The SPARKS FOUNDATION : Data Science And Business Analytics

Prediction Using Supervised ML

Task - To predict the percentage of a student on the number of study hours.

Language Used - Python 3

IDE : Jupyter Notebook

Type- Linear Regression

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Steps to be Followed :

- Step 1 : Import the Dataset
- Step 2 : Visualize and Analyze the Dataset
- Step 3 : Prepare the data
- Step 4 : Design and Train the Machine Learning Model
- Step 5 : Visualize the model
- Step 6 : Make Predictions
- Step 7 : Evaluate the model

Step 1 : Import the Dataset

In [6]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
```

In [7]:
```
# Reading data from remote link using the url

url = "http://bit.ly/w-data"
student_data = pd.read_csv(url)

print("Data imported successfully")
student_data
```

```
Data imported successfully
```

Out[7]:

	Hours	Scores
0	2.5	21
1	5.1	47
2	3.2	27
3	8.5	75
4	3.5	30
5	1.5	20
6	9.2	88
7	5.5	60
8	8.3	81
9	2.7	25
10	7.7	85
11	5.9	62
12	4.5	41
13	3.3	42
14	1.1	17
15	8.9	95
16	2.5	30
17	1.9	24
18	6.1	67
19	7.4	69
20	2.7	30
21	4.8	54
22	3.8	35
23	6.9	76
24	7.8	86

In [10]:
```
student_data.shape

# here we can see that there are 25 rows and 2 columns
```

Out[10]:
```
(25, 2)
```

In [11]:
```
student_data.describe()
```

Out[11]:

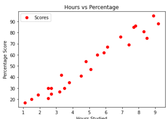
	Hours	Scores
count	25.000000	25.000000
mean	5.012000	51.480000
std	2.525094	25.286887
min	1.100000	17.000000
25%	2.700000	30.000000
50%	4.800000	47.000000
75%	7.400000	75.000000
max	9.200000	95.000000

In [12]:
```
student_data.isnull().sum()

#here we can see that there are no null values in the dataset that can affect the training of our algorithm.
```

Out[12]:
```
Hours     0
Scores    0
dtype: int64
```

Step 2 : Visualize and Analyze the Dataset

In [16]:
```
# Plotting the distribution of scores and number of hours studied on a 2D graph

student_data.plot(x='Hours',y ='Scores', style='ro')
plt.title('Hours vs Percentage')
plt.xlabel('Hours Studied')
plt.ylabel('Percentage Score')
plt.show()
```



From the above graph we can see that there is a positive linear relationship between hours and percentage which means that as the number of hours studied increase, the percentage also increased

Step 3 : Prepare the data

In [27]:
```
# we are extrating values of Hours Data into variable x and the values of Scores Data into variable y

x = student_data.iloc[:, :-1].values
y = student_data.iloc[:, 1].values
```

In [28]:
```
#Number of hours studied
x
```

Out[28]:
```
array([[2.5],
       [5.1],
       [3.2],
       [8.5],
       [3.5],
       [1.5],
       [9.2],
       [5.5],
       [8.3],
       [2.7],
       [7.7],
       [5.9],
       [4.5],
       [3.3],
       [1.1],
       [8.9],
       [2.5],
       [1.9],
       [6.1],
       [7.4],
       [2.7],
       [4.8],
       [3.8],
       [6.9],
       [7.8]])
```

In [29]:
```
#Scores obtained
y
```

Out[29]:
```
array([21, 47, 27, 75, 30, 20, 88, 60, 81, 25, 85, 62, 41, 42, 17, 95, 30,
       24, 67, 69, 30, 54, 35, 76, 86], dtype=int64)
```

In [30]:
```
# We now split the data into train and test datasets using Scikit-Learn's built-in train_test_split()

from sklearn.model_selection import train_test_split

x_train,x_test,y_train,y_test = train_test_split(x,y,test_size = 0.2,random_state = 0)
```

In [31]:
```
x_train
```

Out[31]:
```
array([[3.8],
       [1.9],
       [7.8],
       [6.9],
       [1.1],
       [5.1],
       [7.7],
       [3.3],
       [8.3],
       [9.2],
       [6.1],
       [3.5],
       [2.7],
       [5.5],
       [2.7],
       [8.5],
       [2.5],
       [4.8],
       [8.9],
       [4.5]])
```

In [32]:
```
x_test
```

Out[32]:
```
array([[1.5],
       [3.2],
       [7.4],
       [2.5],
       [5.9]])
```

In [33]:
```
y_train
```

Out[33]:
```
array([35, 24, 86, 76, 17, 47, 85, 42, 81, 88, 67, 30, 25, 60, 30, 75, 21,
       54, 95, 41], dtype=int64)
```

In [34]:
```
y_test
```

Out[34]:
```
array([20, 27, 69, 30, 62], dtype=int64)
```

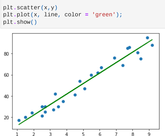
Step 4 : Design and Train the Machine Learning Model

In [35]:
```
from sklearn.linear_model import LinearRegression

regressor = LinearRegression()
regressor.fit(x_train, y_train)

print("Traing Complete.")
```

```
Traing Complete.
```

Step 5: Visualize the Model

In [36]:
```
# Plotting th Regression Line
line = regressor.coef_*x+regressor.intercept_

#Plotting for the test data

plt.scatter(x,y)
plt.plot(x, line, color = 'green');
plt.show()
```



Step 6 : Make Predictions

In [38]:
```
print(x_test) # Testing data - In Hours
y_pred = regressor.predict(x_test) # Predictin the Scores

[[1.5]
 [3.2]
 [7.4]
 [2.5]
 [5.9]]
```

In [39]:
```
# Compare Actual vs Predicted
df = pd.DataFrame({'Actual': y_test, 'Predicted': y_pred})
df
```

Out[39]:

	Actual	Predicted
0	20	16.884145
1	27	33.732261
2	69	75.357018
3	30	26.794801
4	62	60.491033

In [42]:
```
# Testing with custom data of 9.25 hrs/day

hours= 9.25
own_pred = regressor.predict([[hours]])
print(f"No of Hours = {hours}")
print(f"Predicted Score = {own_pred[0]}")
```

```
No of Hours = 9.25
Predicted Score = 93.69173248737535
```

Step 7: Evaluate the Model

It is important to evaluate the performance of algorithm to compare how well different algorithms perform on a particular dataset.

Mean Absolute Error

In [44]:
```
from sklearn import metrics
print('Mean Absolute Error:', metrics.mean_absolute_error(y_test,y_pred))
```

```
Mean Absolute Error: 4.183859899002975
```

Max Error

In [45]:
```
print('Max Error:',metrics.max_error(y_test,y_pred))
```

```
Max Error: 6.732260779489849
```

Mean Squared Error

In [46]:
```
print('Mean Squared Error:', metrics.mean_squared_error(y_test, y_pred))
```

```
Mean Squared Error: 21.5987693072174
```