Phase 4 : Project Development Part 2

Project Title:

Machine learning model deployment with IBM cloud Watson Studio.

Problem Statement:

Become a wizard of predictive anlytics with IBM Cloud Watson Studio. Train machine learning models to predict the outcomes in real time. Deploy the models as web services and integrate them into your applications. Unlock the magic of data driven insights and make informed decidions like never before.

House Price Prediction Analysis - Part 1

Project overview

Data Understanding

Data Visualization

Data Preparation

Modeling

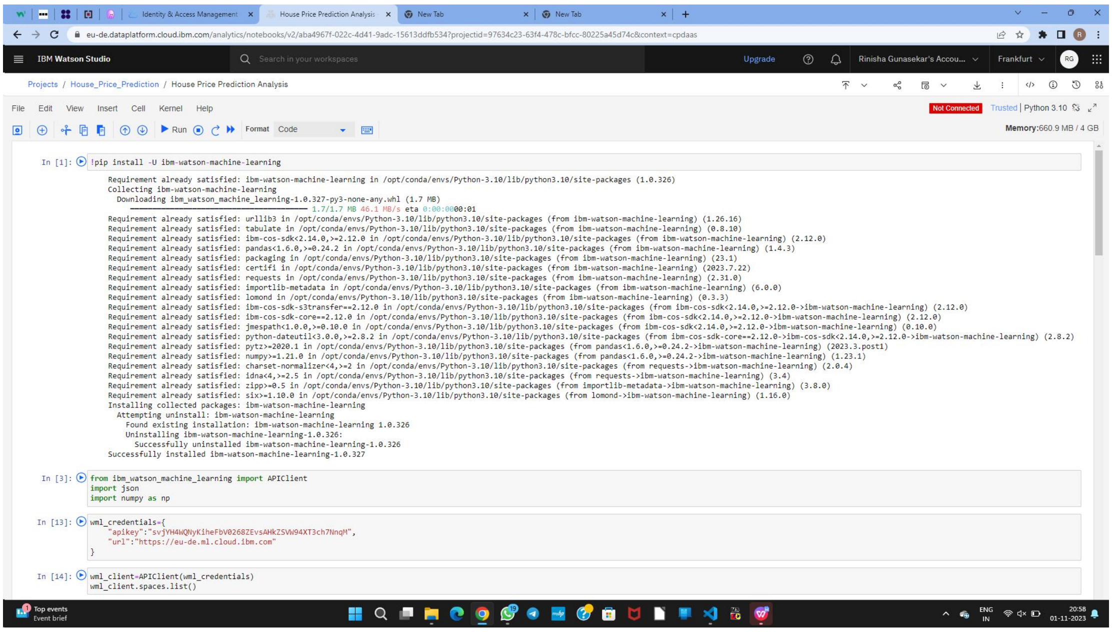
Evaluation

Project Overview:

House Price Prediction Analysis aims to use Machine learning analysis algorithms to predict the price of houses based on their features like number of rooms, number of bedrooms, age of the house, population of the respective area where the house is located, location of the house and the area income with other relevant factors if available.By this Machine Learning model user can predict the price of the house that can be sold.

Step wise process for the House Price Prediction Analysis Machine learning model deployment.

