

## MODEL DEPLOYMENT ON WATSON STUDIO

**Team ID:PNT2022TMID16204**

### **TEAM MEMBERS:**

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```
!pip install -U ibm-watson-machine-learning
```

```
Requirement already satisfied: ibm-watson-machine-learning in
/opt/conda/envs/Python-3.9/lib/python3.9/site-packages (1.0.257)
Requirement already satisfied: tabulate in /opt/conda/envs/Python-
3.9/lib/python3.9/site-packages (from ibm-watson-machine-learning)
(0.8.9)
Requirement already satisfied: importlib-metadata in
/opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from ibm-
watson-machine-learning) (4.8.2)
Requirement already satisfied: lomond in
/opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from ibm-
watson-machine-learning) (0.3.3)
Requirement already satisfied: urllib3 in
/opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from ibm-
watson-machine-learning) (1.26.7)
Requirement already satisfied: packaging in /opt/conda/envs/Python-
3.9/lib/python3.9/site-packages (from ibm-watson-machine-learning)
(21.3)
Requirement already satisfied: requests in /opt/conda/envs/Python-
3.9/lib/python3.9/site-packages (from ibm-watson-machine-learning)
(2.26.0)
Requirement already satisfied: ibm-cos-sdk==2.11.* in
/opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from ibm-
watson-machine-learning) (2.11.0)
Requirement already satisfied: certifi in
/opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from ibm-
watson-machine-learning) (2022.9.24)
Requirement already satisfied: pandas<1.5.0,>=0.24.2 in
/opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from ibm-
watson-machine-learning) (1.3.4)
Requirement already satisfied: jmespath<1.0.0,>=0.7.1 in
/opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from ibm-cos-
sdk==2.11.*->ibm-watson-machine-learning) (0.10.0)
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==2.11.*->ibm-watson-machine-learning) (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==2.11.*->ibm-watson-machine-learning) (2.11.0)
Requirement already satisfied: python-dateutil<3.0.0,>=2.1 in
/opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from ibm-cos-
sdk-core==2.11.0->ibm-cos-sdk==2.11.*->ibm-watson-machine-learning)
(2.8.2)
Requirement already satisfied: pytz>=2017.3 in /opt/conda/envs/Python-
3.9/lib/python3.9/site-packages (from pandas<1.5.0,>=0.24.2->ibm-
watson-machine-learning) (2021.3)
Requirement already satisfied: numpy>=1.17.3 in
/opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from
pandas<1.5.0,>=0.24.2->ibm-watson-machine-learning) (1.20.3)
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-
>ibm-cos-sdk-core==2.11.0->ibm-cos-sdk==2.11.*->ibm-watson-machine-
learning) (1.15.0)
Requirement already satisfied: charset-normalizer~=2.0.0 in
/opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from requests-
>ibm-watson-machine-learning) (2.0.4)
Requirement already satisfied: idna<4,>=2.5 in /opt/conda/envs/Python-
3.9/lib/python3.9/site-packages (from requests->ibm-watson-machine-
learning) (3.3)
Requirement already satisfied: zipp>=0.5 in /opt/conda/envs/Python-
3.9/lib/python3.9/site-packages (from importlib-metadata->ibm-watson-
machine-learning) (3.6.0)
Requirement already satisfied: pyparsing!=3.0.5,>=2.0.2 in
/opt/conda/envs/Python-3.9/lib/python3.9/site-packages (from
packaging->ibm-watson-machine-learning) (3.0.4)

```

```

from ibm_watson_machine_learning import APIClient
import json

```

```

wml_credentials = {
    "apikey": "umsddhtqxmQOPqQ640JQe42AIiwDoBozC9qygTdp45sJ",
    "url": "https://us-south.ml.cloud.ibm.com"
}

```

```

wml_client = APIClient(wml_credentials)
wml_client.spaces.list()

```

Note: 'limit' is not provided. Only first 50 records will be displayed if the number of records exceed 50

```

-----
-----
ID                                NAME                                CREATED
1f8cbe22-b491-4cdd-895f-8cfac5245a83  flight_delay_prediction  2022-
11-11T09:54:35.212Z

```

