

Train the Model on IBM

Date	31 October 2022
Team ID	PNT2022TMID24946
Project Name	Real Time Communication For Specially Abled

1) Register for IBM Cloud

The screenshot shows the IBM Watson Studio profile settings page for Chunduru Naveen Kumar. The browser tabs include WhatsApp, Gmail, YouTube, Maps, News, Translate, IBM, and several IBM Project tabs. The URL is `dataplatfrom.cloud.ibm.com/settings/profile?context=cpdaas`. The page header shows the IBM Watson Studio logo, a search bar, and user information: Chunduru Naveen Kumar's... with a dropdown arrow and a location of Dallas. The main content area is divided into two sections: 'Profile' and 'Git integrations'. The 'Profile' section is active and contains 'Service Filters' and 'Selected Account' information.

Service Filters
Set which services you see by selecting filter options.

Filter by: Resource Groups ☐ 2 x Locations ☐ None ☐

Leave IBM Watson Studio
If you leave IBM Watson Studio, your IBM Cloud account will continue to be active.
[Learn more about the results of leaving.](#)

[Leave IBM Watson Studio](#)

Selected Account
This is the IBM Cloud account that you're working in. If you belong to multiple accounts, you can switch accounts in the accounts list next to your avatar.

Account name	Chunduru Naveen Kumar's Account
Account type	Trial - 366 days left
Account ID	4c6f33d93b7e4de598ab41b96dd28a04

2) Train the ML model on IBM

The screenshot displays the IBM Watson Studio web interface. At the top, a browser tab bar shows several open tabs including 'WhatsApp', 'Inbox (385) - mathesh...', 'IBM', 'IBM-Project-47296-1...', 'Service Details - IBM', and 'IBM Watson Studio'. The address bar shows the URL 'dataplatfrom.cloud.ibm.com/home2?context=cpdaas'. The main header includes the 'IBM Watson Studio' logo, a search bar, and user information for 'Chunduru Naveen Kumar's...' with a location of 'Dallas' and a profile icon 'CK'.

The main content area features a large 'Welcome, Chunduru naveen!' message. Below this, there are three primary action cards: 'Take a tutorial' (Step through implementing a Data fabric use case in a sample project.), 'Work with data' (Create a project for your team to prepare data, find insights, or build models.), and 'Learn what's new' (Stay current with new features, enhancements, and other changes.). To the right of these cards is a 3D visualization of blue and purple cubes connected by dotted lines, with a magnifying glass icon.

Below the welcome section, there are four main panels:

- Quick start:** Contains four links: 'Create data pipelines with DataStage', 'Build customer profiles with IBM Match 360 with Watson', 'Catalog and govern data with Watson Knowledge Catalog', and 'Build and manage ML models'.
- Projects:** Shows a table with one project entry: 'image_classification' created on 'Nov 17, 2022 07:59 AM' by user 'CK'. Below this is a 'New in gallery' section with a 'SAMPLE PROJECT' link.
- Notifications:** Displays 'No notifications' with the message 'You will see your most recent notifications here.'
- Deployments:** Shows 'No deployment spaces' with the message 'After you create spaces, you'll see them here.' and a button to 'New deployment space +'.

A 'Feedback' button is visible on the right side of the dashboard.

Projects / image_classification

Overview Assets Jobs Manage

Find assets Import assets New asset +

2 assets

All assets

Name	Last modified
real_time_test Notebook	2 days ago Modified by you
Animal_Dataset.zip application/x-zip-compressed	2 days ago Modified by you

Asset types

- Data 1
- Notebooks 1

Items per page: 20 1-2 of 2 items 1 of 1 pages

3) Integrate Flask with Scoring End Point

Projects / image_classification / real_time_test

```
In [2]: pwd
Out[2]: '/home/wsuser/work'
```

```
In [3]: pip install Keras
pip install tensorflow
```

Requirement already satisfied: Keras in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (2.7.0)
Requirement already satisfied: tensorflow in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (2.7.2)
Requirement already satisfied: wheel<1.0,>=0.32.0 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorflow) (0.37.0)
Requirement already satisfied: tensorboard==2.7 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorflow) (2.7.0)
Requirement already satisfied: gast<0.5.0,>=0.2.1 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorflow) (0.4.0)
Requirement already satisfied: astunparse>=1.6.0 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorflow) (1.6.3)
Requirement already satisfied: typing-extensions>=3.6.6 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorflow) (4.1.1)
Requirement already satisfied: numpy>=1.14.5 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorflow) (1.20.3)
Requirement already satisfied: google-pasta>=0.1.1 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorflow) (0.2.0)
Requirement already satisfied: flatbuffers<3.0,>=1.12 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorflow) (2.0)
Requirement already satisfied: absl-py>=0.4.0 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorflow) (0.12.0)
Requirement already satisfied: keras<2.8,>=2.7.0 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorflow) (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) (3.3.0)
Requirement already satisfied: keras-preprocessing>=1.1.1 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorflow) (1.1.2)
Requirement already satisfied: protobuf>=3.9.2 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorflow) (3.19.1)
Requirement already satisfied: termcolor>=1.1.0 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorflow) (1.1.0)
Requirement already satisfied: tensorflow-estimator<2.8,>=2.7.0 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorflow) (2.7.0)
Requirement already satisfied: wrapt>=1.11.0 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorflow) (1.12.1)
Requirement already satisfied: six>=1.12.0 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorflow) (1.15.0)
Requirement already satisfied: tensorflow-io-gcs-filesystem>=0.21.0 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorflow) (0.23.1)
Requirement already satisfied: grpcio<2.0,>=1.24.3 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorflow) (1.42.0)
Requirement already satisfied: h5py>=2.9.0 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorflow) (3.2.1)
Requirement already satisfied: markdown>=2.6.8 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorflow) (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 tensorflow) (0.6.0)

```
(2) WhatsApp | Inbox (385) - mathes... | IBM | IBM-Project-47296-10 | Service Details - IBM | real_time_test - IBM | +
dataplatform.cloud.ibm.com/analytics/notebooks/v2/2b308fed-3e06-4c1d-9519-367c878c3f1d/view?projectid=ddba711b-0053-4138-b1e5-450931617092&conte...
Gmail | YouTube | Maps | News | Translate

IBM Watson Studio | Search in your workspaces | Buy | Chunduru Naveen Kumar's... | Dallas | CK

Projects / image_classification / real_time_test

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)

In [27]: from ibm_watson_machine_learning import APIClient
        wml_credentials = {
            "url": "https://us-south.ml.cloud.ibm.com",
            "apikey": "3rH52yjPVRZuSI3ERNZdd12z1795y1btIV6osUdHfdu"
        }
        client = APIClient(wml_credentials)

In [28]: client = APIClient(wml_credentials)

In [29]: 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 [30]: space_uid = guid_from_space_name(client, 'imageclassification')
        print("space UID=" + space_uid)

        space UID=4ce1d0c0-8e85-4d4c-900c-4286c5a9f2c8

In [31]: client.set_default_space(space_uid)

Out[31]: 'SUCCESS'

In [32]: 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-b5f6fcc6471 base
```

```
(2) WhatsApp | Inbox (385) - mathes... | IBM | IBM-Project-47296-10 | Service Details - IBM | real_time_test - IBM | +
dataplatform.cloud.ibm.com/analytics/notebooks/v2/2b308fed-3e06-4c1d-9519-367c878c3f1d/view?projectid=ddba711b-0053-4138-b1e5-450931617092&conte...
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Projects / image_classification / real_time_test

In [24]: !tar -zxvf specially-abled-model_new.tgz A2Z.h5
        A2Z.h5

In [25]: ls -l
        A2Z.h5
        Data/
        specially-abled-model_new.tgz

In [26]: !pip install watson-machine-learning-client --upgrade

Requirement already satisfied: watson-machine-learning-client in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (1.0.391)
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: boto3 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from watson-machine-learning-client) (1.18.21)
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: tqdm in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from watson-machine-learning-client) (4.62.3)
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: 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: lomond in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from watson-machine-learning-client) (0.3.3)
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: 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: 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: 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)
```

(2) WhatsApp x | Inbox (385) - mathes x | IBM x | IBM-Project-47296-16 x | Service Details - IBM x | real_time_test - IBM v x

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Projects / image_classification / real_time_test

```
In [22]: !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 17.2 MB/s eta 0:00:01
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: certifi in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from watson-machine-learning-client) (2022.9.24)
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: lomond in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from watson-machine-learning-client) (0.3.3)
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: tqdm in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from watson-machine-learning-client) (4.62.3)
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: urllib3 in /opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from watson-machine-learning-client) (1.26.7)
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: 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: 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-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: 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: 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: 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: 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
```

(2) WhatsApp | Inbox (385) - mathesh | IBM | IBM-Project-47296-1 | Service Details - IBM | real_time_test - IBM | +

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Projects / image_classification / real_time_test

```

    'z': 25}

In [12]: model = Sequential()

In [13]: model.add(Convolution2D(32, (3,3), input_shape=(100,100,3),activation = 'relu')) #Feature map

In [14]: model.add(MaxPooling2D(pool_size = (2,2))) #Pooled matrix

In [15]: model.add(Flatten())

In [16]: model.summary()

Model: "sequential"

Layer (type)                 Output Shape                 Param #
-----
conv2d (Conv2D)              (None, 98, 98, 32)          896

max_pooling2d (MaxPooling2D) (None, 49, 49, 32)          0

flatten (Flatten)            (None, 76832)               0

Total params: 896
Trainable params: 896
Non-trainable params: 0

In [17]: model.add(Dense(512,activation='relu'))
          model.add(Dense(256,activation='relu'))

In [18]: model.add(Dense(26,activation='softmax'))

```

IBM Watson Studio interface showing a Jupyter Notebook session for image classification.

Browser Tabs: (2) WhatsApp, Inbox (385) - mathesh..., IBM, IBM-Project-47296-16, Service Details - IBM, real_time_test - IBM

URL: dataplatform.cloud.ibm.com/analytcs/notebooks/v2/2b308fed-3e06-4c1d-9519-367c878c3f1d/view?projectid=ddba711b-0053-4138-b1e5-450931617092&conte...

Navigation: Projects / image_classification / real_time_test

Code Execution:

```
In [8]: pwd
```

Out[8]: '/home/wsuser/work'

```
In [ ]: import os
filenames=os.listdir('/home/wsuser/work/Data/training')
```

```
In [10]: x_train = train_datagen.flow_from_directory("/home/wsuser/work/Data/training",target_size=(100,100),class_mode='categorical',batch_size=75)
x_test = test_datagen.flow_from_directory("/home/wsuser/work/Data/testing",target_size=(100,100),class_mode='categorical',batch_size=75)

Found 13000 images belonging to 26 classes.
Found 2688 images belonging to 26 classes.
```

```
In [43]: x_train.class_indices
```

Out[43]: {'A': 0,
'B': 1,
'C': 2,
'D': 3,
'E': 4,
'F': 5,
'G': 6,
'H': 7,
'I': 8,
'J': 9,
'K': 10,
'L': 11,
'M': 12,
'N': 13,
'O': 14,
'P': 15,
'Q': 16,