Step 1: Install the ibm-watson-machine-learning



```
In [1]: !pip install -U ibm-watson-machine-learning

        Requirement already satisfied: ibm-watson-machine-learning in /opt/conda/envs/Python-3.10/lib/python3.10/site-packages (1.0.326)
        Collecting ibm-watson-machine-learning
          Downloading ibm_watson_machine_learning-1.0.327-py3-none-any.whl (1.7 MB)
             ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 1.7/1.7 MB 46.1 MB/s eta 0:00:0000:01
        Requirement already satisfied: urllib3 in /opt/conda/envs/Python-3.10/lib/python3.10/site-packages (from ibm-watson-machine-learning) (1.26.16)
        Requirement already satisfied: tabulate in /opt/conda/envs/Python-3.10/lib/python3.10/site-packages (from ibm-watson-machine-learning) (0.8.10)
        Requirement already satisfied: ibm-cos-sdk<2.14.0,>=2.12.0 in /opt/conda/envs/Python-3.10/lib/python3.10/site-packages (from ibm-watson-machine-learning) (2.12.0)
        Requirement already satisfied: pandas<1.6.0,>=0.24.2 in /opt/conda/envs/Python-3.10/lib/python3.10/site-packages (from ibm-watson-machine-learning) (1.4.3)
        Requirement already satisfied: packaging in /opt/conda/envs/Python-3.10/lib/python3.10/site-packages (from ibm-watson-machine-learning) (23.1)
        Requirement already satisfied: certifi in /opt/conda/envs/Python-3.10/lib/python3.10/site-packages (from ibm-watson-machine-learning) (2023.7.22)
        Requirement already satisfied: requests in /opt/conda/envs/Python-3.10/lib/python3.10/site-packages (from ibm-watson-machine-learning) (2.31.0)
        Requirement already satisfied: importlib-metadata in /opt/conda/envs/Python-3.10/lib/python3.10/site-packages (from ibm-watson-machine-learning) (6.0.0)
        Requirement already satisfied: lomond in /opt/conda/envs/Python-3.10/lib/python3.10/site-packages (from ibm-watson-machine-learning) (0.3.3)
        Requirement already satisfied: ibm-cos-sdk-s3transfer==2.12.0 in /opt/conda/envs/Python-3.10/lib/python3.10/site-packages (from ibm-cos-sdk<2.14.0,>=2.12.0->ibm-watson-machine-learning) (2.12.0)
        Requirement already satisfied: ibm-cos-sdk-core==2.12.0 in /opt/conda/envs/Python-3.10/lib/python3.10/site-packages (from ibm-cos-sdk<2.14.0,>=2.12.0->ibm-watson-machine-learning) (2.12.0)
        Requirement already satisfied: jmespath<1.0.0,>=0.10.0 in /opt/conda/envs/Python-3.10/lib/python3.10/site-packages (from ibm-cos-sdk<2.14.0,>=2.12.0->ibm-watson-machine-learning) (0.10.0)
        Requirement already satisfied: python-dateutil<3.0.0,>=2.8.2 in /opt/conda/envs/Python-3.10/lib/python3.10/site-packages (from ibm-cos-sdk-core==2.12.0->ibm-cos-sdk<2.14.0,>=2.12.0->ibm-watson-machine-learning) (2.8.2)
        Requirement already satisfied: pytz>=2020.1 in /opt/conda/envs/Python-3.10/lib/python3.10/site-packages (from pandas<1.6.0,>=0.24.2->ibm-watson-machine-learning) (2023.3.post1)
        Requirement already satisfied: numpy>=1.21.0 in /opt/conda/envs/Python-3.10/lib/python3.10/site-packages (from pandas<1.6.0,>=0.24.2->ibm-watson-machine-learning) (1.23.1)
        Requirement already satisfied: charset-normalizer<4,>=2 in /opt/conda/envs/Python-3.10/lib/python3.10/site-packages (from requests->ibm-watson-machine-learning) (2.0.4)
        Requirement already satisfied: idna<4,>=2.5 in /opt/conda/envs/Python-3.10/lib/python3.10/site-packages (from requests->ibm-watson-machine-learning) (3.4)
        Requirement already satisfied: zipp>=0.5 in /opt/conda/envs/Python-3.10/lib/python3.10/site-packages (from importlib-metadata->ibm-watson-machine-learning) (3.8.0)
        Requirement already satisfied: six>=1.10.0 in /opt/conda/envs/Python-3.10/lib/python3.10/site-packages (from lomond->ibm-watson-machine-learning) (1.16.0)
        Installing collected packages: ibm-watson-machine-learning
          Attempting uninstall: ibm-watson-machine-learning
            Found existing installation: ibm-watson-machine-learning 1.0.326
            Uninstalling ibm-watson-machine-learning-1.0.326:
              Successfully uninstalled ibm-watson-machine-learning-1.0.326
        Successfully installed ibm-watson-machine-learning-1.0.327

In [3]: from ibm_watson_machine_learning import APIClient
        import json
        import numpy as np

In [13]: wml_credentials={
             "apikey":"svjYH4WQNyKiheFbV0268ZEvsAHkZSVW94XT3ch7NnqM",
             "url":"https://eu-de.ml.cloud.ibm.com"
         }

In [14]: wml_client=APIClient(wml_credentials)
         wml_client.spaces.list()
```

Identity & Access Management
House Price Prediction Analysis
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eu-de.dataplatform.cloud.ibm.com/analytics/notebooks/v2/aba4967f-022c-4d41-9adc-15613ddfb534?projectid=97634c23-63f4-478c-bfcc-80225a45d74c&context=cpdaas
IBM Watson Studio
Search in your workspaces
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Projects / House_Price_Prediction / House Price Prediction Analysis
File
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Python 3.10
Memory:660.9 MB / 4 GB
Top events
Event brief
ENG
IN
20:58
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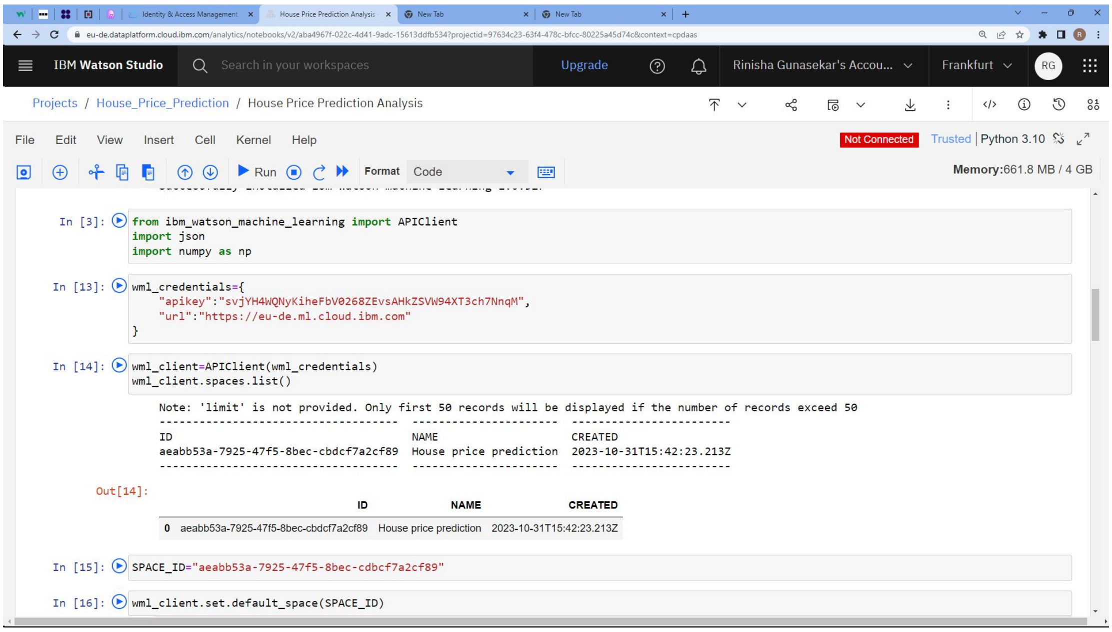
Step 2: Import APIClient, json and numpy. Add the apikey. Create the deployment SPACE_ID



```
In [3]: from ibm_watson_machine_learning import APIClient
        import json
        import numpy as np

In [13]: wml_credentials={
             "apikey":"svjYH4WQNyKiheFbV0268ZEvsAHkZSVW94XT3ch7NnqM",
             "url":"https://eu-de.ml.cloud.ibm.com"
         }

In [14]: 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
             aeabb53a-7925-47f5-8bec-cbdcf7a2cf89  House price prediction  2023-10-31T15:42:23.213Z
             ------------------------------------  ---------------------  ------------------------

Out[14]:
```

	ID	NAME	CREATED
0	aeabb53a-7925-47f5-8bec-cbdcf7a2cf89	House price prediction	2023-10-31T15:42:23.213Z

```
In [15]: SPACE_ID="aeabb53a-7925-47f5-8bec-cbdcf7a2cf89"

In [16]: wml_client.set_default_space(SPACE_ID)
```

