Project Documentation - Diabetes Prediction Model Deployment CAD_Phase5

Project Overview

- **Objective:** The primary goal of our project is to deploy a diabetes prediction model via IBM Cloud Watson Studio to enable real-time predictions, supporting informed healthcare decisions.
- **Design Thinking Process:** We followed a structured design thinking process to ensure an effective problem-solving approach and create a robust solution.

Development Phases

Data Collection

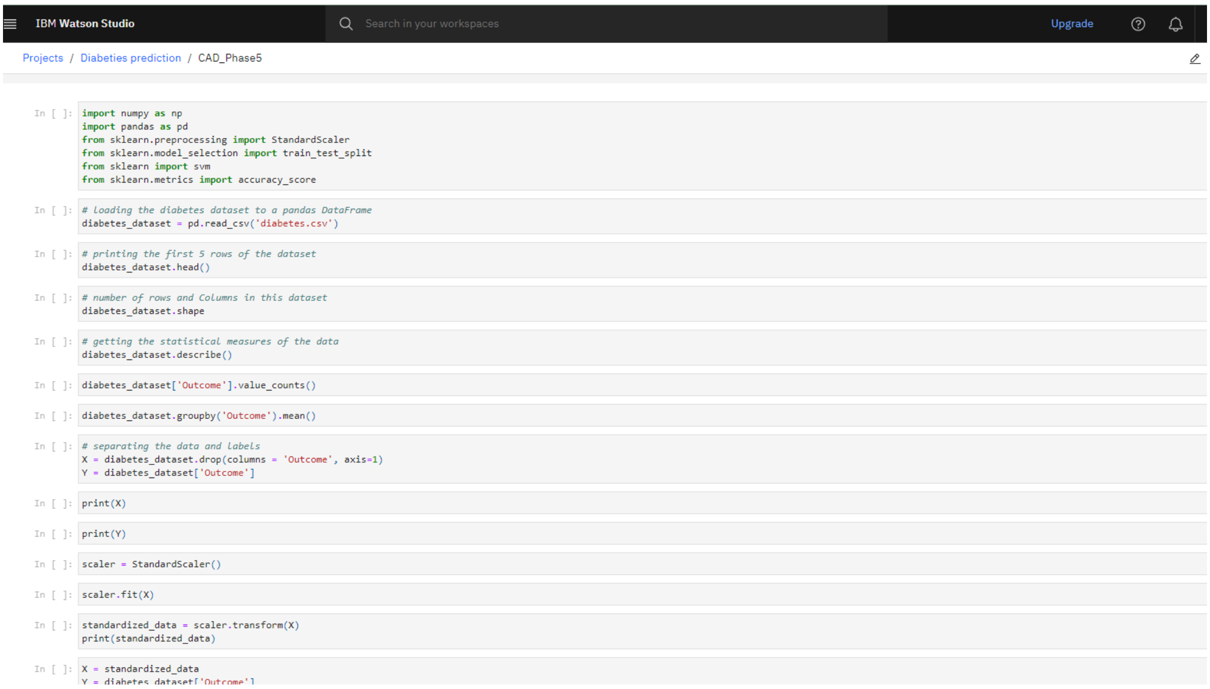
- **Data Collection:** We initiated our project by obtaining a suitable dataset, a fundamental step in model training and validation.

Data Preprocessing

- **Data Preprocessing:** Data preprocessing involved cleaning, transforming, and feature engineering to make the dataset suitable for model training.

Model Training

- **Model Training:** We selected a machine learning model, detailed its architecture and hyperparameters, and explained the choice of performance metrics for model evaluation.


