0.9747

```

Out[16]:

## Saving the Model

```

model.save('aslpng1.h5')
# Current accuracy is 0.8154

```

In [17]:

```

# Convert the Saved Model to a Tar Compressed Format
!tar -zcvf trainedModel.tgz aslpng1.h5

aslpng1.h5

```

In [18]:

```

%%bash
ls -ll

total 210184
-rw-rw---- 1 wsuser wscommon 111324760 Nov  9 13:49 aslpng1.h5
drwxrwx--- 4 wsuser wscommon      4096 Nov  9 13:34 Dataset
-rw-rw---- 1 wsuser wscommon 103895281 Nov  9 13:49 trainedModel.tgz

```

In [19]:

# Watson Machine Learning

In [20]:

```
!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 kB 17.4 MB/s eta 0:00:01
Requirement already satisfied: lomond in /opt/conda/envs/Python-
3.9/lib/python3.9/site-packages (from watson-machine-learning-client) (0.3.3)
Requirement already satisfied: ibm-cos-sdk in /opt/conda/envs/Python-
3.9/lib/python3.9/site-packages (from watson-machine-learning-client)
(2.11.0)
Requirement already satisfied: tqdm in /opt/conda/envs/Python-
3.9/lib/python3.9/site-packages (from watson-machine-learning-client)
(4.62.3)
Requirement already satisfied: boto3 in /opt/conda/envs/Python-
3.9/lib/python3.9/site-packages (from watson-machine-learning-client)
(1.18.21)
Requirement already satisfied: pandas in /opt/conda/envs/Python-
3.9/lib/python3.9/site-packages (from watson-machine-learning-client) (1.3.4)
Requirement already satisfied: tabulate in /opt/conda/envs/Python-
3.9/lib/python3.9/site-packages (from watson-machine-learning-client) (0.8.9)
Requirement already satisfied: requests in /opt/conda/envs/Python-
3.9/lib/python3.9/site-packages (from watson-machine-learning-client)
(2.26.0)
Requirement already satisfied: certifi in /opt/conda/envs/Python-
3.9/lib/python3.9/site-packages (from watson-machine-learning-client)
(2022.9.24)
Requirement already satisfied: urllib3 in /opt/conda/envs/Python-
3.9/lib/python3.9/site-packages (from watson-machine-learning-client)
(1.26.7)
Requirement already satisfied: jmespath<1.0.0,>=0.7.1 in
/opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from boto3->watson-
machine-learning-client) (0.10.0)
Requirement already satisfied: s3transfer<0.6.0,>=0.5.0 in
/opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from boto3->watson-
machine-learning-client) (0.5.0)
Requirement already satisfied: botocore<1.22.0,>=1.21.21 in
/opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from boto3->watson-
machine-learning-client) (1.21.41)
Requirement already satisfied: python-dateutil<3.0.0,>=2.1 in
/opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from
botocore<1.22.0,>=1.21.21->boto3->watson-machine-learning-client) (2.8.2)
Requirement already satisfied: six>=1.5 in /opt/conda/envs/Python-
3.9/lib/python3.9/site-packages (from python-dateutil<3.0.0,>=2.1-
>botocore<1.22.0,>=1.21.21->boto3->watson-machine-learning-client) (1.15.0)
Requirement already satisfied: ibm-cos-sdk-s3transfer==2.11.0 in
/opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from ibm-cos-sdk-
>watson-machine-learning-client) (2.11.0)
```

```
Requirement already satisfied: ibm-cos-sdk-core==2.11.0 in
/opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from ibm-cos-sdk-
>watson-machine-learning-client) (2.11.0)
Requirement already satisfied: idna<4,>=2.5 in /opt/conda/envs/Python-
3.9/lib/python3.9/site-packages (from requests->watson-machine-learning-
client) (3.3)
Requirement already satisfied: charset-normalizer~=2.0.0 in
/opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from requests-
>watson-machine-learning-client) (2.0.4)
Requirement already satisfied: pytz>=2017.3 in /opt/conda/envs/Python-
3.9/lib/python3.9/site-packages (from pandas->watson-machine-learning-client)
(2021.3)
Requirement already satisfied: numpy>=1.17.3 in /opt/conda/envs/Python-
3.9/lib/python3.9/site-packages (from pandas->watson-machine-learning-client)
(1.20.3)
Installing collected packages: watson-machine-learning-client
Successfully installed watson-machine-learning-client-1.0.391
```

In [22]:

```
from ibm_watson_machine_learning import APIClient
wml_credentials = {
    "url": "https://us-south.ml.cloud.ibm.com",
    "apikey": "4y7eNmzaeDsCxie0E5b-PACwiQldF2Ock7lM6VAd28Fb"
}

client = APIClient(wml_credentials)
```

## Save to Deployment Space

In [23]:

```
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_name)['metadata']['id'])
```

In [24]:

```
space_uid = guid_from_space_name(client, 'model')
print("Space UID : ", space_uid)

Space UID : 7ea8348c-8baa-4f9a-bac8-f21015c4bc86
```

In [25]:

```
client.set.default_space(space_uid)
```

Out[25]:

```
'SUCCESS'
```

In [26]:

```
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-b5f6fcccc6471 | 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  |
| 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  |
| xgboost_0.82-py3.6            | 39e31acd-5f30-41dc-ae44-60233c80306e  | base  |
| pytorch-onnx_1.2-py3.6-edt    | 40589d0e-7019-4e28-8daa-fb03b6f4fe12  | 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-4240baled5f7  | 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  |
| spark-mllib_2.3-r_3.6         | 6586b9e3-ccd6-4f92-900f-0f8cb2bd6f0c  | base  |
| tensorflow_2.4-py3.7          | 65e171d7-72d1-55d9-8ebb-f813d620c9bb  | base  |
| spss-modeler_18.2             | 687eddc9-028a-4117-b9dd-e57b36f1efa5  | base  |
| -----                         | -----                                 | ----- |

Note: Only first 50 records were displayed. To display more use 'limit' parameter.

In [27]:

```
software_spec_uid =
client.software_specifications.get_uid_by_name("tensorflow_rt22.1-py3.9")
```

```
software_spec_uid
```

Out[27]:

```
'acd9c798-6974-5d2f-a657-ce06e986df4d'
```

In [31]:

```
model_details = client.repository.store_model(model='trainedModel.tgz',
meta_props={
    client.repository.ModelMetaNames.NAME: "CNN",
    client.repository.ModelMetaNames.SOFTWARE_SPEC_UID: software_spec_uid,
    client.repository.ModelMetaNames.TYPE: "tensorflow_2.7"})
model_id = client.repository.get_model_id(model_details)
```

In [32]:

```
model_id
```

Out[32]:

```
'eec72d86-8ba8-46cc-8588-c9ff4bf89c85'
```

In [35]:

```
client.repository.download(model_id, 'aslpng1.tar.gz')
Successfully saved model content to file: 'aslpng1.tar.gz'
```

Out[35]:

```
 '/home/wsuser/work/aslpng1.tar.gz'
```

In [ ]: