

**Practical File submitted for the
evaluation of**

“Artificial Intelligence Lab”

Subject Code: 21CAM3116

B.TECH - Third Year (VI Semester)

Department of Computer Science & Engineering



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Submitted To:

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EXPERIMENT-1

Aim:

Write a Python Program to perform Simple Linear Regression.

Code:

```
In [1]: import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
```

```
In [3]: df=pd.read_csv("Salary_Data.csv")
```

```
In [4]: df
```

```
Out[4]:
```

	YearsExperience	Age	Salary
0	1.1	21.0	39343
1	1.3	21.5	46205
2	1.5	21.7	37731
3	2.0	22.0	43525
4	2.2	22.2	39891
5	2.9	23.0	56642
6	3.0	23.0	60150
7	3.2	23.3	54445
8	3.2	23.3	64445
9	3.7	23.6	57189
10	3.9	23.9	63218
11	4.0	24.0	55794
12	4.0	24.0	56967
13	4.1	24.0	57081
14	4.5	25.0	61111
15	4.9	25.0	67938
16	5.1	26.0	66029
17	5.3	27.0	83088
18	5.9	28.0	81383
19	6.0	29.0	93940
20	6.8	30.0	91738
21	7.1	30.0	98273
22	7.9	31.0	101302
23	8.2	32.0	113812
24	8.7	33.0	109431
25	9.0	34.0	105582
26	9.5	35.0	116969
27	9.6	36.0	112635
28	10.3	37.0	122391
29	10.5	38.0	121872

```
In [5]: df.tail()
```

```
Out[5]:
```

	YearsExperience	Age	Salary
25	9.0	34.0	105582
26	9.5	35.0	116969
27	9.6	36.0	112635
28	10.3	37.0	122391
29	10.5	38.0	121872

```
In [6]: df.head()
```

```
Out[6]:
```

	YearsExperience	Age	Salary
0	1.1	21.0	39343
1	1.3	21.5	46205
2	1.5	21.7	37731
3	2.0	22.0	43525
4	2.2	22.2	39891

```
In [7]: df1=df.drop("Age",axis=1)
```

```
In [8]: df1
```

```
Out[8]:
```

	YearsExperience	Salary
0	1.1	39343
1	1.3	46205
2	1.5	37731
3	2.0	43525
4	2.2	39891
5	2.9	56642
6	3.0	60150
7	3.2	54445
8	3.2	64445
9	3.7	57189
10	3.9	63218
11	4.0	55794
12	4.0	56957
13	4.1	57081
14	4.5	61111
15	4.9	67938
16	5.1	66029
17	5.3	83088
18	5.9	81363
19	6.0	93940
20	6.8	91738
21	7.1	98273
22	7.9	101302
23	8.2	113812
24	8.7	109431
25	9.0	105582
26	9.5	116969
27	9.6	112635
28	10.3	122391
29	10.5	121872

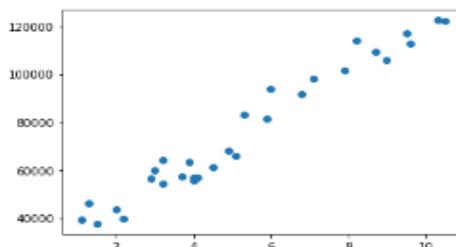
```
In [9]: df1.head()
```

```
Out[9]:
```

	YearsExperience	Salary
0	1.1	39343
1	1.3	46205
2	1.5	37731
3	2.0	43525
4	2.2	39891

```
In [10]: plt.scatter(df1["YearsExperience"],df1["Salary"])
```

```
Out[10]: <matplotlib.collections.PathCollection at 0x23542a06c70>
```



```
In [11]: df1.corr()
```

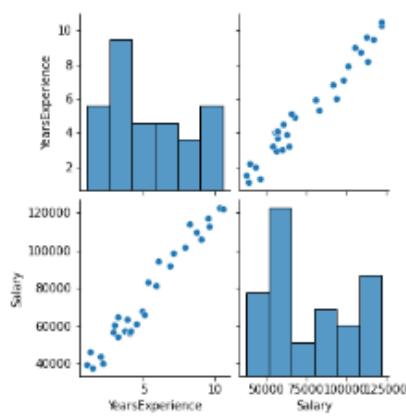
```
Out[11]:
```

	YearsExperience	Salary
YearsExperience	1.000000	0.978242
Salary	0.978242	1.000000

```
In [12]: import seaborn as sns
```

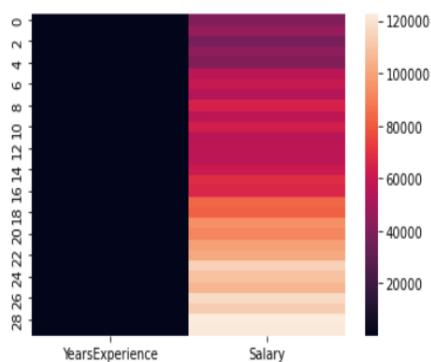
```
In [13]: sns.pairplot(df1)
```

```
Out[13]: <seaborn.axisgrid.PairGrid at 0x2353f1c8520>
```



```
In [14]: sns.heatmap(df1)
```

```
Out[14]: <AxesSubplot:>
```



```
In [15]: X=df1[["YearsExperience"]]
y=df1["Salary"]
```

```
In [16]: x_s=df1["YearsExperience"]
np.array(x_s).shape
x_s
```

```
Out[16]: 0      1.1
1      1.3
2      1.5
3      2.0
4      2.2
5      2.9
6      3.0
7      3.2
8      3.2
9      3.7
10     3.9
11     4.0
12     4.0
13     4.1
14     4.5
15     4.9
16     5.1
17     5.3
18     5.9
19     6.0
20     6.8
21     7.1
22     7.9
23     8.2
24     8.7
25     9.0
26     9.5
27     9.6
28    10.3
29    10.5
Name: YearsExperience, dtype: float64
```

```
In [17]: from sklearn.model_selection import train_test_split
In [18]: X_train,X_test,Y_train,Y_test=train_test_split(X,y,test_size=0.25,random_state=42)
In [19]: X_train,Y_train
Out[19]: (    YearsExperience
       12              4.0
       0              1.1
       4              2.2
       16             5.1
       5              2.9
      13             4.1
      11              4.0
      22              7.9
      1              1.3
      2              1.5
      25              9.0
      3              2.0
      21              7.1
      26              9.5
      18              5.9
      29             10.5
      20              6.8
      7              3.2
      10              3.9
      14              4.5
      19              6.0
      6              3.0,
      12      56957
      0      39343
      4      39891
      16     66029
      5      56642
      13     57081
      11     55794
      22     101302
      1      46205
      2      37731
      25     105582
      3      43525
      21     98273
      26     116969
      18     81363
      29     121872

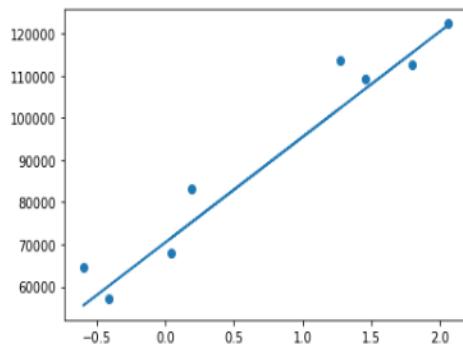
In [20]: from sklearn.preprocessing import StandardScaler
In [21]: scaler=StandardScaler()
In [22]: X_train=scaler.fit_transform(X_train)
In [23]: X_test=scaler.transform(X_test)
In [24]: from sklearn.linear_model import LinearRegression
In [25]: regressor=LinearRegression()
In [26]: regressor.fit(X_train,Y_train)
Out[26]: LinearRegression()
In [27]: Y_pred=regressor.predict(X_train)
In [28]: Y_pred=regressor.predict(X_train)
In [29]: y_pred1=regressor.predict(X_test)
```

```
In [30]: Y_test,y_pred1
```

```
Out[30]: (27    112635
 15    67938
 23    113812
 17    83088
 8     64445
 9     57189
 28    122391
 24    109431
Name: Salary, dtype: int64,
array([115439.88180109, 71396.10622651, 102320.45928951, 75144.51265839,
       55465.37889103, 60150.88693088, 121999.59305688, 107005.96732936]))
```

```
In [31]: plt.scatter(X_test,Y_test)
plt.plot(X_test,y_pred1)
```

```
Out[31]: [
```



```
In [32]: from sklearn.metrics import mean_absolute_error,mean_squared_error,r2_score
```

```
In [33]: mse=mean_squared_error(Y_test,y_pred1)
mae=mean_absolute_error(Y_test,y_pred1)
rmse=np.sqrt(mse)

print("Mean square error: ",mse)
print("Mean absolute error: ",mae)
print("Root mean square error: ",rmse)
```

```
Mean square error:  38802588.99247064
Mean absolute error:  5056.995466663591
Root mean square error:  6229.172416338356
```

```
In [34]: score=r2_score(Y_test,y_pred1)
score
```

```
Out[34]: 0.9347210011126782
```

EXPERIMENT-2

Aim:

Write a Python Program to perform Multilinear Linear Regression.

Code:

```
In [1]: import pandas as pd
import numpy as np
import matplotlib.pyplot as plt

In [3]: df=pd.read_csv("Salary_Data.csv")
df.head()

Out[3]:   YearsExperience  Age  Salary
0            1.1  21.0  39343
1            1.3  21.5  46205
2            1.5  21.7  37731
3            2.0  22.0  43525
4            2.2  22.2  39891

In [8]: X=df.iloc[:, :-1]
Y=df.iloc[:, -1]

In [9]: X,Y

Out[9]: (   YearsExperience  Age
0            1.1  21.0
1            1.3  21.5
2            1.5  21.7
3            2.0  22.0
4            2.2  22.2
5            2.9  23.0
6            3.0  23.0
7            3.2  23.3
8            3.2  23.3
9            3.7  23.6
10           3.9  23.9
11           4.0  24.0
12           4.0  24.0
13           4.1  24.0
14           4.5  25.0
15           4.9  25.0
16           5.1  26.0
17           5.3  27.0
18           5.9  28.0
19           6.0  29.0
20           6.8  30.0
21           7.1  30.0
22           7.9  31.0
23           8.2  32.0
24           8.7  33.0
25           9.0  34.0
26           9.5  35.0
27           9.6  36.0
28          10.3  37.0
29          10.5  38.0,
0            39343
1            46205
2            37731
3            43525
4            39891
5            56642
6            60150
7            54445
8            64445
9            57189
10           63218
11           55794
```

```
        salary, salary)

In [10]: from sklearn.model_selection import train_test_split

In [12]: X_train,X_test,Y_train,Y_test=train_test_split(X,Y,test_size=0.25,random_state=42)

In [13]: from sklearn.linear_model import LinearRegression

In [14]: reg=LinearRegression()
reg.fit(X_train,Y_train)

Out[14]: LinearRegression()

In [15]: x_pred=reg.predict(X_train)
y_pred=reg.predict(X_test)

In [16]: Y_test,y_pred

Out[16]: (27    112635
       15    67938
       23    113812
       17    83088
       8     64445
       9     57189
      28    122391
      24    109431
      Name: Salary, dtype: int64,
      array([118960.22367886,  67167.65572722, 101530.57769495,  74519.75819122,
      54740.70223941,  57842.17438335, 124907.47579079, 106569.34945491]))
```

```
In [17]: print("Training Score:", reg.score(X_train,Y_train))
print("Testing Score:",reg.score(X_test,Y_test))

Training Score: 0.9629170101633955
Testing Score: 0.9213567327731517

In [18]: from sklearn.metrics import mean_absolute_error,mean_squared_error

In [20]: mse=mean_squared_error(Y_test,y_pred)
mae=mean_absolute_error(Y_test,y_pred)
rmse=np.sqrt(mse)
print(mse)
print(mae)
print(rmse)

46746464.058000326
5460.103818161702
6837.138587011406
```

EXPERIMENT-3

Aim:

Write a Python Program to perform Polynomial Regression.

```
In [1]: import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
```

```
In [2]: data=pd.read_csv("Position_Salary.csv")
data.head()
```

```
Out[2]:
```

	Position	Level	Salary
0	Business Analyst	1	45000
1	Junior Consultant	2	50000
2	Senior Consultant	3	60000
3	Manager	4	80000
4	Country Manager	5	110000

```
In [3]: X_in=data.iloc[:,1:2].values
Y_ot=data.iloc[:,2].values
```

```
In [4]: X_in,Y_ot
```

```
Out[4]: (array([[ 1],
 [ 2],
 [ 3],
 [ 4],
 [ 5],
 [ 6],
 [ 7],
 [ 8],
 [ 9],
 [10]], dtype=int64),
array([ 45000,  50000,  60000,  80000, 110000, 150000, 200000,
300000, 500000, 1000000], dtype=int64))
```

```
In [5]: from sklearn.linear_model import LinearRegression
```

```
In [6]: reg1=LinearRegression()
reg1.fit(X_in,Y_ot)
```

```
Out[6]: LinearRegression()
```

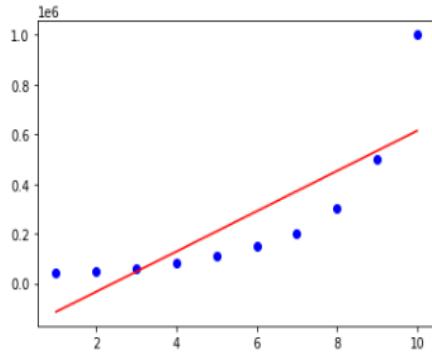
```
In [7]: y_pred=reg1.predict([[3.8]])
y_pred
```

```
Out[7]: array([112006.06060606])
```

```
In [8]: y_pred1=reg1.predict(X_in)
```

```
In [9]: plt.scatter(X_in,Y_ot,color="blue")
plt.plot(X_in,y_pred1,color="red")
```

```
Out[9]: [<matplotlib.lines.Line2D at 0x22684b3b250>]
```



```
In [21]: reg2=LinearRegression()
```

```
In [22]: reg2.fit(x_poly,Y_ot)
```

```
Out[22]: LinearRegression()
```

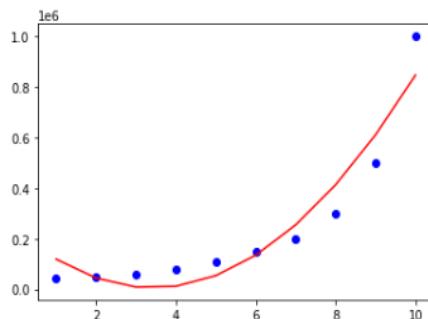
```
In [23]: reg2.predict([[1,3,9]])
```

```
Out[23]: array([8439.39393939])
```

```
In [24]: y_pred2=reg2.predict(x_poly)
```

```
In [25]: plt.scatter(X_in,Y_ot,color="blue")
plt.plot(X_in,y_pred2,color="red")
```

```
Out[25]: [<matplotlib.lines.Line2D at 0x22685c4c040>]
```



```
In [29]: reg2.predict(ploy_reg.fit_transform([[8,3]]))
```

```
Out[29]: array([467993.56060606])
```

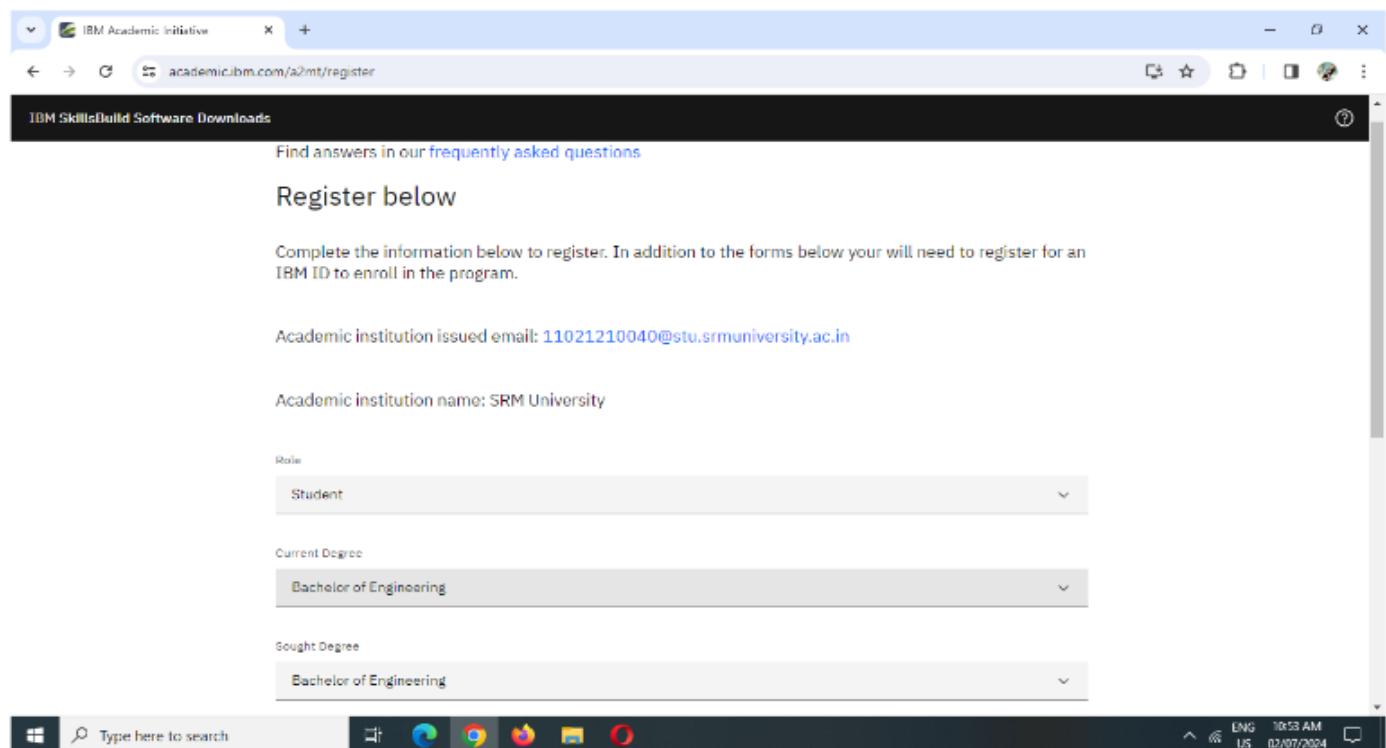
```
In [31]: reg2.predict([[1,8,64]])
```

```
Out[31]: array([412833.33333333])
```

EXPERIMENT-4

Aim:

Write down the steps to create IBM cloud account and understand different IBM Watson Services.



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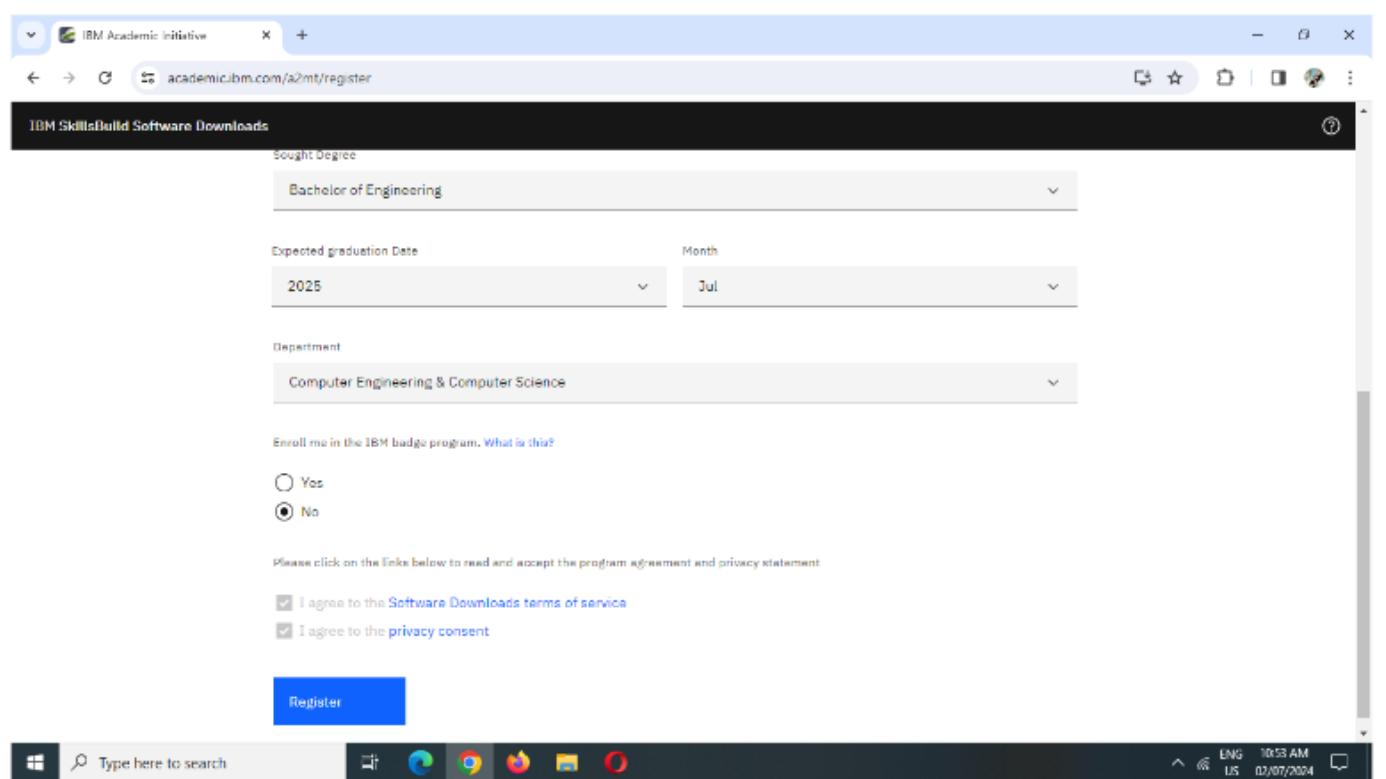
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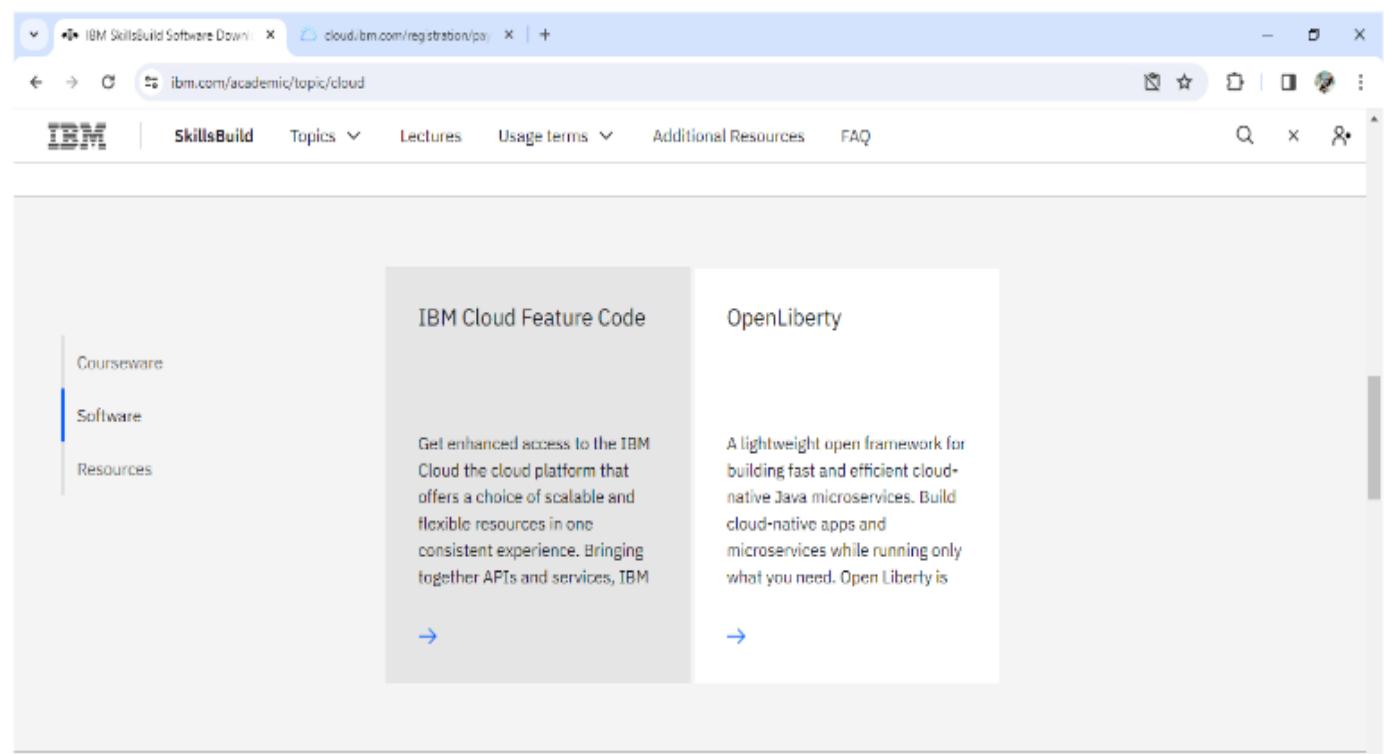
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OpenLiberty

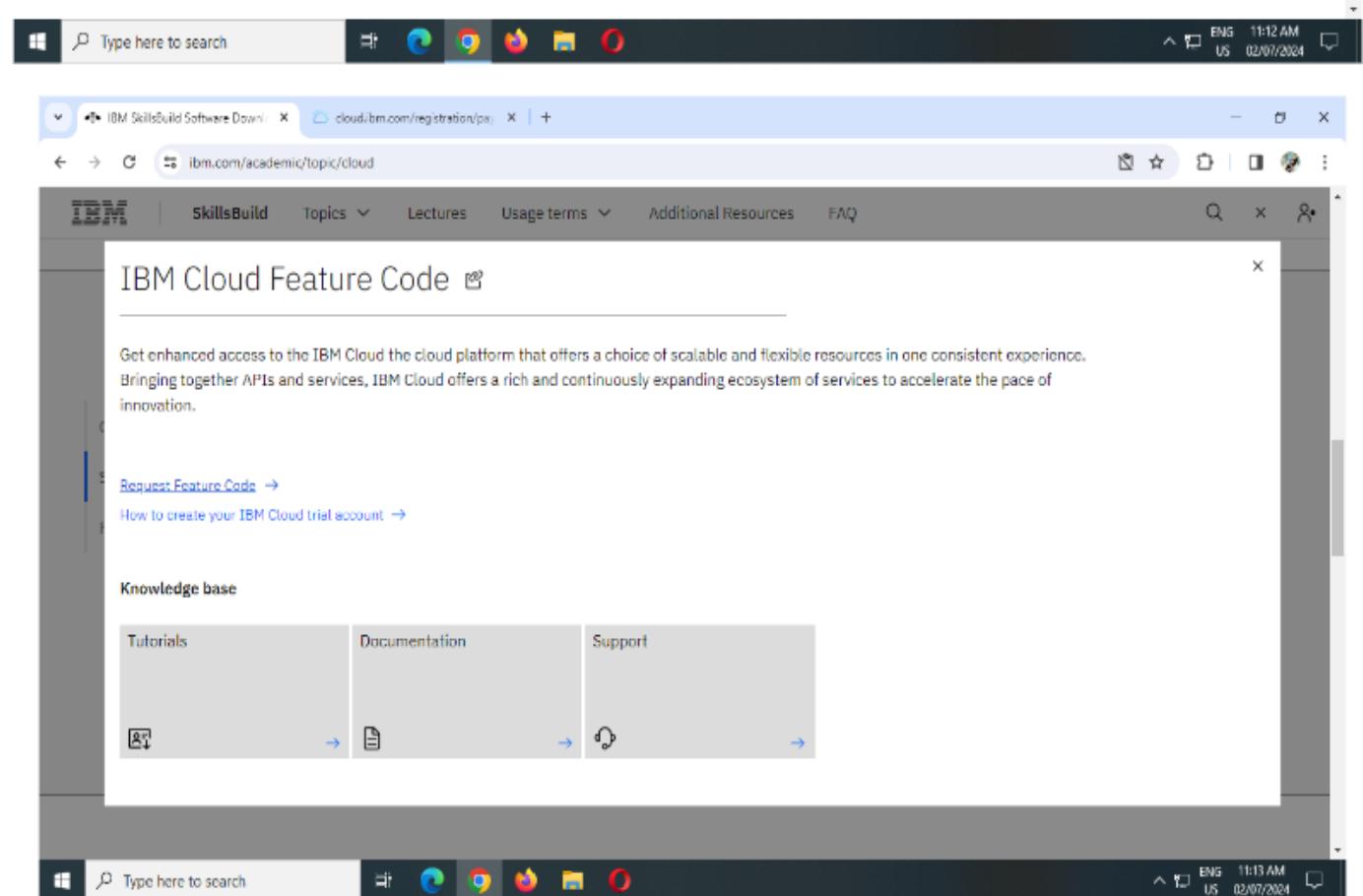
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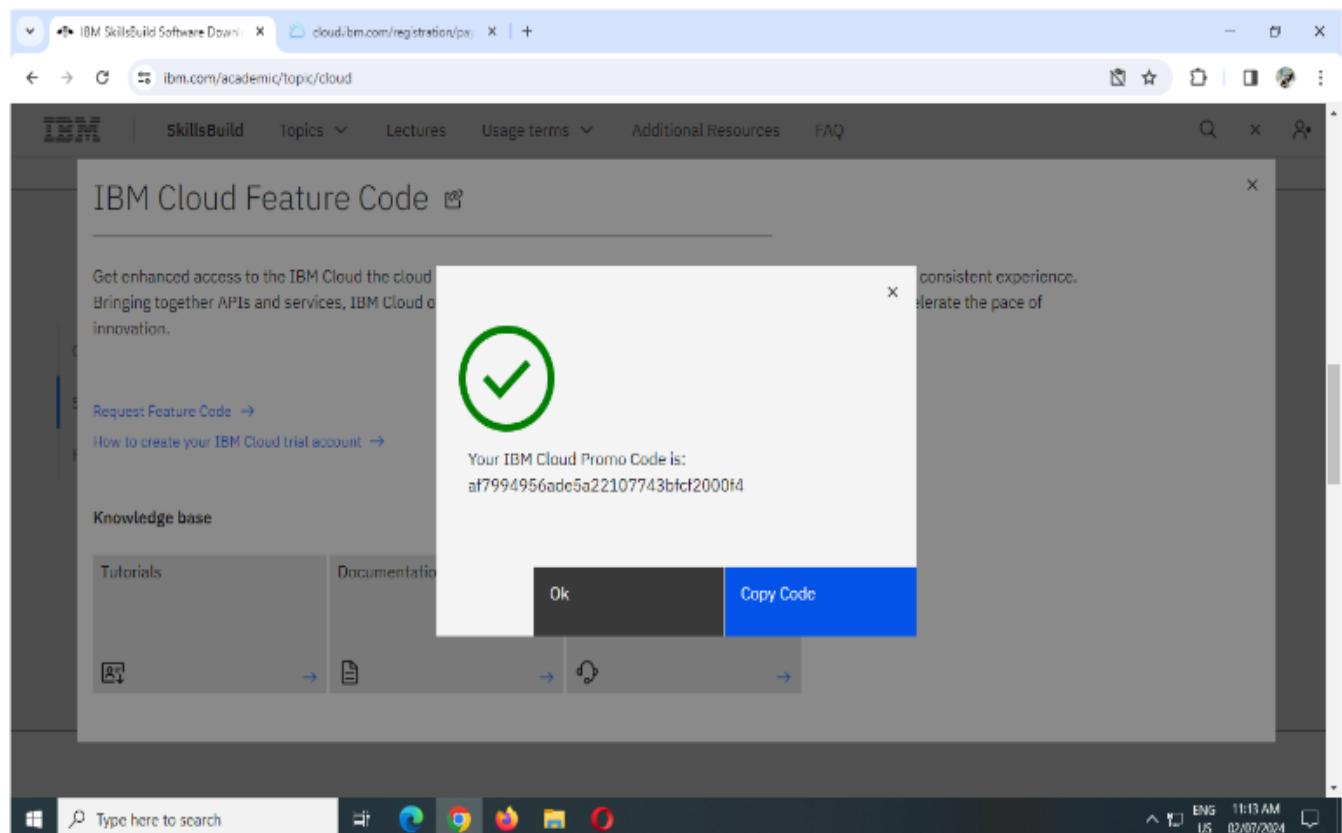
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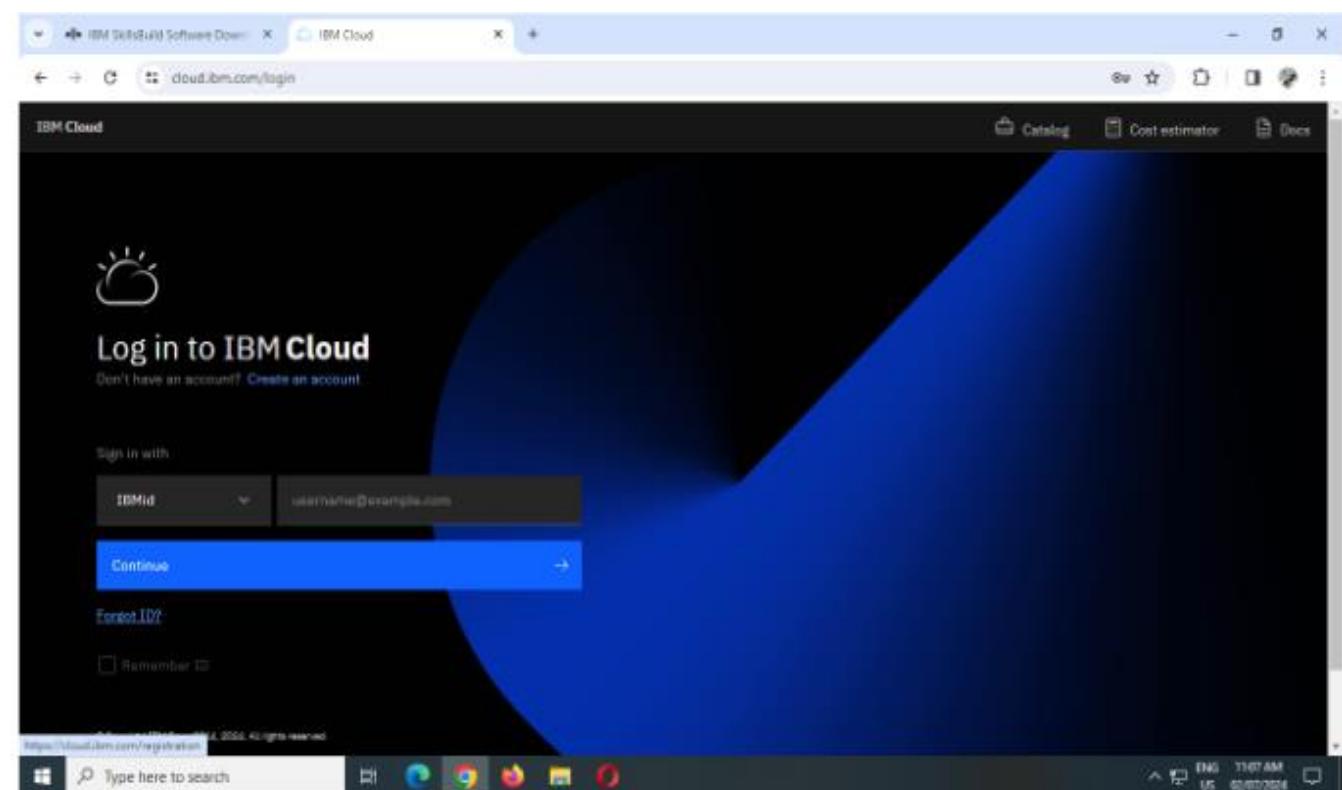
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.....

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for your ID, meaning your access is controlled by your organization's login service.
 [Last updated: 2023-09-30]

What data does IBM collect?
Why IBM needs your data
How your data is obtained
How IBM uses your data
How IBM protects your data
How long we keep your data
About your IBMid Account Privacy

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IBM Cloud

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[Register with a code](#) ①
 Account type
 Company Personal

Next ↓

Company information

Billing information

Tax information

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Windows Taskbar: Type here to search, Edge, Chrome, Firefox, File Explorer, Task View, Start button, ENG 11:11 AM, US 02/07/2024

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IBM Cloud

Verify identity

Apply code Register without a code ①
 Enter the code that has been provided to you. You can apply the code to only one account, and it can't be removed.

Enter code
 af7994956ade5a22107743b1cf2000f4

Account ID: db889ca12885421980a8358738a81fc ② ③

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Windows Taskbar: Type here to search, Edge, Chrome, Firefox, File Explorer, Task View, Start button, ENG 11:13 AM, US 02/07/2024

EXPERIMENT-5

Aim:

Perform Classification on Iris data set by using Watson studio.

Catalog / Watson Machine Learning

Deploy, manage and integrate machine learning models into your applications and services in as little as one click.

Create **About**

Type Service **Select a location**

Provider IBM **London (eu-gb)**

Last updated 05/03/2024

Category AI / Machine Learning

Compliance HIPAA Enabled, IAM-enabled, Service Endpoint Supported

Location London, Dallas, Frankfurt, Tel Aviv

Summary

Watson Machine Learning **Free**

Location: London
Plan: Lite
Service name: Watson Machine Learning-ho
Resource group: Default

Existing Lite plan instance
You can have only 1 Lite plan instance of this service per resource group. [Delete](#) your current Lite plan instance in Default resource group to create a new one, or [view the existing instance](#).

I have read and agree to the following license agreements:
[Terms](#)

Create

Resource list / Watson Machine Learning-cc **Active** **cpdas** 

Manage **Plan**

 **Watson Machine Learning in Cloud Pak for Data and watsonx**

Put AI models to work. Deploy, monitor, and update models to gain insights on either platform. Work with foundation models on watsonx as a Service.

Launch in 

IBM Watson Machine Learning in Cloud Pak for Data and watsonx
IBM Cloud Pak for Data, watsonx
Unifying platforms
IBM Cloud Base cloud infrastructure

IBM Watson Machine Learning is part of IBM Cloud Pak for Data and watsonx, and serves as the data science capability of the data fabric architecture.

Helpful links

Documentation
Learn about the tools and capabilities you need to run, monitor, and update your AI assets.

Learning path
Check out sample projects, notebooks, and data sets to help you be productive.

Videos
Watch videos to learn about Watson Machine Learning.

IBM Watson Studio

Search in your workspaces

Upgrade Shimona Dandona's Account Frankfurt SD ::

Welcome, Shimona!

Take a tutorial Step through implementing a Data fabric use case in a sample project. →

Work with Create a pro prepare data models. →

Build and manage ML models with Watson Studio

Watson Studio is a service that you use to build, deploy, and manage AI models and to optimize decisions. Work within a project to build models. Customize how you work by choosing from notebooks, graphical canvases, and no-code tools.

Quick start

Create data pipelines with DataStage

Build customer profiles with IBM Match 360 with Watson

Catalog and govern data with IBM Knowledge Catalog

Build and manage ML models with Watson Studio

Get started

Sample project Open a sample project with pre-built Watson Studio assets.

New project Create a project and then add your own data to get started.

Deployments +

Classification_Model Feb 26, 2024 11:36 AM

Test the model using the WML API

Create a project

Start with a new, blank project or select from where to import an existing project.

+ New

Local file

Resource hub

Define details

Name: IRIS

Description (optional): What's the purpose of this project?

Storage

Cloud Object Storage

Project includes integration with Cloud Object Storage for storing project assets.

Advanced settings

Cancel Create

Projects / IRIS

New asset

Create an AutoAI experiment

+ New

Sample

Define details

Name: Iris_Dataset

Description (optional): What's the purpose of this AutoAI experiment?

Tags (optional): Add tags to make assets easier to find.

Start typing to add tags

Define configuration

Watson Machine Learning Service Instance: Watson Machine Learning-cc

Environment definition: Large: 8 CPU and 32 GB RAM

This environment definition consumes 20 capacity units per hour for training. For details, see Watson Machine Learning plans.

Cancel Create

Define configuration

Watson Machine Learning Service Instance

Watson Machine Learning-cc



Environment definition 

Large: 8 CPU and 32 GB RAM

This environment definition consumes **20 capacity units per hour** for training. For details, see

Projects / IRIS / Iris_Dataset



Configure AutoAI experiment
Iris_Dataset 

Add data source



Drop data files here or
browse for files to upload

Add files such as tabular data (CSV).

[Browse](#) [Select data from project](#)

Projects / IRIS / Iris_Dataset



Configure AutoAI experiment
Iris_Dataset 

Add files such as tabular data (CSV).

[Browse](#) [Select data from project](#)

 **iris_dataset.csv**
Size: 4.39 KB | Columns: 6

 **Create a time series analysis?**

Enable this option to predict future activity over a specified date/time range. Data must be structured and sequential. [Learn more](#)

Yes No

Projects / IRIS / Iris_Dataset



Configure AutoAI experiment

 Iris_Dataset 

Autosaved: 3:50:40 PM

Add files such as tabular data (CSV).

 **iris_dataset.csv**
Size: 4.39 KB | Columns: 6

 **Create a time series analysis?**
Enable this option to predict future activity over a specified date/time range. Data must be structured and sequential. [Learn more](#)

 **What do you want to predict?**
Prediction column 

Projects / IRIS / Iris_Dataset



Configure AutoAI experiment

 Iris_Dataset 

Autosaved: 3:50:40 PM

Add files such as tabular data (CSV).

 **iris_dataset.csv**
Size: 4.39 KB | Columns: 6

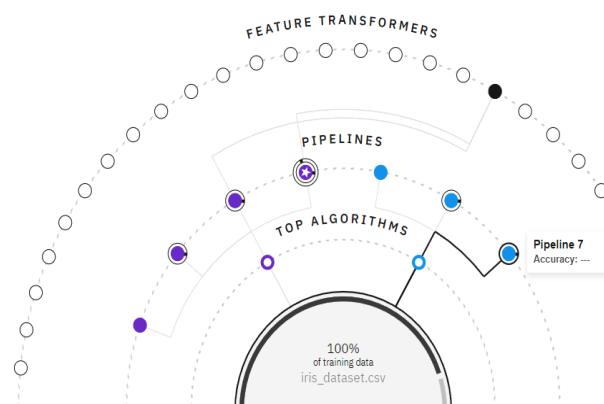
 Enable this option to predict future activity over a specified date/time range. Data must be structured and sequential. [Learn more](#)