```
-----  
SPACE_ID= "1f8cbe22-b491-4cdd-895f-8cfac5245a83"
```

```
wml_client.set.default_space(SPACE_ID)
```

```
'SUCCESS'
```

```
wml_client.software_specifications.list(500)
```

```
-----  
-----  
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	
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	
pytorch-onnx_1.2-py3.6	692a6a4d-2c4d-45ff-a1ed-b167ee55469a
base	
spark-mllib_2.3-scala_2.11	7963efe5-bbec-417e-92cf-0574e21b4e8d
base	
spark-mllib_2.4-py37	7abc992b-b685-532b-a122-a396a3cdbaab
base	
caffe_1.0-py3.6	7bb3dbe2-da6e-4145-918d-b6d84aa93b6b
base	
pytorch-onnx_1.7-py3.7	812c6631-42b7-5613-982b-02098e6c909c
base	
cuda-py3.6	82c79ece-4d12-40e6-8787-a7b9e0f62770
base	
tensorflow_1.15-py3.6-horovod	8964680e-d5e4-5bb8-919b-8342c6c0dfd8
base	
hybrid_0.1	8c1a58c6-62b5-4dc4-987a-df751c2756b6
base	
pytorch-onnx_1.3-py3.7	8d5d8a87-a912-54cf-81ec-3914adaa988d
base	
caffe-ibm_1.0-py3.6	8d863266-7927-4d1e-97d7-56a7f4c0a19b
base	
spss-modeler_17.1	902d0051-84bd-4af6-ab6b-8f6aa6fdeabb
base	
do_12.10	9100fd72-8159-4eb9-8a0b-a87e12eefa36
base	
do_py3.7	9447fa8b-2051-4d24-9eef-5acb0e3c59f8
base	
spark-mllib_3.0-r_3.6	94bb6052-c837-589d-83f1-f4142f219e32
base	
cuda-py3.7-opence	94e9652b-7f2d-59d5-ba5a-23a414ea488f
base	

nlp-py3.8	96e60351-99d4-5a1c-9cc0-473ac1b5a864
base	
cuda-py3.7	9a44990c-1aa1-4c7d-baf8-c4099011741c
base	
hybrid_0.2	9b3f9040-9cee-4ead-8d7a-780600f542f7
base	
spark-mllib_3.0-py38	9f7a8fc1-4d3c-5e65-ab90-41fa8de2d418
base	
autoai-kb_3.3-py3.7	a545cca3-02df-5c61-9e88-998b09dc79af
base	
spark-mllib_3.0-py39	a6082a27-5acc-5163-b02c-6b96916eb5e0
base	
runtime-22.1-py3.9-do	a7e7dbf1-1d03-5544-994d-e5ec845ce99a
base	
default_py3.8	ab9e1b80-f2ce-592c-a7d2-4f2344f77194
base	
tensorflow_rt22.1-py3.9	acd9c798-6974-5d2f-a657-ce06e986df4d
base	
kernel-spark3.2-py3.9	ad7033ee-794e-58cf-812e-a95f4b64b207
base	
autoai-obm_2.0 with Spark 3.0	af10f35f-69fa-5d66-9bf5-acb58434263a
base	
default_py3.7_opence	c2057dd4-f42c-5f77-a02f-72bdbd3282c9
base	
tensorflow_2.1-py3.7	c4032338-2a40-500a-beef-b01ab2667e27
base	
do_py3.7_opence	cc8f8976-b74a-551a-bb66-6377f8d865b4
base	
spark-mllib_3.3	d11f2434-4fc7-58b7-8a62-755da64fdaf8
base	
autoai-kb_3.0-py3.6	d139f196-e04b-5d8b-9140-9a10ca1fa91a
base	
spark-mllib_3.0-py36	d82546d5-dd78-5fbb-9131-2ec309bc56ed
base	
autoai-kb_3.4-py3.8	da9b39c3-758c-5a4f-9cfd-457dd4d8c395
base	
kernel-spark3.2-r3.6	db2fe4d6-d641-5d05-9972-73c654c60e0a
base	
autoai-kb_rt22.1-py3.9	db6afe93-665f-5910-b117-d879897404d9
base	
tensorflow_rt22.1-py3.9-horovod	dda170cc-ca67-5da7-9b7a-cf84c6987fae
base	
autoai-ts_1.0-py3.7	deef04f0-0c42-5147-9711-89f9904299db
base	
tensorflow_2.1-py3.7-horovod	e384fce5-fdd1-53f8-bc71-11326c9c635f
base	
default_py3.7	e4429883-c883-42b6-87a8-f419d64088cd
base	
do_22.1	e51999ba-6452-5f1f-8287-17228b88b652
base	

autoai-obm_3.2	eae86aab-da30-5229-a6a6-1d0d4e368983
base	
tensorflow_rt22.2-py3.10	f65bd165-f057-55de-b5cb-f97cf2c0f393
base	
do_20.1	f686cdd9-7904-5f9d-a732-01b0d6b10dc5
base	
pytorch-onnx_rt22.2-py3.10-edt	f8a05d07-e7cd-57bb-a10b-23f1d4b837ac
base	
scikit-learn_0.19-py3.6	f963fa9d-4bb7-5652-9c5d-8d9289ef6ad9
base	
tensorflow_2.4-py3.8	fe185c44-9a99-5425-986b-59bd1d2eda46
base	

-----  
-----

```
import sklearn
sklearn.__version__
```

```
'1.0.2'
```

```
MODEL_NAME = 'flightdelayprediction'
DEPLOYMENT_NAME = 'flight_delay_prediction'
DEMO_MODEL = model
```

```
software_spec_uid =
wml_client.software_specifications.get_id_by_name('runtime-22.1-
py3.9')
```

```
# Setup model meta
```

```
model_props = {
    wml_client.repository.ModelMetaNames.NAME: MODEL_NAME,
    wml_client.repository.ModelMetaNames.TYPE: 'scikit-learn_1.0',
    wml_client.repository.ModelMetaNames.SOFTWARE_SPEC_UID:
software_spec_uid
}
```

```
#Save model
```

```
model_details = wml_client.repository.store_model(
    model=DEMO_MODEL,
    meta_props=model_props,
    training_data=train_x,
    training_target=train_y
)
```

```
model_details
```

```
{'entity': {'hybrid_pipeline_software_specs': [],
  'label_column': 'ARR_DEL15',
  'schemas': {'input': [{'fields': [{'name': 'MONTH', 'type':
'int64'},
    {'name': 'DAY_OF_MONTH', 'type': 'int64'},
    {'name': 'DAY_OF_WEEK', 'type': 'int64'},
```

```

        {'name': 'CRS_DEP_TIME', 'type': 'int64'},
        {'name': 'ORIGIN_ATL', 'type': 'uint8'},
        {'name': 'ORIGIN_DTW', 'type': 'uint8'},
        {'name': 'ORIGIN_JFK', 'type': 'uint8'},
        {'name': 'ORIGIN_MSP', 'type': 'uint8'},
        {'name': 'ORIGIN_SEA', 'type': 'uint8'},
        {'name': 'DEST_ATL', 'type': 'uint8'},
        {'name': 'DEST_DTW', 'type': 'uint8'},
        {'name': 'DEST_JFK', 'type': 'uint8'},
        {'name': 'DEST_MSP', 'type': 'uint8'},
        {'name': 'DEST_SEA', 'type': 'uint8'}],
        'id': '1',
        'type': 'struct'}],
    'output': [],
    'software_spec': {'id': '12b83a17-24d8-5082-900f-0ab31fbfd3cb',
        'name': 'runtime-22.1-py3.9'},
    'type': 'scikit-learn_1.0'},
'metadata': {'created_at': '2022-11-11T11:48:38.088Z',
    'id': 'aae0ddb1-5562-4e59-860a-7f28afc694ad',
    'modified_at': '2022-11-11T11:48:51.701Z',
    'name': 'flightdelayprediction',
    'owner': 'IBMid-666002MR4W',
    'resource_key': '1bbba327-eee7-4adb-b46b-1b129f15d36b',
    'space_id': '1f8cbe22-b491-4cdd-895f-8cfac5245a83'},
'system': {'warnings': []}]

model_id = wml_client.repository.get_model_id(model_details)
model_id

'aae0ddb1-5562-4e59-860a-7f28afc694ad'

# Set meta
deployment_props = {

wml_client.deployments.ConfigurationMetaNames.NAME:DEPLOYMENT_NAME,
    wml_client.deployments.ConfigurationMetaNames.ONLINE: {}
}

# Deploy
deployment = wml_client.deployments.create(
    artifact_uid=model_id,
    meta_props=deployment_props
)

#####
#####

Synchronous deployment creation for uid: 'aae0ddb1-5562-4e59-860a-7f28afc694ad' started

```



```
#####  
#####
```

initializing

Note: online\_url is deprecated and will be removed in a future release. Use serving\_urls instead.

ready

```
-----  
-----  
Successfully finished deployment creation, deployment_uid='da808bb7-  
ffdd-41a9-a4e8-84d47d0506eb'  
-----  
-----
```

The screenshot shows the IBM Watson Studio interface. The top navigation bar includes the IBM Watson Studio logo, a search bar, and user account information. The main content area is titled 'flight\_delay\_prediction' and has tabs for Overview, Assets, Deployments, Jobs, and Manage. The 'Deployments' tab is active, showing a table of deployments. A file upload notification is visible on the right side of the page.

Name	Type	Status	Asset	Last modified
flight_delay_prediction	Online	Deployed	flightdelayprediction	2 days ago Tamil Mani P (You)
flight_delay_prediction	Online	Deployed	flightdelayprediction	6 days ago Tamil Mani P (You)
flight_delay_prediction	Online	Deployed	flight_delay	7 days ago Tamil Mani P (You)

Items per page: 20 1-3 of 3 items 1 of 1 pages

Drop files here or browse for files to upload.

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