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House Price Prediction Analysis
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eu-de.dataplatform.cloud.ibm.com/analytics/notebooks/v2/aba4967f-022c-4d41-9adc-15613ddfb534?projectid=97634c23-63f4-478c-bfcc-80225a45d74c&context=cpdaas
IBM Watson Studio
Search in your workspaces
Upgrade
Rinisha Gunasekar's Accou...
Frankfurt
RG
Projects / House_Price_Prediction / House Price Prediction Analysis
File
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View
Insert
Cell
Kernel
Help
Run
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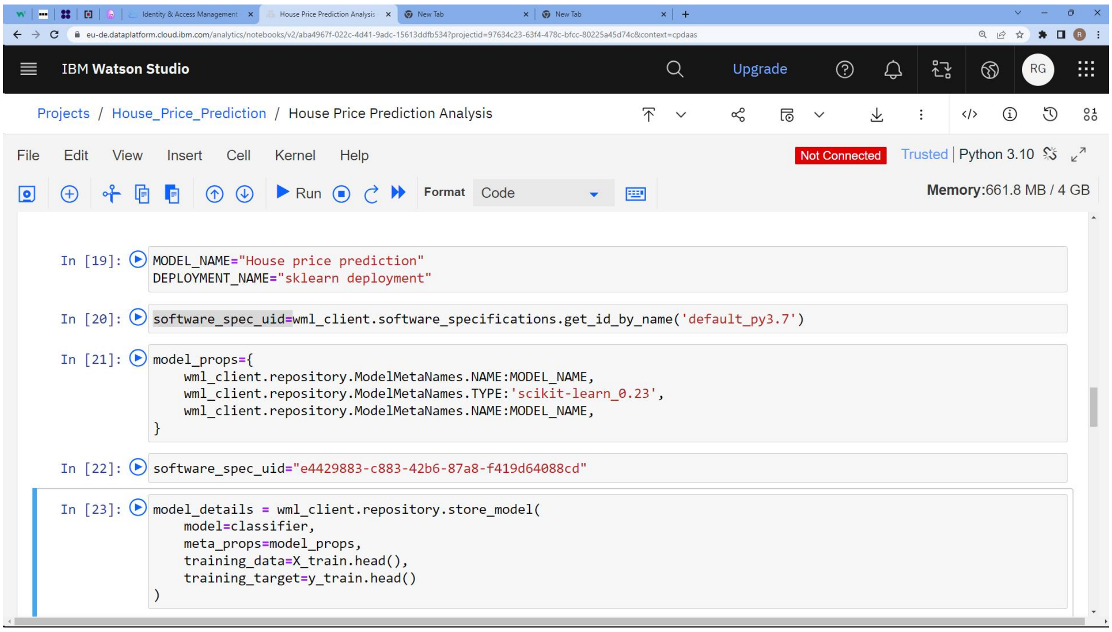
Python 3.10
Memory:661.8 MB / 4 GB

Step 3: The props and details of the ‘house price prediction’ model was given.



```
In [19]: MODEL_NAME="House price prediction"
         DEPLOYMENT_NAME="sklearn deployment"

In [20]: software_spec_uid=wml_client.software_specifications.get_id_by_name('default_py3.7')

In [21]: model_props={
             wml_client.repository.ModelMetaNames.NAME:MODEL_NAME,
             wml_client.repository.ModelMetaNames.TYPE:'scikit-learn_0.23',
             wml_client.repository.ModelMetaNames.NAME:MODEL_NAME,
         }

In [22]: software_spec_uid="e4429883-c883-42b6-87a8-f419d64088cd"

In [23]: model_details = wml_client.repository.store_model(
             model=classifier,
             meta_props=model_props,
             training_data=X_train.head(),
             training_target=y_train.head()
         )
```