 **What do you want to predict?**
Prediction column 

Prediction column: species CUH remaining: 20 CUH

PREDICTION TYPE Multiclass Classification OPTIMIZED FOR Accuracy & run time

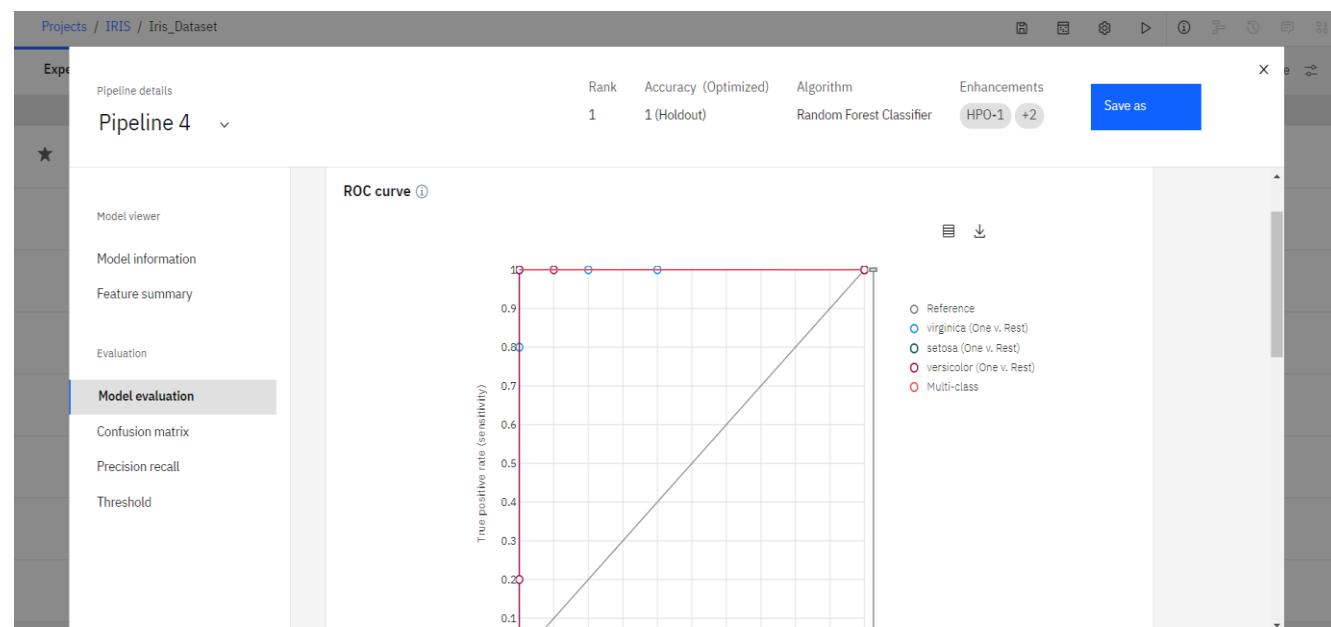
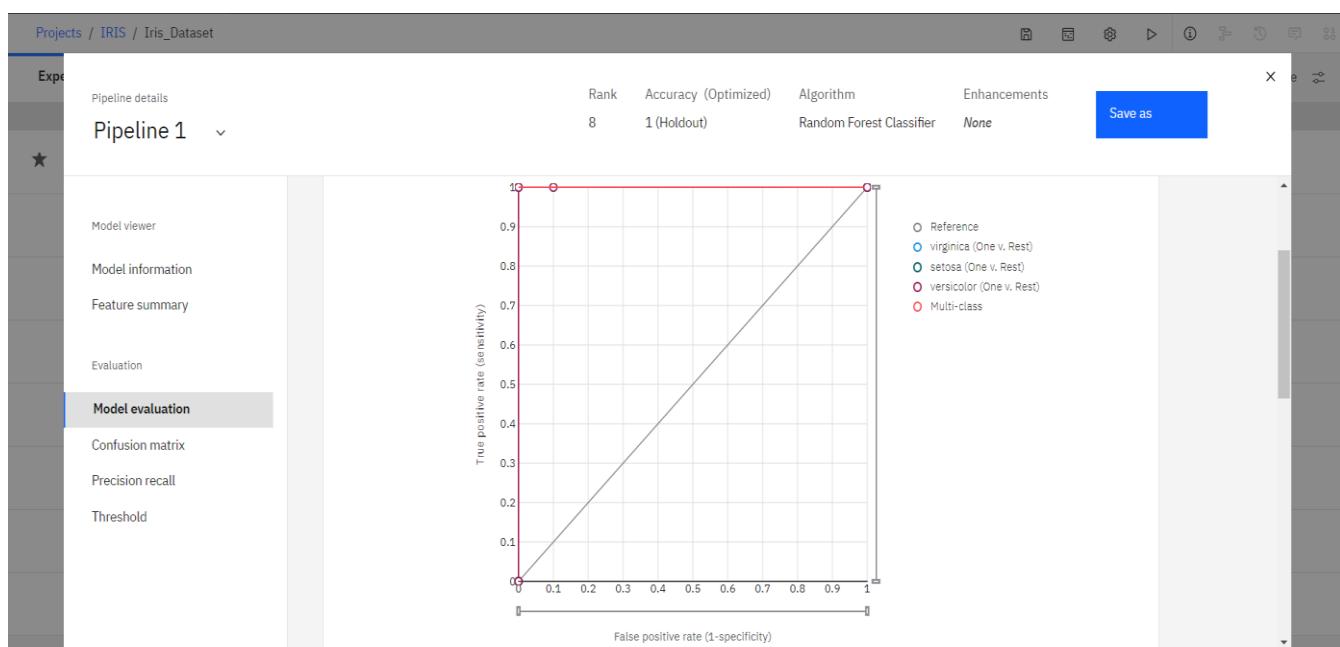
Relationship map 
Prediction column: species



Progress map 

Feature engineering
SNAP BOOSTING MACHINE CLASSIFIER
Started feature engineering for pipeline P7
Time elapsed: 2 minutes

 Pipeline leaderboard 



EXPERIMENT-6

Aim:

Write a Python Program to perform Logistic Regression.

Code:

```
In [1]: import numpy as np
import pandas as pd
import seaborn as sns

In [2]: data=sns.load_dataset("iris")

In [3]: data
Out[3]:
```

	sepal_length	sepal_width	petal_length	petal_width	species
0	5.1	3.5	1.4	0.2	setosa
1	4.9	3.0	1.4	0.2	setosa
2	4.7	3.2	1.3	0.2	setosa
3	4.6	3.1	1.5	0.2	setosa
4	5.0	3.6	1.4	0.2	setosa
...
145	6.7	3.0	5.2	2.3	virginica
146	6.3	2.5	5.0	1.9	virginica
147	6.5	3.0	5.2	2.0	virginica
148	6.2	3.4	5.4	2.3	virginica
149	5.9	3.0	5.1	1.8	virginica

150 rows × 5 columns

```
In [4]: data["species"].unique()
Out[4]: array(['setosa', 'versicolor', 'virginica'], dtype=object)

In [5]: data.isnull()
Out[5]:
```

	sepal_length	sepal_width	petal_length	petal_width	species
0	False	False	False	False	False
1	False	False	False	False	False
2	False	False	False	False	False
3	False	False	False	False	False
4	False	False	False	False	False
...
145	False	False	False	False	False
146	False	False	False	False	False
147	False	False	False	False	False
148	False	False	False	False	False
149	False	False	False	False	False

150 rows × 5 columns

```
In [6]: data.isnull().sum()
Out[6]: sepal_length    0
sepal_width     0
petal_length    0
petal_width     0
species        0
dtype: int64

In [7]: data=data[data["species"]!="setosa"]
```

```
In [8]: data
```

```
Out[8]:
```

	sepal_length	sepal_width	petal_length	petal_width	species
50	7.0	3.2	4.7	1.4	versicolor
51	6.4	3.2	4.5	1.5	versicolor
52	6.9	3.1	4.9	1.5	versicolor
53	5.5	2.3	4.0	1.3	versicolor
54	6.5	2.8	4.6	1.5	versicolor
...
145	6.7	3.0	5.2	2.3	virginica
146	6.3	2.5	5.0	1.9	virginica
147	6.5	3.0	5.2	2.0	virginica
148	6.2	3.4	5.4	2.3	virginica
149	5.9	3.0	5.1	1.8	virginica

100 rows × 5 columns

```
In [9]: data["species"].unique()
```

```
Out[9]: array(['versicolor', 'virginica'], dtype=object)
```

```
In [10]: data["species"] = data["species"].map({'versicolor': 0, 'virginica': 1})
```

```
C:\Users\Shimona\AppData\Local\Temp\ipykernel_29836\2317091820.py:1: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user\_guide/indexing.html#returning-a-view-versus-a-copy
data["species"] = data["species"].map({'versicolor': 0, 'virginica': 1})
```

```
In [11]: data.head()
```

```
Out[11]:
```

	sepal_length	sepal_width	petal_length	petal_width	species
50	7.0	3.2	4.7	1.4	0
51	6.4	3.2	4.5	1.5	0
52	6.9	3.1	4.9	1.5	0
53	5.5	2.3	4.0	1.3	0
54	6.5	2.8	4.6	1.5	0

```
In [12]: X = data.iloc[:, :-1]
```

```
Y = data.iloc[:, -1]
```

```
In [13]: Y
```

```
Out[13]:
```

	species
50	0
51	0
52	0
53	0
54	0
..	
145	1
146	1
147	1
148	1
149	1

Name: species, Length: 100, dtype: int64

```
In [14]: from sklearn.model_selection import train_test_split
```

```
In [15]: X_train, X_test, Y_train, Y_test = train_test_split(X, Y, test_size=0.25, random_state=42)
```

```
In [16]: from sklearn.linear_model import LogisticRegression
```

```
In [17]: classifier = LogisticRegression()
classifier.fit(X_train, Y_train)
```

```
Out[17]: LogisticRegression()
```

```
In [17]: classifier=LogisticRegression()
classifier.fit(X_train,Y_train)

Out[17]: LogisticRegression()

In [21]: y_pred=classifier.predict(X_test)
x_pred=classifier.predict(X_train)

In [19]: Y_test,y_pred

Out[19]: (133    1
 103    1
 120    1
 95    0
 94    0
 89    0
 72    0
 130    1
 60    0
 50    0
 68    0
 80    0
 123    1
 83    0
 140    1
 54    0
 126    1
 127    1
 62    0
 81    0
 105    1
 138    1
 76    0
 92    0
 119    1
Name: species, dtype: int64,
array([1, 1, 1, 0, 0, 0, 1, 0, 0, 0, 1, 1, 1, 0, 1, 1, 0, 0, 1, 0,
       0, 1], dtype=int64)
```

```
In [20]: from sklearn.metrics import accuracy_score,classification_report
```

```
In [22]: print("Training score:",accuracy_score(Y_train,x_pred))
print("Testing score:",accuracy_score(Y_test,y_pred))
```

Training score: 0.9733333333333334
 Testing score: 0.92

```
In [23]: print(classification_report(Y_test,y_pred))
```

	precision	recall	f1-score	support
0	0.93	0.93	0.93	14
1	0.91	0.91	0.91	11
accuracy			0.92	25
macro avg	0.92	0.92	0.92	25
weighted avg	0.92	0.92	0.92	25

```
In [25]: classifier.predict([[4.9,3.0,1.4,0.2]])
```

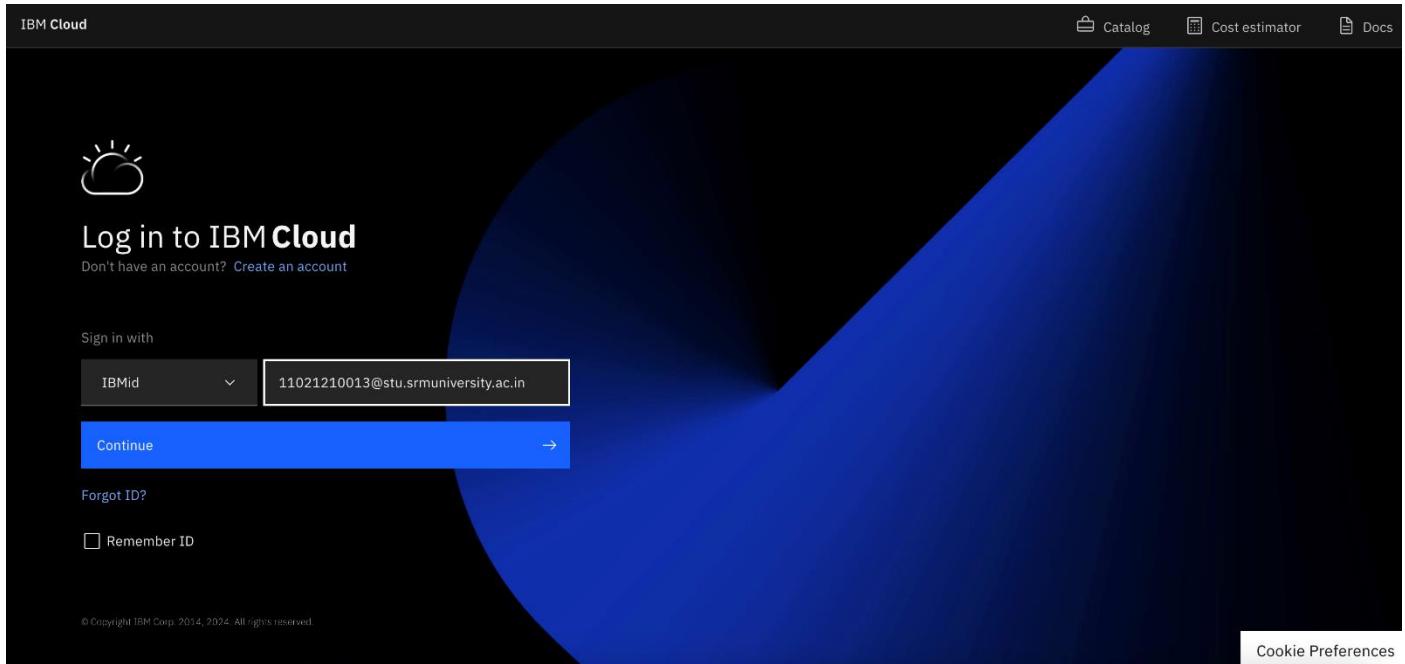
```
C:\Users\Shimona\anaconda3\lib\site-packages\sklearn\base.py:450: UserWarning: X does not have valid feature names, but LogisticRegression was fitted with feature names
  warnings.warn(
```

```
Out[25]: array([0], dtype=int64)
```

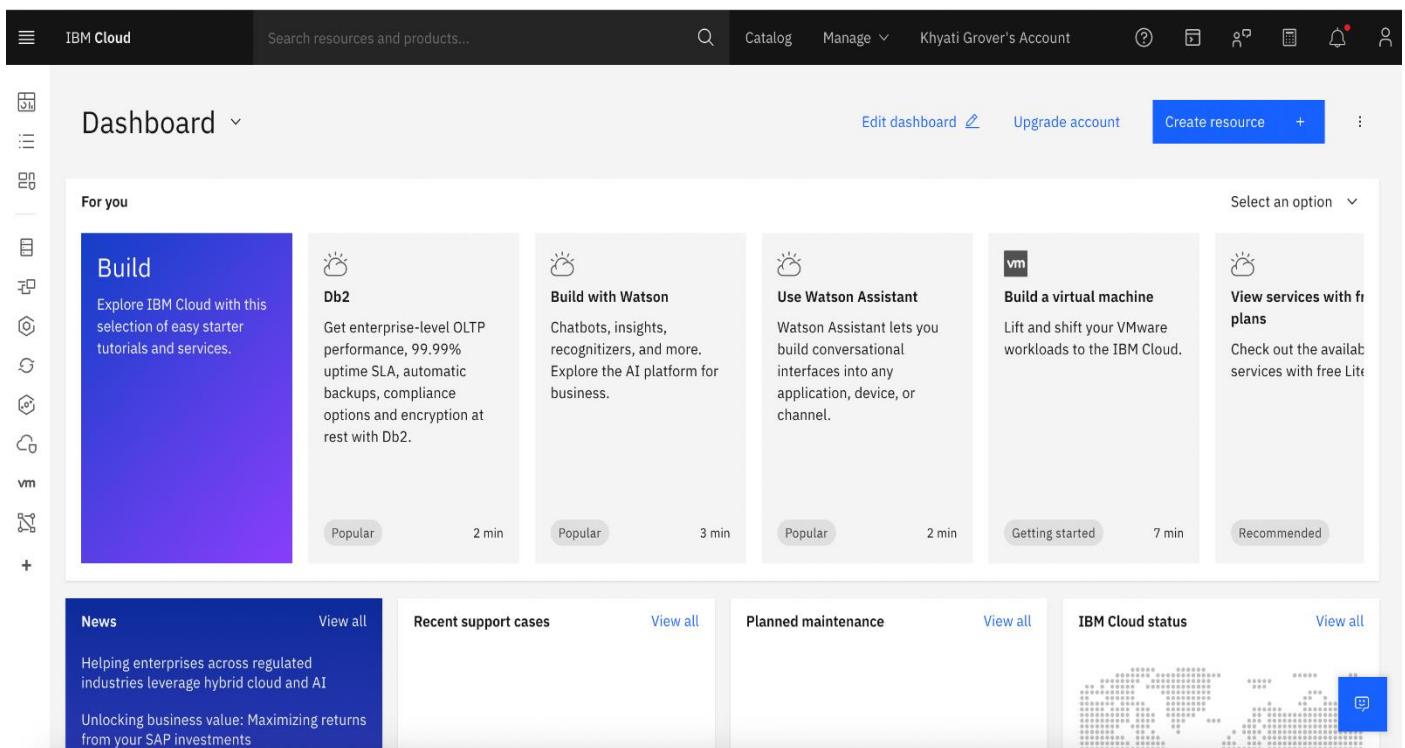
EXPERIMENT-7

Aim:

Train AI to host restaurant Customers by using Watsonx Assistant.



The screenshot shows the IBM Cloud login interface. At the top, there is a navigation bar with 'IBM Cloud', 'Catalog', 'Cost estimator', and 'Docs'. Below the navigation bar, the main area has a dark background with a large blue circular graphic on the right. The text 'Log in to IBM Cloud' is prominently displayed, followed by a subtext 'Don't have an account? [Create an account](#)'. Below this, there is a 'Sign in with' section with a dropdown menu set to 'IBMid' and an input field containing the email '11021210013@stu.srmuniversity.ac.in'. A 'Continue' button with a right-pointing arrow is located below the input field. To the right of the input field, there is a 'Forgot ID?' link and a 'Remember ID' checkbox. At the bottom of the page, there is a copyright notice '© Copyright IBM Corp. 2014, 2024. All rights reserved.' and a 'Cookie Preferences' link.



The screenshot shows the IBM Cloud dashboard. At the top, there is a navigation bar with 'IBM Cloud', a search bar, 'Catalog', 'Manage', 'Khyati Grover's Account', and various user icons. The main content area is titled 'Dashboard'. On the left, there is a sidebar with various icons for navigation. The main dashboard area has a 'For you' section with several cards: 'Build' (Explore IBM Cloud with this selection of easy starter tutorials and services), 'Db2' (Get enterprise-level OLTP performance, 99.99% uptime SLA, automatic backups, compliance options and encryption at rest with Db2), 'Build with Watson' (Chatbots, insights, recognizers, and more. Explore the AI platform for business), 'Use Watson Assistant' (Watson Assistant lets you build conversational interfaces into any application, device, or channel), and 'Build a virtual machine' (Lift and shift your VMware workloads to the IBM Cloud). Below this, there are sections for 'News', 'Recent support cases', 'Planned maintenance', and 'IBM Cloud status'. The 'News' section includes a link to 'View all' news items and a summary about SAP investments. The 'IBM Cloud status' section shows a map of the world with a blue dot indicating the status of the service.

IBM Cloud Search resources and products... Catalog Manage Khyati Grover's Account Sell on IBM Cloud Catalog settings

Catalog

IBM Cloud catalog Search the catalog...

Viewing 222 products

Category Relevance

- Compute (37)
- Containers (11)
- Networking (30)
- Storage (25)
- Enterprise applications (3)
- AI / Machine Learning (23)
- Analytics (12)
- Databases (21)



Cloud Object Storage on VPC for SAP HANA Backup
By IBM

Deploy the capability to backup an SAP HANA database to IBM Cloud Object Storage in a single step.



DevSecOps Application Lifecycle Management
By IBM

DevSecOps provides a set of predefined continuous integration, continuous deployment and continuous compliance toolchain templates.



Power Virtual Server for SAP HANA
By IBM

Deploy SAP systems on Power Virtual Server with VPC landing zone

IBM watsonx Assistant Lite Upgrade Restaurant Bot Learning resources ?

Home

Welcome, you're in watsonx Assistant!

Restaurant Bot | English (US)

Restaurant bot can handle mainly three queries: about restaurant, menu-related queries and order related queries

Get started

3 steps left 7 min 0%

- Learn about watsonx Assistant 5 min
- Explore your learning resources New!
Check out our new set of learning resources, and mark complete when you're ready to continue.
- Explore watsonx Assistant features on our interactive demo site 2 min

IBM watsonx Assistant Lite Upgrade Restaurant Bot Learning resources ?

Dialog

Intents

	Intents (4) ↑	Description	Modified ↑	Examples ↑
<input type="checkbox"/>	#about_restaurant		2 months ago	7
<input type="checkbox"/>	#Cancel_Order		a month ago	5
<input type="checkbox"/>	#menu		2 months ago	3
<input type="checkbox"/>	#yes		a month ago	5

Showing 1–4 of 4 intents

IBM Watson Assistant Lite [Upgrade](#) | Restaurant Bot [Learning resources](#) [?](#) [Try it](#)

Intent name: #about_restaurant

Name your intent to match a customer's question or goal.

Description (optional): Add a description to this intent.

User example: Type a user example here. Add unique examples of what the user might say. (Pro tip: Add at least 6 unique examples to help Watson understand.)

[Add example](#)

[User examples \(7\) ↑](#) [Annotate entities](#) [What's this?](#) [Added 11](#)

- are open for breakfast?
- 2 months ago
- hello?
- 2 months ago
- tell me about yourself?
- 2 months ago
- types of food?
- 2 months ago
- what are timings for your restaurant?
- 2 months ago
- what is your history?
- 2 months ago
- where are you located?
- 2 months ago

IBM Watson Assistant Lite [Upgrade](#) | Restaurant Bot [Learning resources](#) [?](#) [Try it](#)

Intent name: #Cancel_Order

Name your intent to match a customer's question or goal.

Description (optional): Add a description to this intent.

User example: Type a user example here. Add unique examples of what the user might say. (Pro tip: Add at least 5 unique examples to help Watson understand.)

[Add example](#)

[User examples \(5\) ↑](#) [Annotate entities](#) [What's this?](#) [Added 11](#)

- I need to cancel to my order. [a month ago](#)
- I need to rush, kindly cancel my order. [a month ago](#)
- I want to cancel order. [a month ago](#)
- Order is taking a lot of time to prepare, please cancel my order. [a month ago](#)
- There is a change in plan, so please cancel my order. [a month ago](#)

IBM Watson Assistant Lite [Upgrade](#) | Restaurant Bot [Learning resources](#) [?](#) [Try it](#)

Intent name: #menu

Name your intent to match a customer's question or goal.

Description (optional): Add a description to this intent.

User example: Type a user example here. Add unique examples of what the user might say. (Pro tip: Add at least 5 unique examples to help Watson understand.)

[Add example](#)

[User examples \(3\) ↑](#) [Annotate entities](#) [What's this?](#) [Added 11](#)

- food [2 months ago](#)
- menu [2 months ago](#)
- veg and non_veg [2 months ago](#)

IBM Watson Assistant Lite [Upgrade](#) Restaurant Bot

Intent name: #yes

Name your intent to match a customer's question or goal: #yes

Description (optional): Add a description to this intent.

User example: Type a user example here. Add unique examples of what the user might say. (Pro tip: Add at least 5 unique examples to help Watson understand.)

Add example

User examples (5) ↑

Correct a month ago

Please do it. a month ago

Right a month ago

Sure a month ago

Yes a month ago

Annotations: Annotate entities [What's this?](#)

IBM Watson Assistant Lite [Upgrade](#) Restaurant Bot

Dialog

Intents

Entities

My Entities

Entity (2) ↑

Values

@menu non veg, other menu, veg, standard menu a few seconds ago

@Order_number order_syntax a month ago

Create entity +

Modified ↑

Showing 1–2 of 2 entities

1 of 1 pages

IBM Watson Assistant Lite [Upgrade](#) | Restaurant Bot [▼](#)

Last updated: a few seconds ago [Edit](#) [Search](#) [Try it](#)

Entity name **@menu** [Fuzzy matching](#) [On](#)

Name your entity to match the category of values that it will detect.

Value [Synonyms](#) [Type a synonym](#) [+](#)

[Add value](#)

[Dictionary \(4\)](#) [Annotation \(0\)](#)

Values (4) ↑	Type
<input type="checkbox"/> non veg	Synonyms
<input type="checkbox"/> other menu	Synonyms
<input type="checkbox"/> standard menu	Synonyms
<input type="checkbox"/> veg	Synonyms

IBM Watson Assistant Lite [Upgrade](#) | Restaurant Bot [▼](#)

Last updated: a few seconds ago [Edit](#) [Search](#) [Try it](#)

Entity name **@Order_number** [Fuzzy matching](#) [On](#)

Name your entity to match the category of values that it will detect.

Value [Synonyms](#) [Type a synonym](#) [+](#)

[Add value](#)

[Dictionary \(1\)](#) [Annotation \(0\)](#)

Values (1) ↑	Type
<input type="checkbox"/> order_syntax	Patterns <code>[A-Z]{3}/d{5}</code>

IBM Watson Assistant Lite [Upgrade](#) | Restaurant Bot [▼](#)

Last updated: a few seconds ago [Edit](#) [Search](#) [Try it](#)

[Dialog](#)

[Intents](#) [Add node](#) [Add child node](#) [Add folder](#)

[Entities](#) [My Entities](#) [System Entities](#)

[Dialog](#) [About Restaurant](#) [menu](#) [Cancel order](#) [Anything else](#)

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[Content Catalog](#)

Intents:

- Welcome
 - welcome
 - 1 Responses / 0 Context Set / Does not return
- About Restaurant
 - #about_restaurant
 - 1 Responses / 0 Context Set / Does not return
- menu
 - #menu
 - 1 Responses / 0 Context Set / Does not return
- Cancel order
 - #cancel_order
 - 1 Responses / 1 Context Set / Skip user input / Does not return
- Anything else
 - anything_else
 - 1 Responses / 0 Context Set / Does not return

IBM watsonx Assistant Lite [Upgrade](#) | Restaurant Bot [▼](#) Learning resources [@](#)

Dialog

Add node Add child node Add folder

Intents Entities Options

My Entities System Entities Dialog Webhooks Disambiguation Autocorrection Algorithm Version Upload / Download Content Catalog

Entities

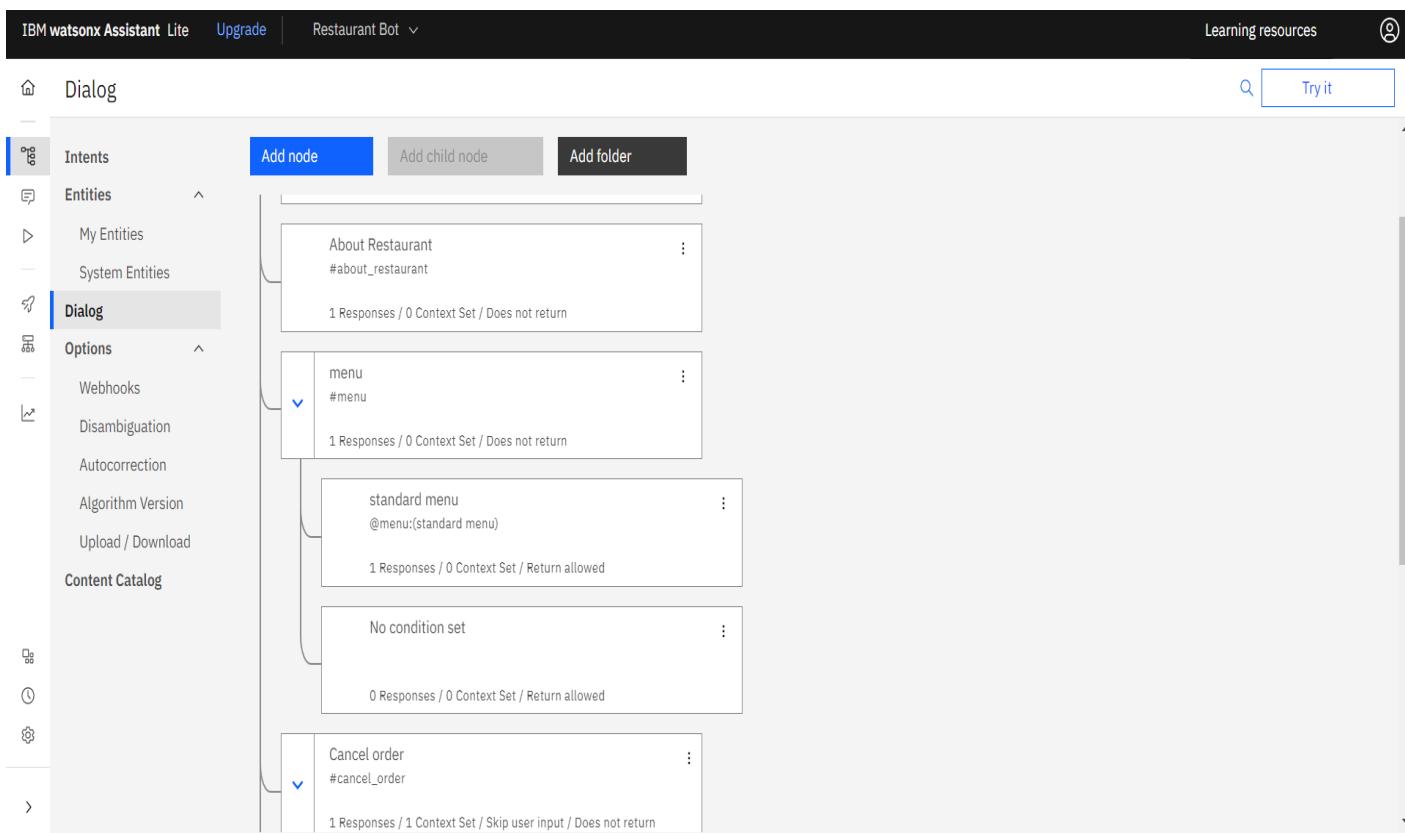
About Restaurant #about_restaurant 1 Responses / 0 Context Set / Does not return

menu #menu 1 Responses / 0 Context Set / Does not return

standard menu @menu:(standard menu) 1 Responses / 0 Context Set / Return allowed

No condition set 0 Responses / 0 Context Set / Return allowed

Cancel order #cancel_order 1 Responses / 1 Context Set / Skip user input / Does not return



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Dialog

Add node Add child node Add folder

Intents Entities Options

My Entities System Entities Dialog Webhooks Disambiguation Autocorrection Algorithm Version Upload / Download Content Catalog

Entities

Cancel order #cancel_order 1 Responses / 1 Context Set / Skip user input / Does not return

Skip user input and evaluate child nodes

order number provided @order_number:order_syntax 1 Responses / 0 Context Set / Return allowed

#yes 1 Responses / 0 Context Set / Return allowed

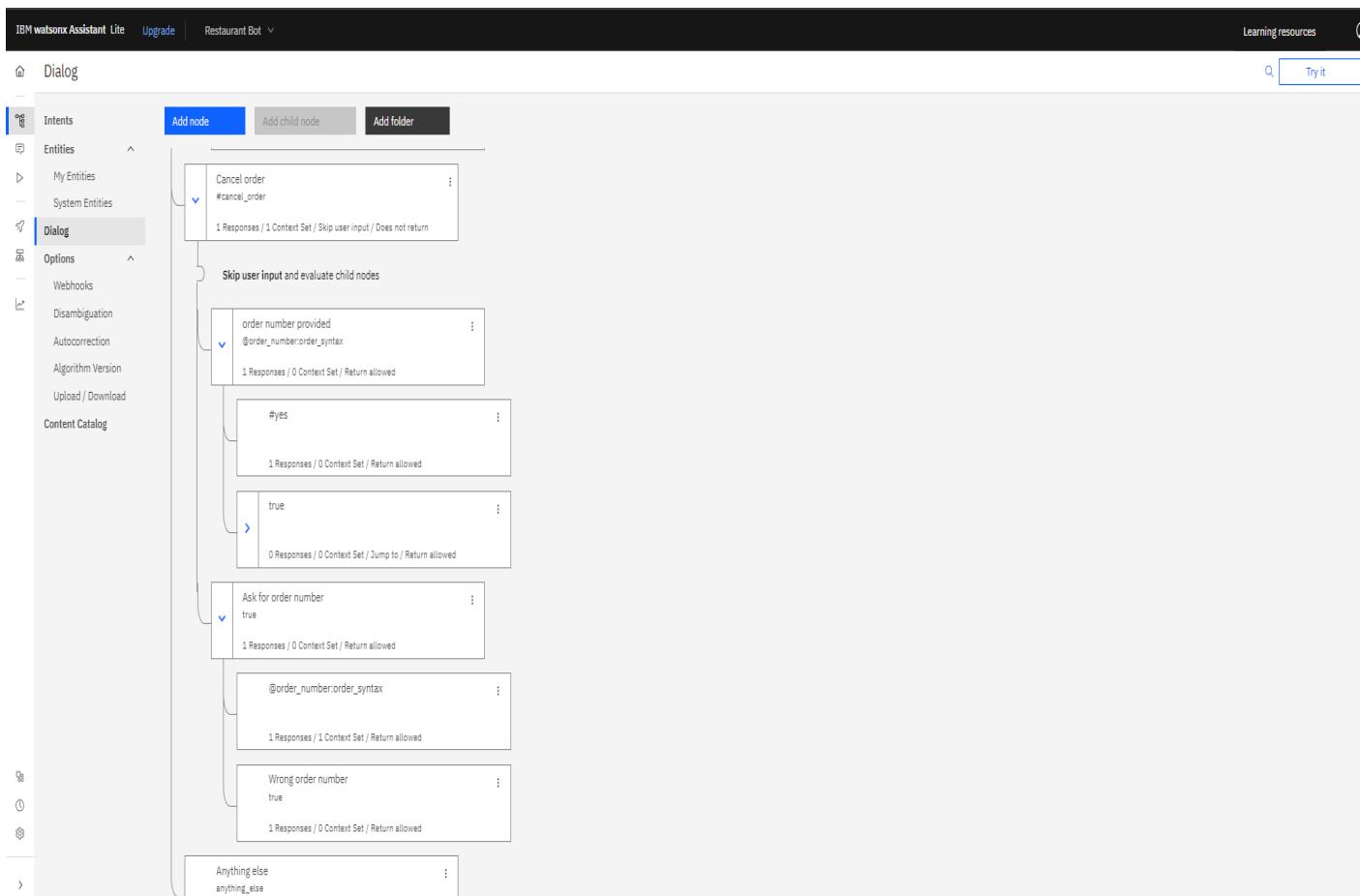
true 0 Responses / 0 Context Set / Jump to / Return allowed

Ask for order number true 1 Responses / 0 Context Set / Return allowed

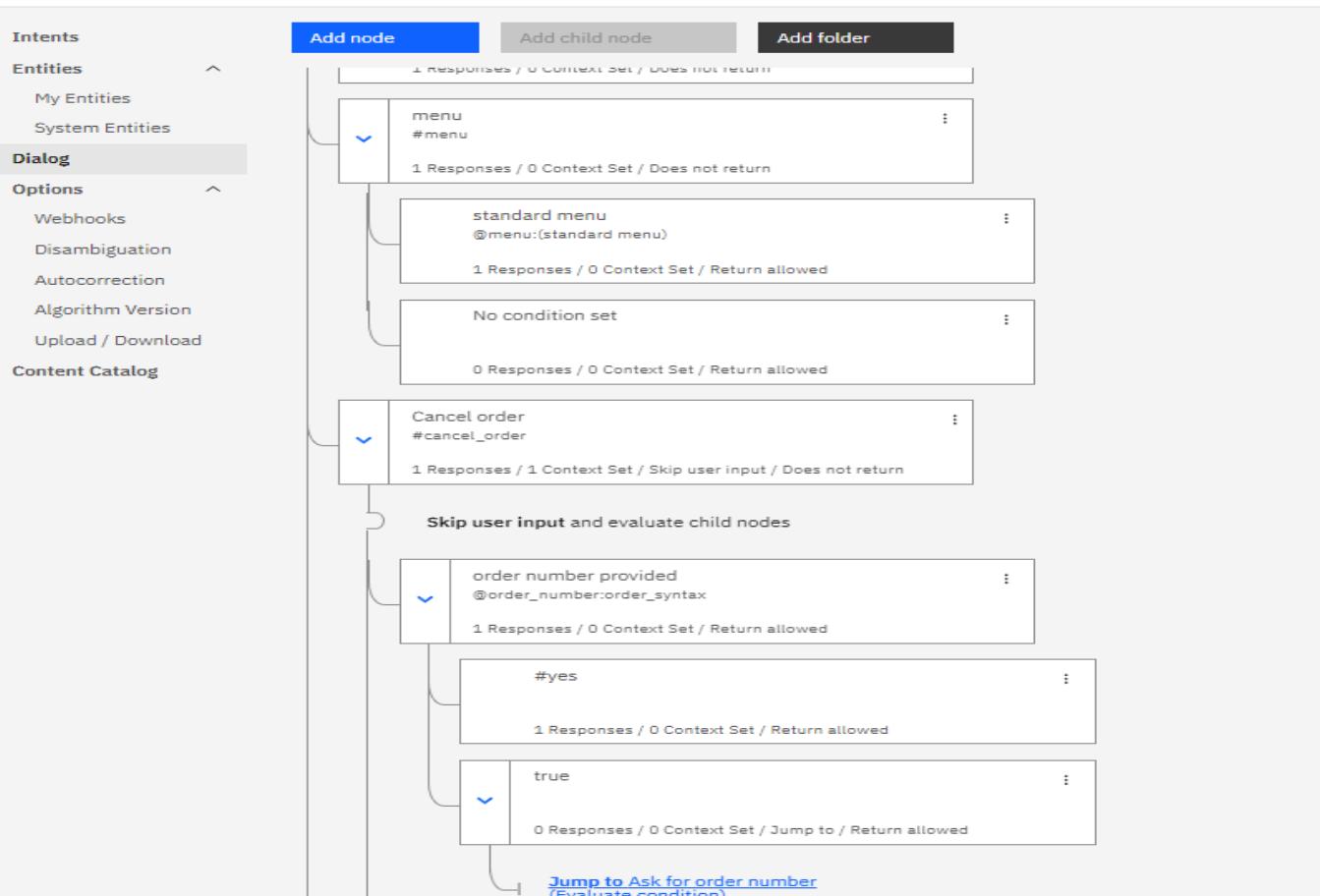
@order_number:order_syntax 1 Responses / 1 Context Set / Return allowed

Wrong order number true 1 Responses / 0 Context Set / Return allowed

Anything else anything_else



Dialog



Try it out

Clear Manage context 0

non veg

chicken fish

veg

sabji dahi bread

DINNER

MONDAY, APRIL 15, 2019

SOUPS

Chowder, 20.00 | Creamy, 20.00 | Tomato, 20.00 | Potato, 20.00 | Onion, 20.00 | Vegetable, 20.00 |

ENTRÉES

Beef stroganoff, 20.00 | Chicken, 20.00 | Fish, 20.00 | Pork, 20.00 | Lamb, 20.00 |

POULTRY

Roasted chicken, 20.00 | Roasted turkey, 20.00 | Roasted duck, 20.00 | Roasted duck, 20.00 | Roasted duck, 20.00 | Roasted duck, 20.00 |

VEGETABLES

Steamed vegetables, 10.00 | Roasted vegetables, 10.00 | Mashed potatoes, 10.00 | Mashed potatoes, 10.00 | Mashed potatoes, 10.00 |

DESSERTS

Apple pie, 10.00 | Chocolate cake, 10.00 | Lemon cake, 10.00 |

DRINKS

Cola, 10.00 | Soda, 10.00 | Iced tea, 10.00 | Lemonade, 10.00 |

Use the up key for most recent

Enter something to test your assistant

EXPERIMENT-8

Aim:

Write a Python program to show the simple working of Neural Network.

Code:

```
[2]: import numpy as np

[3]: in_arr=np.array([[0,0],[1,0],[0,1],[1,1]])
in_arr.shape
in_arr

[3]: array([[0, 0],
           [1, 0],
           [0, 1],
           [1, 1]])

[15]: op_arr=np.array([0,1,1,0])
op_arr.shape
#take transpose or reshape the array
op_arr=op_arr.reshape(4,1) #enter row, column value
op_arr

[15]: array([[0],
           [1],
           [1],
           [0]])


[16]: #weights
weights=np.array([[0.1],[0.2]])
weights

[16]: array([[0.1],
           [0.2]])

[17]: #bias
bias=0.3

y= Wi * Xi + b #only for linear problems #for non-linear, create activation function

###Activation function 1/1 + exp(-x)

[20]: def sigmoid_fxn(x):
       return 1/1 + np.exp(-x) #np.exp call from library

[49]: for epochs in range(700):
       input_value=in_arr
       weighted_sum=np.dot(in_arr, weights)+bias #dot to multiply array otherwise will show error
       first_output=sigmoid_fxn(weighted_sum)
       print(first_output)

[[1.61125682]
 [1.50019   ]
 [1.45296291]
 [1.37065847]]
```

```
[50]: error=first_output-op_arr
print(error)

[[1.61125682]
 [0.50019]
 [0.45296291]
 [1.37065847]]

[51]: total_error=np.square(np.subtract(first_output, op_arr)).mean()
print(total_error)

1.2325546578804967

[52]: def sig_der(x):
    return sigmoid_fxn(x)*(1-sigmoid_fxn(x))
    #can place it before epochs cell

[53]: first_der=error
second_der=sig_der(first_output)
derivative=first_der*second_der
print(derivative)

[[-0.38588199]
 [-0.1364798]
 [-0.13071352]
 [-0.43645201]]

[54]: t_input=in_arr.T
final_der=np.dot(t_input, derivative)
print(final_der)

[[-0.57293181]
 [-0.56716552]]

[55]: #update weights
weights=weights-0.06*final_der #0.06 can b replaced

#update bias
for i in derivative:
    bias=bias-0.06* i
print("Updated Weights: ", weights)
print("Update bias: ",bias)

Updated Weights: [[0.23490509]
 [0.33373688]]
Update bias: [0.55760972]

[56]: #prediction
pred=np.array([[0,1]])

res=np.dot(pred,weights +bias)
result=sigmoid_fxn(res)
print(result)

[[1.41010314]]
```

EXPERIMENT-9

Aim:

Build your own translator with Node-red or by using Python program.

Code:

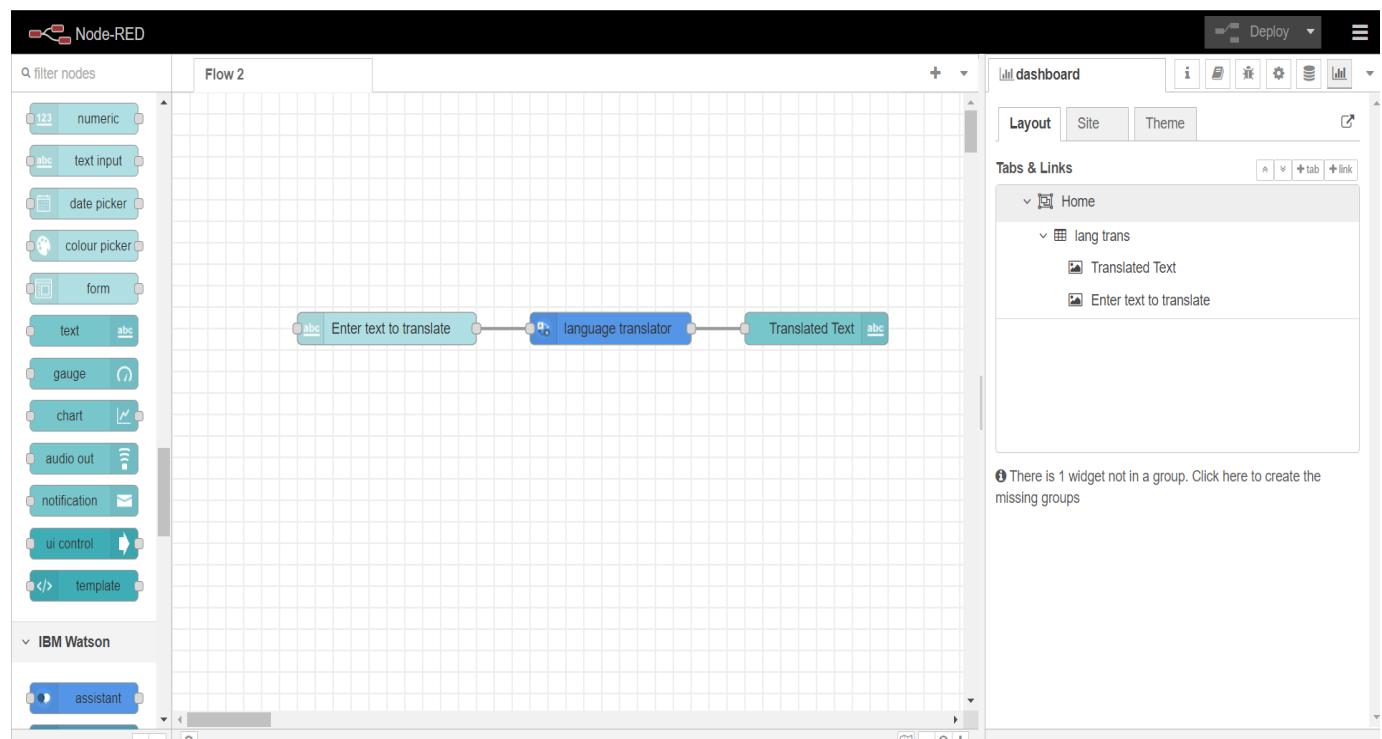
```

added 303 packages in 2m
46 packages are looking for funding
  run `npm fund` for details
C:\Users\Shimona>node-red
10 May 10:59:16 - [info]
10 May 10:59:16 - [info] Welcome to Node-RED
=====
10 May 10:59:16 - [info] Node-RED version: v3.1.9
10 May 10:59:16 - [info] Node.js version: v20.13.1
10 May 10:59:16 - [info] Windows_NT 10.0.22621 x64 LE
10 May 10:59:16 - [info] Loading palette nodes
10 May 10:59:17 - [info] Settings file : C:\Users\Shimona\.node-red\settings.js
10 May 10:59:17 - [info] Context store : 'default' [module=memory]
10 May 10:59:17 - [info] User directory : C:\Users\Shimona\.node-red
10 May 10:59:17 - [warn] Projects disabled : editorTheme.projects.enabled=false
10 May 10:59:17 - [info] Flows file : C:\Users\Shimona\.node-red\flows.json
10 May 10:59:17 - [info] Creating new flow file
10 May 10:59:17 - [warn]

-----
Your flow credentials file is encrypted using a system-generated key.
If the system-generated key is lost for any reason, your credentials
file will not be recoverable, you will have to delete it and re-enter
your credentials.

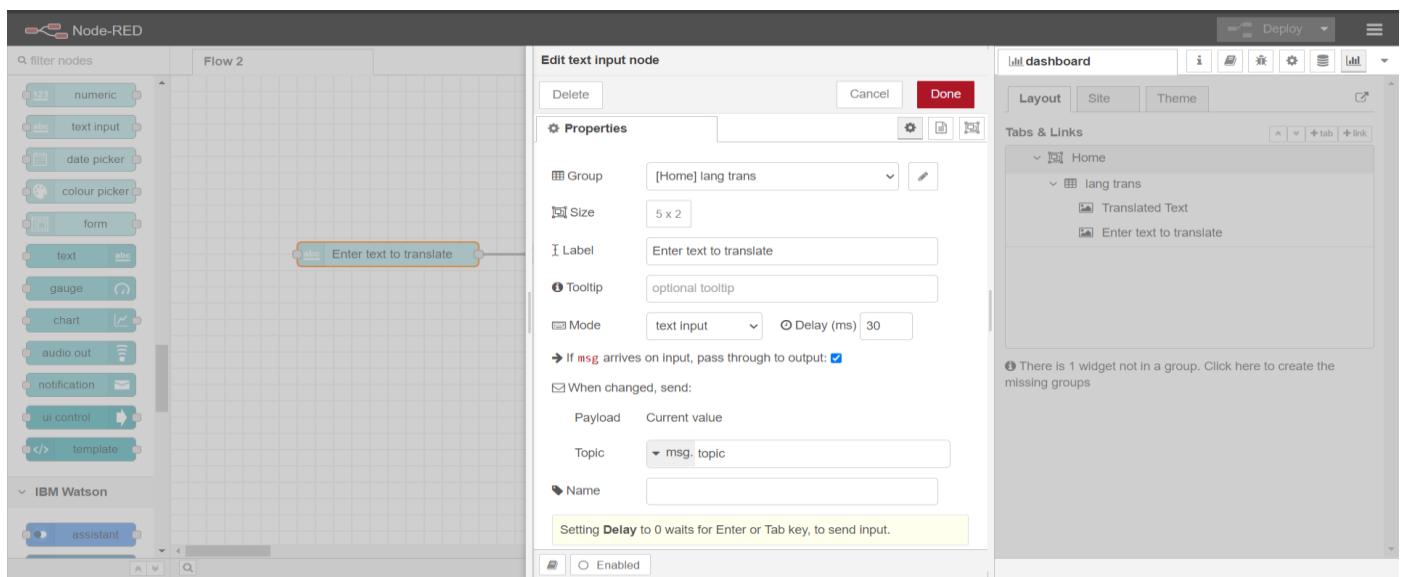
You should set your own key using the 'credentialSecret' option in
your settings file. Node-RED will then re-encrypt your credentials
file using your chosen key the next time you deploy a change.

-----
10 May 10:59:17 - [info] Server now running at http://127.0.0.1:1880/
10 May 10:59:17 - [warn] Encrypted credentials not found
10 May 10:59:17 - [info] Starting flows
10 May 10:59:17 - [info] Started flows
|
```



Node-RED

Flow 2



Edit text input node

Properties

- Group: [Home] lang trans
- Size: 5 x 2
- Label: Enter text to translate
- Tooltip: optional tooltip
- Mode: text input (selected)
- If **msg** arrives on input, pass through to output:
- When changed, send:
 - Payload: Current value
 - Topic: msg.topic
- Name:
- Setting **Delay** to 0 waits for Enter or Tab key, to send input.

Enabled

lhd dashboard

Layout Site Theme

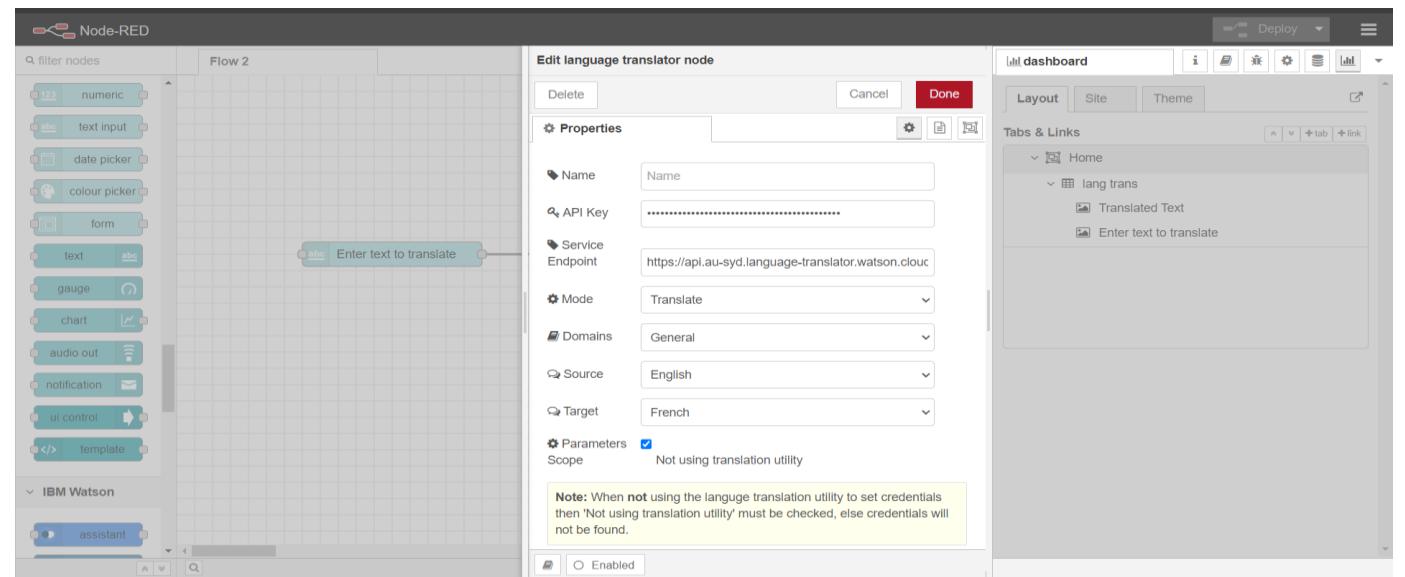
Tabs & Links

- Home
 - lang trans
 - Translated Text
 - Enter text to translate

There is 1 widget not in a group. Click here to create the missing groups

Node-RED

Flow 2



Edit language translator node

Properties

- Name: Name
- API Key:
- Service Endpoint: https://api.au-syd.language-translator.watson.cloud.ibm.com
- Mode: Translate
- Domains: General
- Source: English
- Target: French
- Parameters: Not using translation utility

Note: When not using the language translation utility to set credentials then 'Not using translation utility' must be checked, else credentials will not be found.

Enabled

lhd dashboard

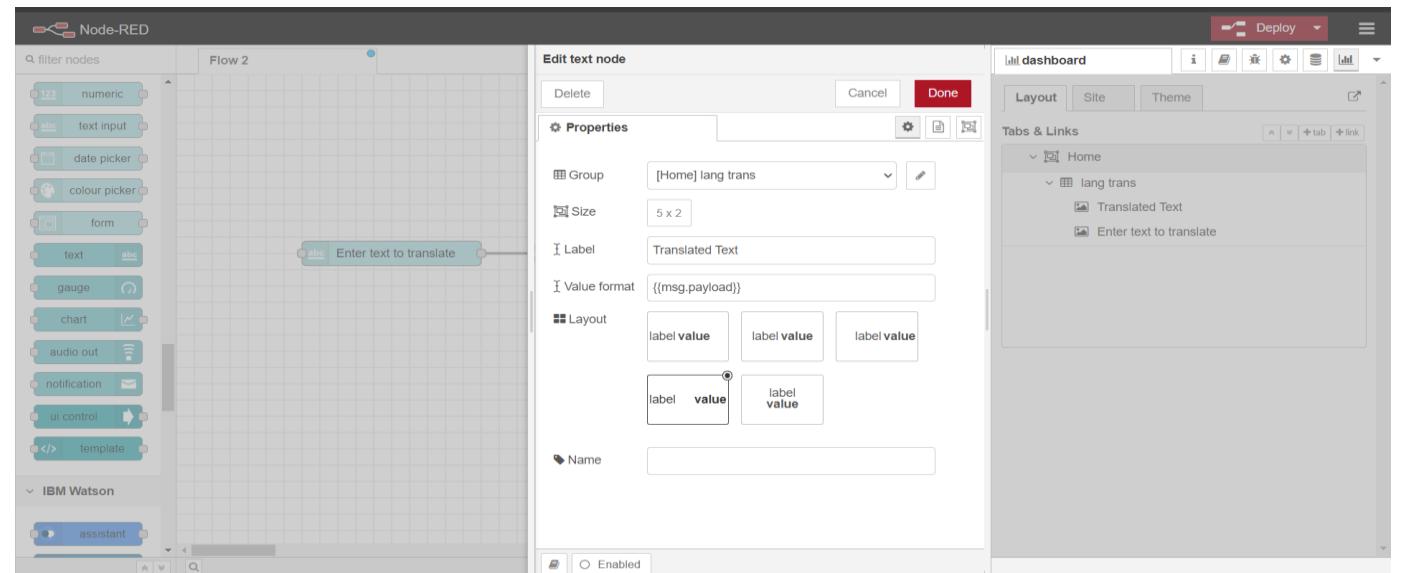
Layout Site Theme

Tabs & Links

- Home
 - lang trans
 - Translated Text
 - Enter text to translate

Node-RED

Flow 2



Edit text node

Properties

- Group: [Home] lang trans
- Size: 5 x 2
- Label: Translated Text
- Value format: {{msg.payload}}
- Layout:

label	value	label
label	value	label
- Name:

Enabled

lhd dashboard

Layout Site Theme

Tabs & Links

- Home
 - lang trans
 - Translated Text
 - Enter text to translate

Home

lang trans

Translated **Bonjour, mon nom**
Text **est Shimona**
Dandona

Enter text to translate
hello, my name is Shimona Danc

EXPERIMENT-10

Aim:

To understand and implement Text to Speech and Speech to Text Service using IBM Watson.

Code:

```
[1]: pip install gtts
Requirement already satisfied: gtts in c:\users\lenovo\anaconda3\lib\site-packages (2.5.1)
Requirement already satisfied: requests<3,>=2.27 in c:\users\lenovo\anaconda3\lib\site-packages (from gtts) (2.31.0)
Requirement already satisfied: click<8.2,>=7.1 in c:\users\lenovo\anaconda3\lib\site-packages (from gtts) (8.1.7)
Requirement already satisfied: colorama in c:\users\lenovo\appdata\roaming\python\python311\site-packages (from click<8.2,>=7.1->gtts) (0.4.6)
Requirement already satisfied: charset-normalizer<4,>=2 in c:\users\lenovo\anaconda3\lib\site-packages (from requests<3,>=2.27->gtts) (2.0.4)
Requirement already satisfied: idna<4,>=2.5 in c:\users\lenovo\anaconda3\lib\site-packages (from requests<3,>=2.27->gtts) (3.4)
Requirement already satisfied: urllib3<3,>=1.21.1 in c:\users\lenovo\anaconda3\lib\site-packages (from requests<3,>=2.27->gtts) (2.0.7)
Requirement already satisfied: certifi>=2017.4.17 in c:\users\lenovo\anaconda3\lib\site-packages (from requests<3,>=2.27->gtts) (2024.2.2)
Note: you may need to restart the kernel to use updated packages.

[2]: import gtts
[3]: from gtts import gTTS
[4]: v=gtts.lang.tts_langs()

[5]: for i,j in v.items():
    print(i,j)

af Afrikaans
ar Arabic
bg Bulgarian
bn Bengali
bs Bosnian
ca Catalan
cs Czech
da Danish
de German
el Greek
en English
es Spanish
et Estonian
fi Finnish
fr French
gu Gujarati
hi Hindi
hr Croatian
hu Hungarian
id Indonesian
is Icelandic
it Italian
iw Hebrew
ja Japanese
jw Javanese
km Khmer
kn Kannada
ko Korean
la Latin
lv Latvian
ml Malayalam
mr Marathi
ms Malay
my Myanmar (Burmese)
ne Nepali
nl Dutch
no Norwegian
pl Polish
pt Portuguese
```