IBM Watson Studio
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```
In [ ]: import numpy as np
        import pandas as pd
        from sklearn.preprocessing import StandardScaler
        from sklearn.model_selection import train_test_split
        from sklearn import svm
        from sklearn.metrics import accuracy_score

In [ ]: # loading the diabetes dataset to a pandas DataFrame
        diabetes_dataset = pd.read_csv('diabetes.csv')

In [ ]: # printing the first 5 rows of the dataset
        diabetes_dataset.head()

In [ ]: # number of rows and Columns in this dataset
        diabetes_dataset.shape

In [ ]: # getting the statistical measures of the data
        diabetes_dataset.describe()

In [ ]: diabetes_dataset['Outcome'].value_counts()

In [ ]: diabetes_dataset.groupby('Outcome').mean()

In [ ]: # separating the data and labels
        X = diabetes_dataset.drop(columns = 'Outcome', axis=1)
        Y = diabetes_dataset['Outcome']

In [ ]: print(X)

In [ ]: print(Y)

In [ ]: scaler = StandardScaler()

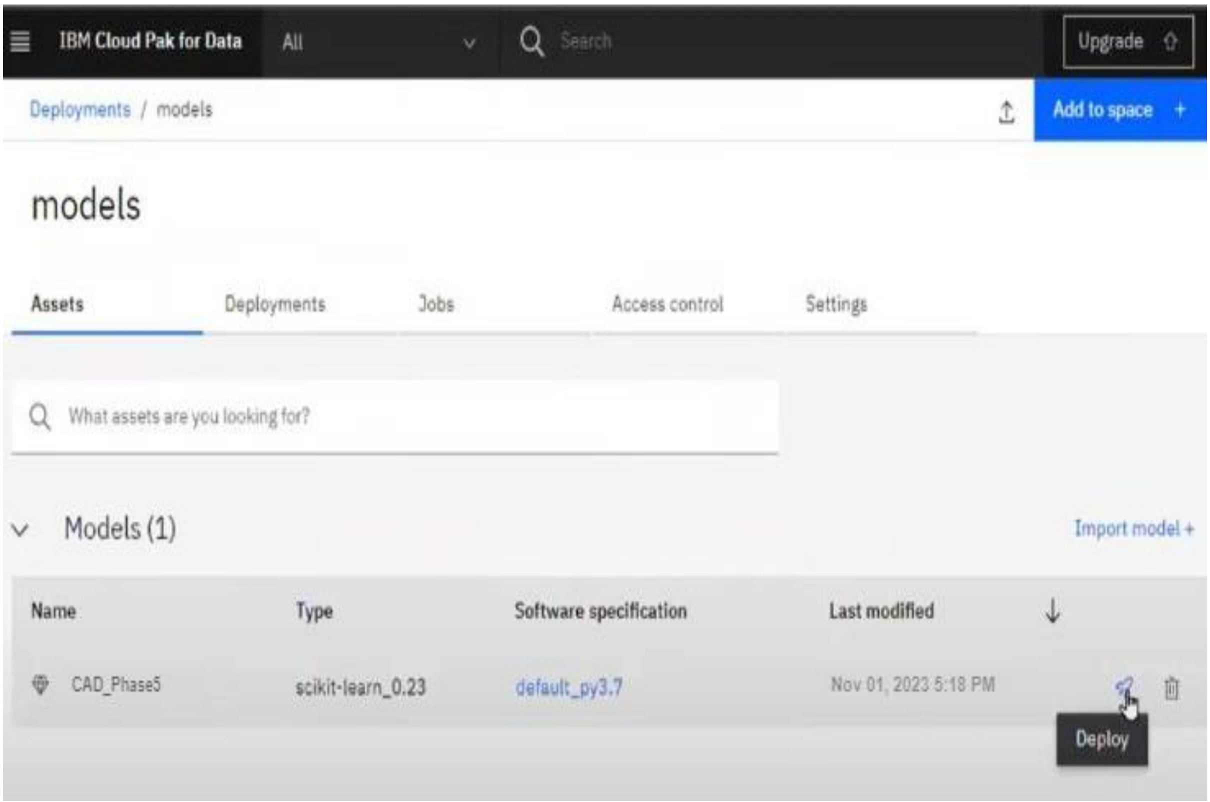
In [ ]: scaler.fit(X)

In [ ]: standardized_data = scaler.transform(X)
        print(standardized_data)

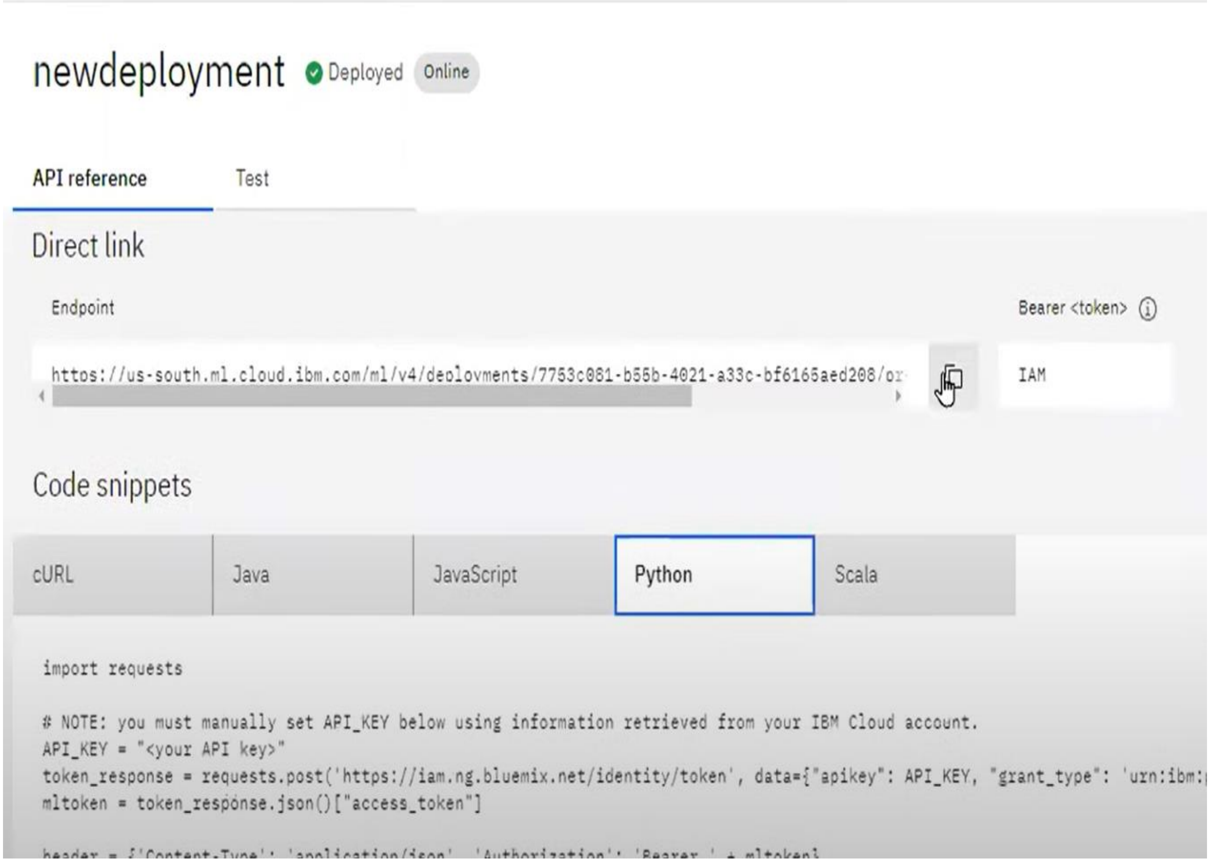
In [ ]: X = standardized_data
        Y = diabetes_dataset['Outcome']
```

Model Deployment

- **Model Deployment:** This phase involved the actual deployment of the trained model using IBM Cloud Watson Studio.s



Name	Type	Software specification	Last modified
CAD_Phase5	scikit-learn_0.23	default_py3.7	Nov 01, 2023 5:18 PM



Endpoint

https://us-south.ml.cloud.ibm.com/ml/v4/deployments/7753c081-b55b-4021-a33c-bf6165aed208/or

Bearer <token>

IAM

```
import requests

# NOTE: you must manually set API_KEY below using information retrieved from your IBM Cloud account.
API_KEY = "<your API key>"
token_response = requests.post('https://iam.ng.bluemix.net/identity/token', data={"apikey": API_KEY, "grant_type": 'urn:ibm:
mltoken = token_response.json()["access_token"]

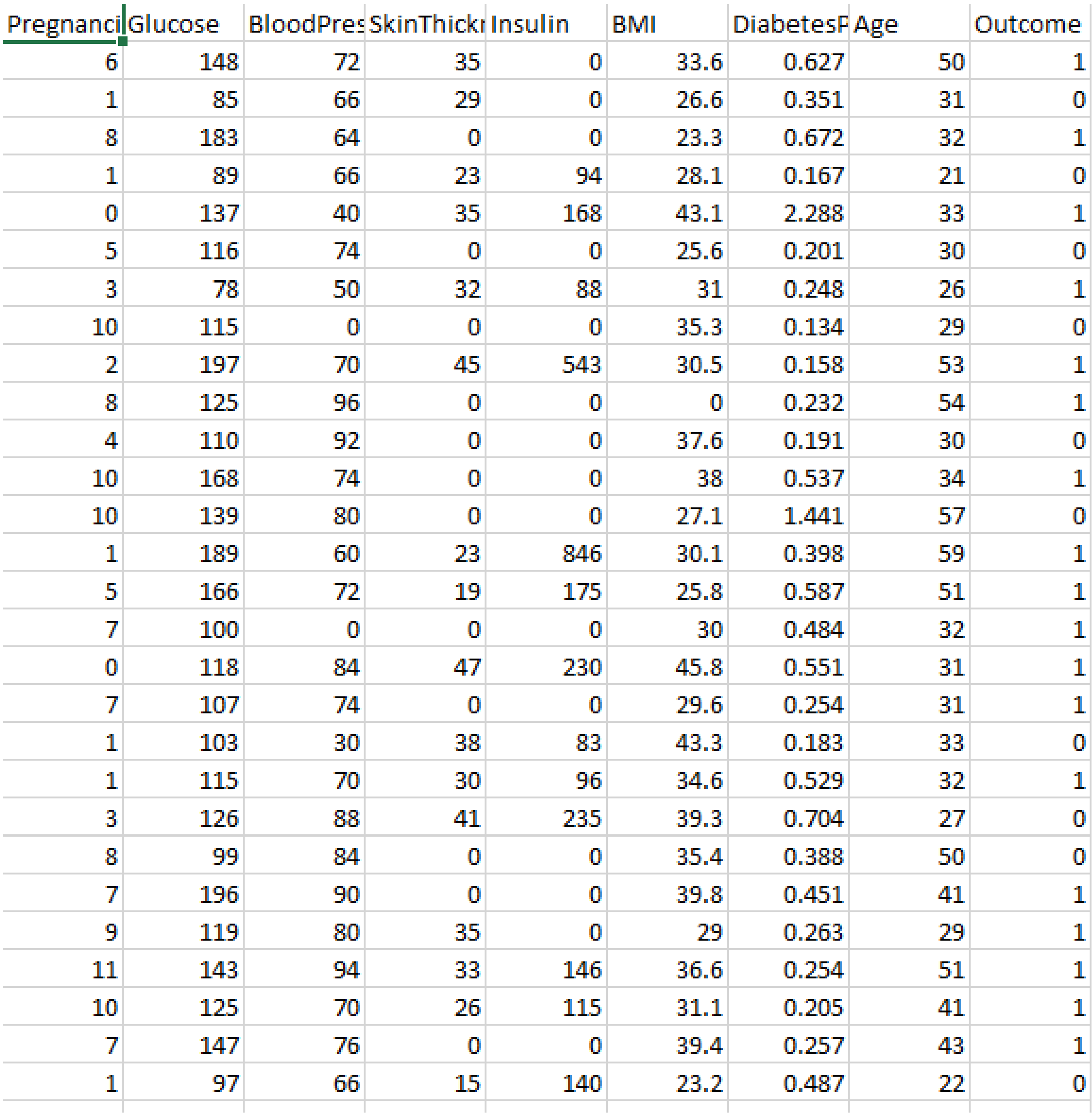
header = {'Content-Type': 'application/json', 'Authorization': 'Bearer ' + mltoken}
```

Predictive Use Case

- **Predictive Use Case:** Our project addresses the critical issue of predicting diabetes in patients, significantly impacting healthcare management.

Dataset Selection

- **Dataset Selection:** We carefully chose a relevant dataset



Pregnanci	Glucose	BloodPres	SkinThickr	Insulin	BMI	DiabetesP	Age	Outcome
6	148	72	35	0	33.6	0.627	50	1
1	85	66	29	0	26.6	0.351	31	0
8	183	64	0	0	23.3	0.672	32	1
1	89	66	23	94	28.1	0.167	21	0
0	137	40	35	168	43.1	2.288	33	1
5	116	74	0	0	25.6	0.201	30	0
3	78	50	32	88	31	0.248	26	1
10	115	0	0	0	35.3	0.134	29	0
2	197	70	45	543	30.5	0.158	53	1
8	125	96	0	0	0	0.232	54	1
4	110	92	0	0	37.6	0.191	30	0
10	168	74	0	0	38	0.537	34	1
10	139	80	0	0	27.1	1.441	57	0
1	189	60	23	846	30.1	0.398	59	1
5	166	72	19	175	25.8	0.587	51	1
7	100	0	0	0	30	0.484	32	1
0	118	84	47	230	45.8	0.551	31	1
7	107	74	0	0	29.6	0.254	31	1
1	103	30	38	83	43.3	0.183	33	0
1	115	70	30	96	34.6	0.529	32	1
3	126	88	41	235	39.3	0.704	27	0
8	99	84	0	0	35.4	0.388	50	0
7	196	90	0	0	39.8	0.451	41	1
9	119	80	35	0	29	0.263	29	1
11	143	94	33	146	36.6	0.254	51	1
10	125	70	26	115	31.1	0.205	41	1
7	147	76	0	0	39.4	0.257	43	1
1	97	66	15	140	23.2	0.487	22	0

Model Training

- **Model Training:** Insights into the architecture of the machine learning model used for diabetes prediction were provided, along with an explanation of key hyperparameters. We also detailed the metrics used to evaluate model performance.

Deployment Process

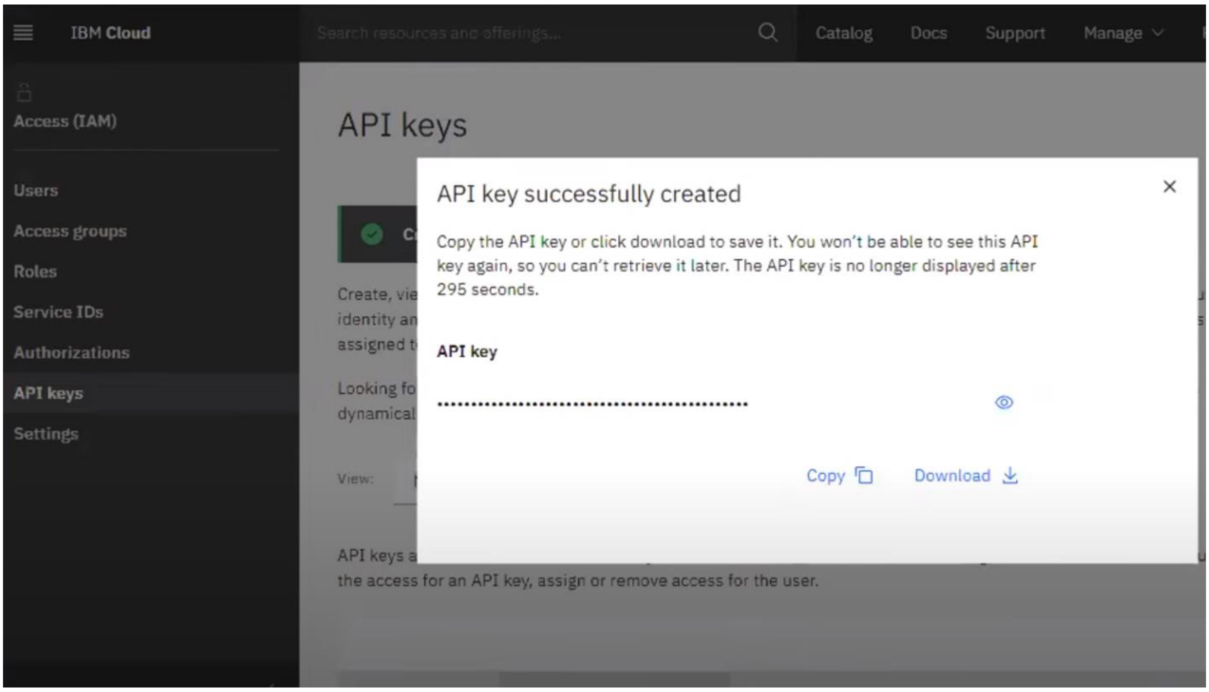
- **Deployment Process:** This section provides detailed steps in deploying our model using IBM Cloud Watson Studio, accompanied by screenshots and diagrams illustrating the deployment process.

Integration Steps

- **Integration Steps:** Here, we explain how other applications or services can integrate with our deployed model and provide information on API endpoints.

Real-Time Predictions

- **Real-Time Predictions:** This section elaborates on how users can access and utilize our deployed model for real-time predictions. API requests are provided for users to understand how to make predictions through the deployed model.



API key successfully created

Copy the API key or click download to save it. You won't be able to see this API key again, so you can't retrieve it later. The API key is no longer displayed after 295 seconds.

API key

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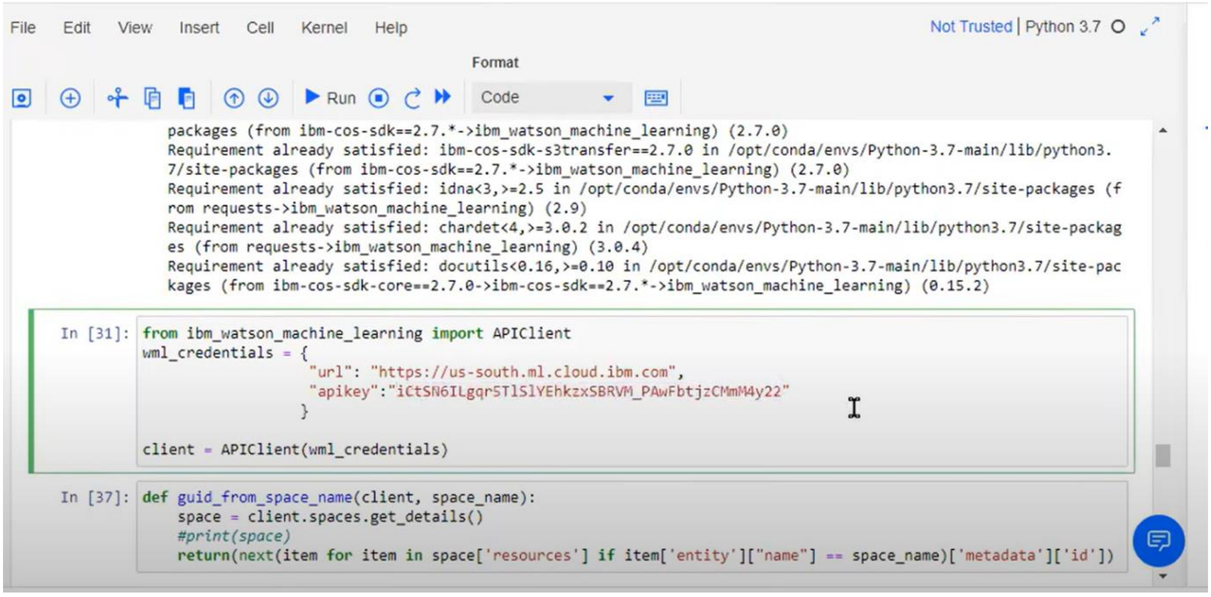
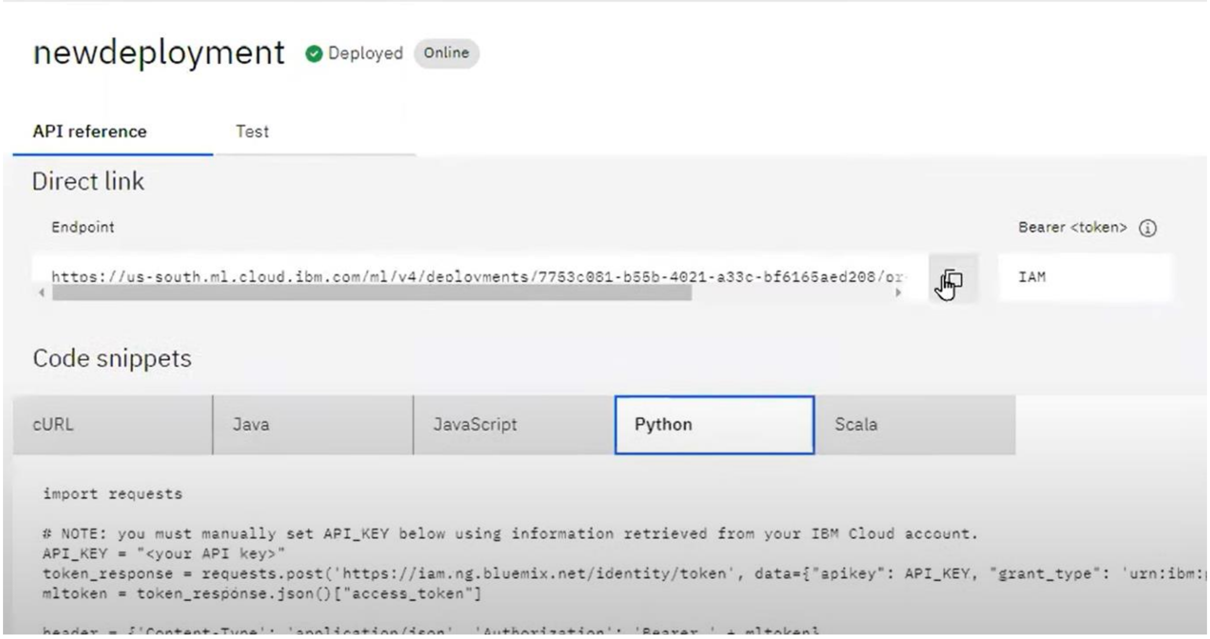


```
packages (from ibm-cos-sdk==2.7.*->ibm_watson_machine_learning) (2.7.0)
Requirement already satisfied: ibm-cos-sdk-s3transfer==2.7.0 in /opt/conda/envs/Python-3.7-main/lib/python3.
7/site-packages (from ibm-cos-sdk==2.7.*->ibm_watson_machine_learning) (2.7.0)
Requirement already satisfied: idna<3,>=2.5 in /opt/conda/envs/Python-3.7-main/lib/python3.7/site-packages (f
rom requests->ibm_watson_machine_learning) (2.9)
Requirement already satisfied: chardet<4,>=3.0.2 in /opt/conda/envs/Python-3.7-main/lib/python3.7/site-packag
es (from requests->ibm_watson_machine_learning) (3.0.4)
Requirement already satisfied: docutils<0.16,>=0.10 in /opt/conda/envs/Python-3.7-main/lib/python3.7/site-pac
kages (from ibm-cos-sdk-core==2.7.0->ibm-cos-sdk==2.7.*->ibm_watson_machine_learning) (0.15.2)
```

```
In [31]: from ibm_watson_machine_learning import APIClient
         wml_credentials = {
                            "url": "https://us-south.ml.cloud.ibm.com",
                            "apikey":"iCtSN6ILgqr5TlSlYEhkzxSBRVM_PAwFbtjzCMmM4y22"
                           }

         client = APIClient(wml_credentials)
```

```
In [37]: def guid_from_space_name(client, space_name):
             space = client.spaces.get_details()
             #print(space)
             return(next(item for item in space['resources'] if item['entity']["name"] == space_name)['metadata']['id'])
```



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mltoken = token_response.json()["access_token"]

header = {'Content-Type': 'application/json', 'Authorization': 'Bearer ' + mltoken}
```

Conclusion

Our project aimed to deploy a diabetes prediction model for real-time predictions, empowering better healthcare decisions. We followed a structured approach to address this problem effectively.

Throughout the project, we completed essential phases:

- **Data Collection:** We gathered a suitable dataset for model training.
- **Data Preprocessing:** We cleaned and transformed the dataset to make it ready for the model.
- **Model Training:** We explained the model's architecture and performance metrics for evaluation.
- **Model Deployment:** We successfully deployed the model using IBM Cloud Watson Studio

The deployment process was explained with screenshots, ensuring clarity. Integration steps and real-time predictions through API were highlighted.

In conclusion, our project has a meaningful impact on healthcare decisions, and our model stands as a tool to make a positive difference. We are committed to further improvements in the future.