IBM Watson Studio
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Projects / House_Price_Prediction / House Price Prediction Analysis
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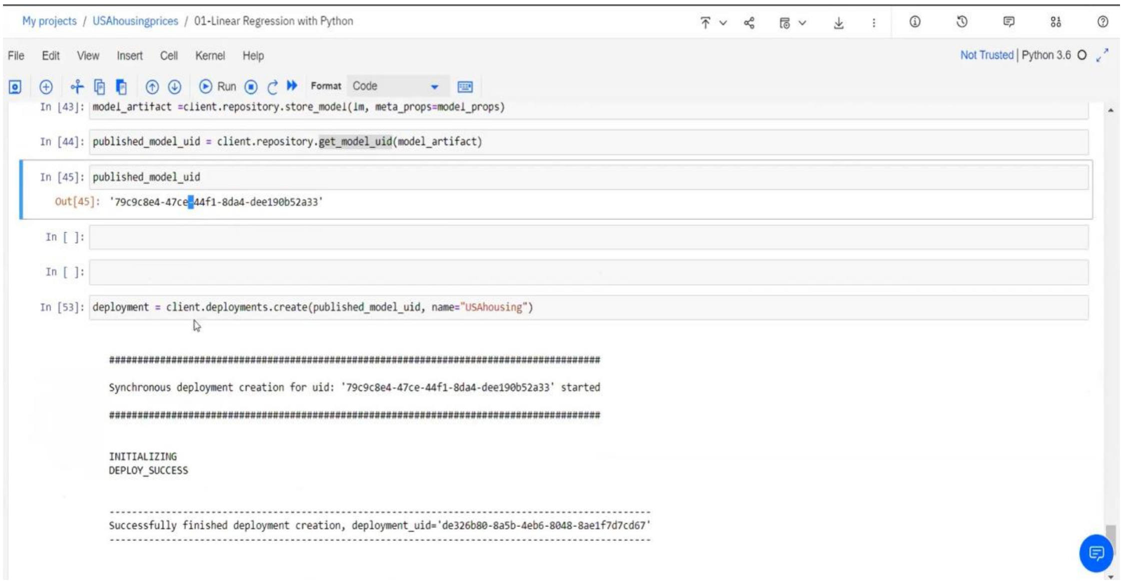
Step 4: The deployment creation is successfully finished.



```
In [43]: model_artifact =client.repository.store_model(lm, meta_props=model_props)

In [44]: published_model_uid = client.repository.get_model_uid(model_artifact)

In [45]: published_model_uid
 Out[45]: '79c9c8e4-47ce-44f1-8da4-dee190b52a33'

In [ ]:

In [ ]:

In [53]: deployment = client.deployments.create(published_model_uid, name="USAhousing")

         #######################################################################################

         Synchronous deployment creation for uid: '79c9c8e4-47ce-44f1-8da4-dee190b52a33' started

         #######################################################################################


         INITIALIZING
         DEPLOY_SUCCESS


         ------------------------------------------------------------------------------------------------
         Successfully finished deployment creation, deployment_uid='de326b80-8a5b-4eb6-8048-8ae1f7d7cd67'
         ------------------------------------------------------------------------------------------------
```

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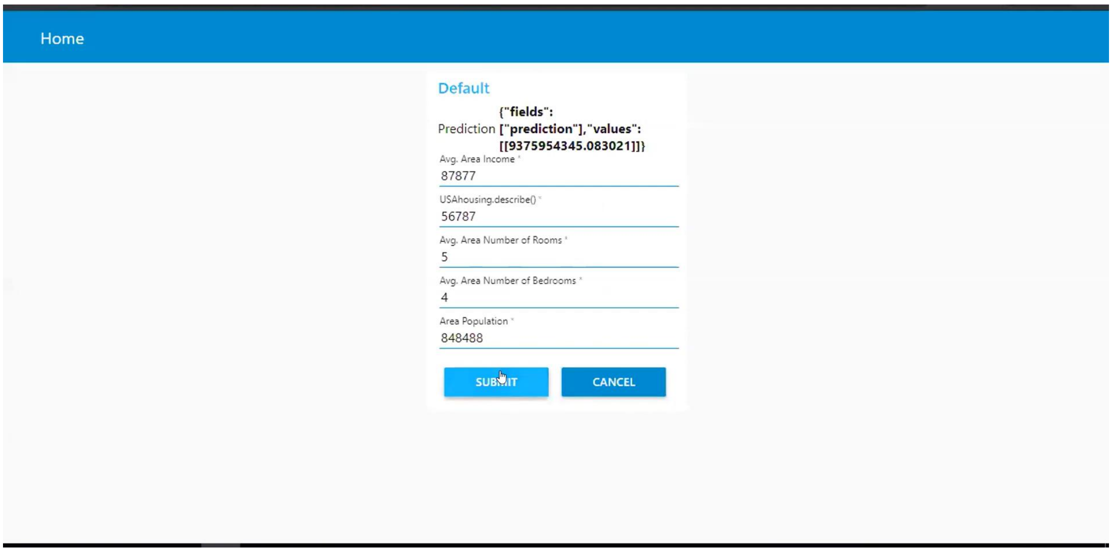
Step 5: Now we have deployed our machine learning model as a Web service. Once the model is deployed ,it can be used to make predictions or provide other intelligent services to web users.



Prediction {"fields": ["prediction"],"values": [[9375954345.083021]]}

Avg. Area Income *
87877

USAhousing.describe() *
56787

Avg. Area Number of Rooms *
5

Avg. Area Number of Bedrooms *
4

Area Population *
848488