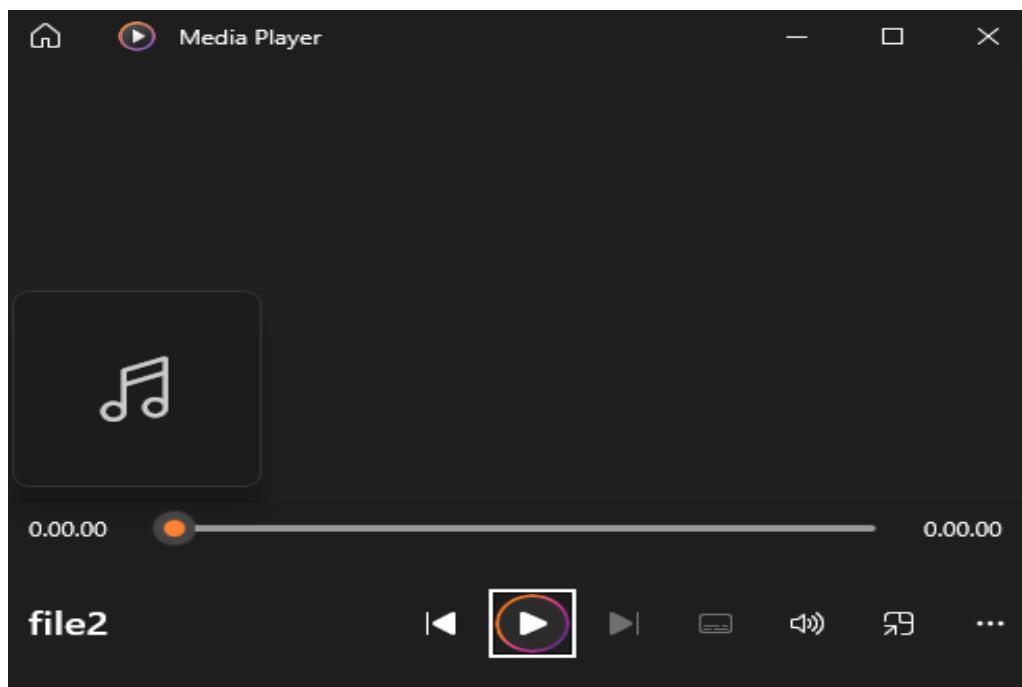
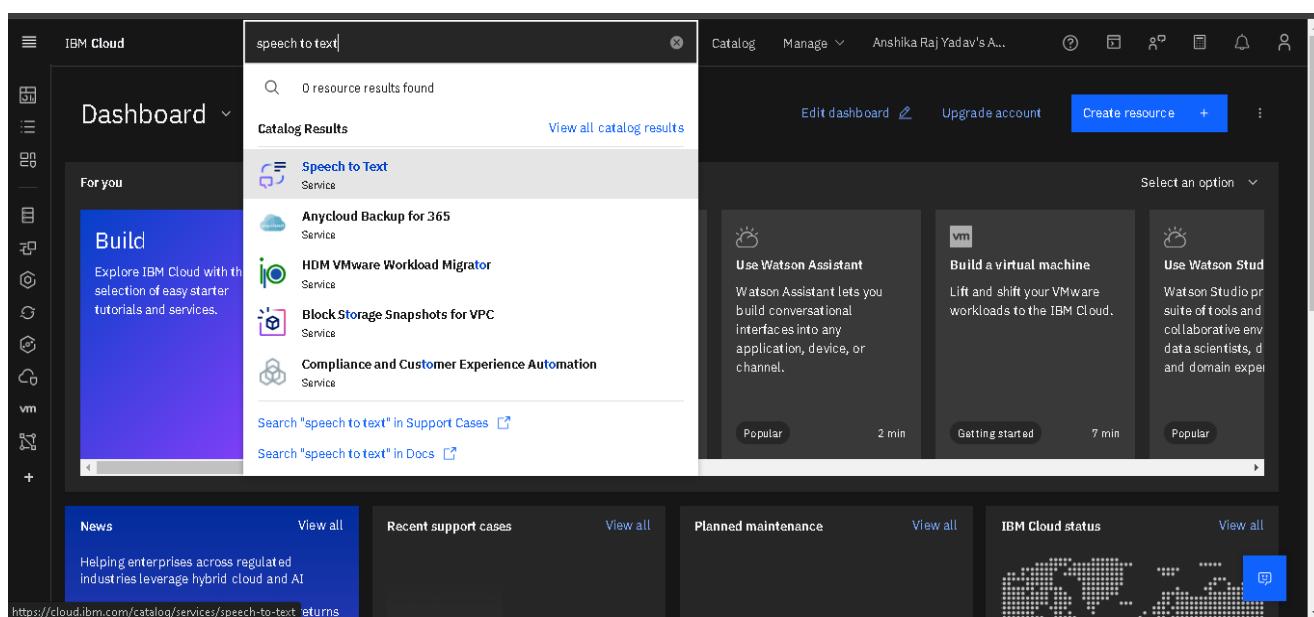
```
[6]: import os

[7]: def text_to_speech(txt,lang):
    obj=gTTS(text=txt,lang=lang)
    obj.save("file2.mp3")
    os.system("file2.mp3")

[8]: """
    Press 1: To convert text into speech
    Press 0: Exit
"""

while True:
    choice=input("Enter your choice: ")
    if choice=='1':
        text_to_speech(input("Enter your text: "),input("Enter Language: "))
    elif choice=='0':
        break
    else:
        print("Invalid choice")
```

Enter your choice: 1
 Enter your text: hello
 Enter Language: en

Dashboard

Catalog Results

Speech to Text

Watson Assistant

Build a virtual machine

Use Watson Studio

Recent support cases

Planned maintenance

IBM Cloud status

News

Helping enterprises across regulated industries leverage hybrid cloud and AI

<https://cloud.ibm.com/catalog/services/speech-to-text>

Catalog /

Speech to Text

Low-latency, streaming transcription

Create **About**

Type: Service

Provider: IBM

Last updated: 05/02/2023

Category: AI / Machine Learning

Compliance: EU Supported, HIPAA Enabled, IAM-enabled

Location: Sydney, Frankfurt, London, Tokyo, Washington DC, Dallas

Plan: 500 Minutes per Month

Features and capabilities: Lite

Pricing: Free

The Lite plan gets you started with 500 minutes per month at no cost. When you upgrade to a paid plan, you will get access to Customization capabilities.

Lite plan services are deleted after 30 days of inactivity.

Click to view tiers and pricing detail

Create **Add to estimate**

Resource list /

Speech to Text-g4

Active Add tags

Details Actions...

Manage Getting started Service credentials Plan Connections

Service credentials: You can generate a service credential for your app or external connector.

Create credential

Name: Service credentials-1

Role: Manager

Advanced options

Cancel Add

mTCm1GdZXw7_5Y9ZMbMVDJ50wtXmPwk4xZsyAgV9qRXy

<https://api.au-syd.speech-to-text.watson.cloud.ibm.com/instances/86fc7c04-d37d-4269-95e6-a0274f0255bf>

```
curl -X POST -u "apikey:mTCm1GdZXw7_5Y9ZMbMVDJ50wtXmPwk4xZsyAgV9qRXy" \
--header "Content-Type: audio/flac" \
--data-binary @'{path_to_file}audio-file.flac' \
"https://api.au-syd.speech-to-text.watson.cloud.ibm.com/instances/86fc7c04-d37d-4269-95e6-a0274f0255bf/v1/recognize"
```

```
MINGW64:/c/Users/Shimona
rm: cannot remove '/etc/post-install/01-devices.post': Permission denied
rm: cannot remove '/etc/post-install/03-mtab.post': Permission denied
rm: cannot remove '/etc/post-install/06-windows-files.post': Permission denied
rm: cannot remove '/etc/post-install/99-post-install-cleanup.post': Permission denied

$ curl -X POST -u "apikey:mTCm1GdZXw7_5Y9ZMbMVDJ50wtXmPwk4xZsyAgV9qRXy" \
--header "Content-Type: audio/flac" \
--data-binary @'{path_to_file}audio-file.flac' \
"https://api.au-syd.speech-to-text.watson.cloud.ibm.com/instances/86fc7c04-d37d-4269-95e6-a0274f0255bf/v1/recognize"
Warning: Couldn't read data from file "{path_to_file}audio-file.flac", this
Warning: makes an empty POST.
  % Total    % Received % Xferd  Average Speed   Time   Time   Time  Current
                                         Dload  Upload Total   Spent   Left  Speed
100  126  100  126    0     0   42    0  0:00:03  0:00:02  0:00:01    42{ 
    "error": "Stream was 0 bytes but needs to be at least 100 bytes.",
    "code": 400,
    "code_description": "Bad Request"
}
```

EXPERIMENT-11

Aim:

Write a Python Program to detect faces.

Code:

```
[3]: !pip install opencv-python

Collecting opencv-python
  Downloading opencv_python-4.9.0.80-cp37-abi3-win_amd64.whl.metadata (20 kB)
Requirement already satisfied: numpy>=1.21.2 in c:\users\lenovo\anaconda3\lib\site-packages (from opencv-python) (1.26.4)
Downloading opencv_python-4.9.0.80-cp37-abi3-win_amd64.whl (38.6 MB)
----- 0.0/38.6 MB ? eta :---:-
----- 0.0/38.6 MB ? eta :---:-
----- 0.0/38.6 MB 960.0 kB/s eta 0:00:41
----- 0.1/38.6 MB 1.3 MB/s eta 0:00:30
----- 0.3/38.6 MB 2.6 MB/s eta 0:00:15
----- 0.5/38.6 MB 3.3 MB/s eta 0:00:12
----- 0.8/38.6 MB 3.5 MB/s eta 0:00:11
----- 0.9/38.6 MB 3.5 MB/s eta 0:00:11
----- 1.1/38.6 MB 3.6 MB/s eta 0:00:11
----- 1.1/38.6 MB 3.6 MB/s eta 0:00:11
----- 1.6/38.6 MB 3.8 MB/s eta 0:00:10
----- 2.0/38.6 MB 4.4 MB/s eta 0:00:09
----- 2.2/38.6 MB 4.4 MB/s eta 0:00:09
----- 2.7/38.6 MB 4.9 MB/s eta 0:00:08

[37]: import cv2
import matplotlib.pyplot as plt

[38]: cam=cv2.VideoCapture(0)
v1, frame=cam.read()
cv2.waitKey(5)
cam.release()
cv2.destroyAllWindows()

[39]: v1
[39]: True

[40]: frame

[40]: array([[[ 54,  42,  16],
   [ 54,  42,  16],
   [ 53,  41,  15],
   ...,
   [ 70,  44,  36],
   [ 71,  46,  36],
   [ 71,  46,  36]],

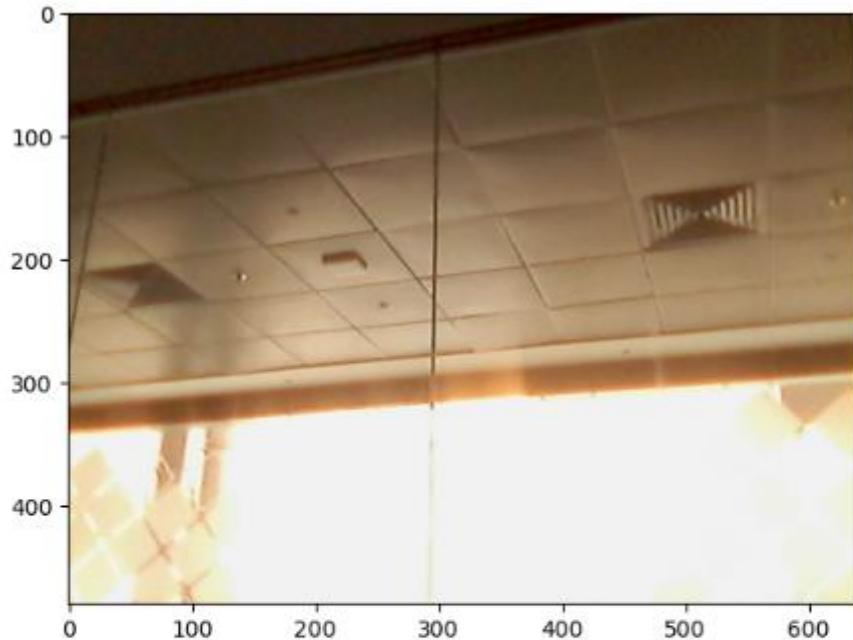
   [[ 58,  44,   9],
   [ 55,  42,   8],
   [ 54,  44,  10],
   ...,
   [ 70,  51,  24],
   [ 71,  53,  23],
   [ 76,  58,  27]],

   [[ 58,  44,   7],
   [ 53,  38,   1],
   [ 55,  41,   3],
   ...,
   [ 67,  51,  32],
   [ 66,  52,  33],
   [ 66,  52,  33]],

   ...,
   [[239, 237, 178],
   [241, 239, 182],
   [241, 240, 185],
   ...,
   [240, 235, 197],
   [241, 236, 198],
   [240, 235, 197]],
```

```
[41]: plt.imshow(frame)
```

```
[41]: <matplotlib.image.AxesImage at 0x2729a1eca10>
```



```
[42]: cv2.namedWindow("Open-CV",cv2.WINDOW_NORMAL)
webcam=cv2.VideoCapture(0)
```

```
while True:
    rect,img=webcam.read()
    cv2.imshow("Open-CV",img)

    if cv2.waitKey(10)==ord("q"):
        break
webcam.release()
cv2.destroyAllWindows()
```

```
[43]: ord("q")
```

```
[43]: 113
```

EXPERIMENT-12

Aim:

Create your own image dataset by using OpenCV.

Code:

```
[11]: import cv2
import matplotlib.pyplot as plt
from IPython.display import clear_output
import os
```

detect face

```
[12]: def detect_face(frame):
    detector = cv2.CascadeClassifier('haarcascade_frontalface_alt.xml')
    faces = detector.detectMultiScale(frame, 1.2)

    return faces
```

gray scale

```
[13]: def gray_scale(image):
    img = cv2.cvtColor(image, cv2.COLOR_BGR2GRAY)

    return img
```

cut face

```
[14]: def cut_face(image, face_coord):
    faces = []
    for (x, y, w, h) in face_coord:
        face = image[y:y+h, x:x+w]
        faces.append(face)

    return faces
```

normalize intensity

```
[15]: def normalize_intensity(images):
    new_images = []
    for image in images:
        img = cv2.equalizeHist(image)
        new_images.append(img)

    return new_images
```

resize image

```
[16]: def resize(images, size=(80, 100)):
    resized_images = []
    for img in images:
        img = cv2.resize(img, size)
        resized_images.append(img)

    return resized_images
```

make pipeline

```
[17]: def pipeline(frame, face_coord):
    faces = cut_face(frame, face_coord)
    faces = normalize_intensity(faces)
    faces = resize(faces)

    return faces
```

plot function

```
[18]: def plot_fn(image, title=''):
    if len(image.shape) == 3:
        image = cv2.cvtColor(image, cv2.COLOR_BGR2RGB)

    plt.axis('off')
    plt.title(title)
    plt.imshow(image, cmap='gray')
    plt.show()
```

draw rectangle

```
[19]: def draw_rectangle(image, coords):
    for (x, y, w, h) in coords:
        cv2.rectangle(image, (x, y), (x+w, y+h), (0, 0, 255), 2)

    return image
```

make dataset

```
[*]: cam = cv2.VideoCapture(0)
name = input('Enter your name: ')
no_samples = int(input("Enter number of samples: "))
folder = 'userData/' + name.lower()

if os.path.exists(folder):
    print("Person already exists")
else:
    os.mkdir(folder)
    flag_start_capturing = False
    sample = 1

    cv2.namedWindow(name, cv2.WINDOW_NORMAL)

    while True:
        ret, frame = cam.read()
        gray_img = gray_scale(frame)
        face_coord = detect_face(gray_img)

        if len(face_coord):
            faces = pipeline(gray_img, face_coord)
            img_name = str(sample) + '.jpg'
            cv2.imwrite(folder + '/' + img_name, faces[0])
            plot_fn(faces[0], f'Image Saved: {sample}')
            clear_output(wait=True)

            if flag_start_capturing:
                sample += 1
            else:
                print("No face detected")

            frame = draw_rectangle(frame, face_coord)
            cv2.imshow(name, frame)
            key = cv2.waitKey(1)

            if key == ord('c'):
                if not flag_start_capturing:
                    flag_start_capturing = True
            if sample > no_samples:
                break
            if key == ord('q'):
                break

cam.release()
cv2.destroyAllWindows()
```

EXPERIMENT-13

Aim:

To classify images using OpenCV

Code: