The Sparks Foundation

Data Science and Business Analytics (GRIP JULY'22)

Task 1: Prediction using Supervised ML

Problem Statement

- Predict the percentage of a student based on the number of study hours.
- What will be the predicted score if a student studies for 9.25 hrs/day?

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Simple Linear Regression

In this regression task we will predict the percentage of marks that a student is expected to score based upon the number of hours they studied. This is a simple linear regression task as it involves just two variables.

Importing all libraries required in this notebook

In [1]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
%matplotlib inline
from sklearn.metrics import mean_squared_error
from sklearn.metrics import mean_absolute_error
import warnings
warnings.filterwarnings('ignore')
```

Dataset needed : http://bit.ly/w-data

Read the csv dataset as a pandas dataframe.

In [2]:
```
path = 'http://bit.ly/w-data'
data = pd.read_csv(path)

print('Success')
```

```
Success
```

Data Understanding

In [3]:
```
data.head(10)          # Check top 10 rows
```

Out[3]:

	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

In [4]:
```
data.tail()          # Check last 5 rows
```

Out[4]:

	Hours	Scores
20	2.7	30
21	4.8	54
22	3.8	35
23	6.9	76
24	7.8	86

In [5]:
```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 25 entries, 0 to 24
Data columns (total 2 columns):
 #   Column  Non-Null Count  Dtype
---  ------  --------------  -----
 0   Hours   25 non-null     float64
 1   Scores  25 non-null     int64
dtypes: float64(1), int64(1)
memory usage: 528.0 bytes
```

In [6]:
```
data.describe()
```

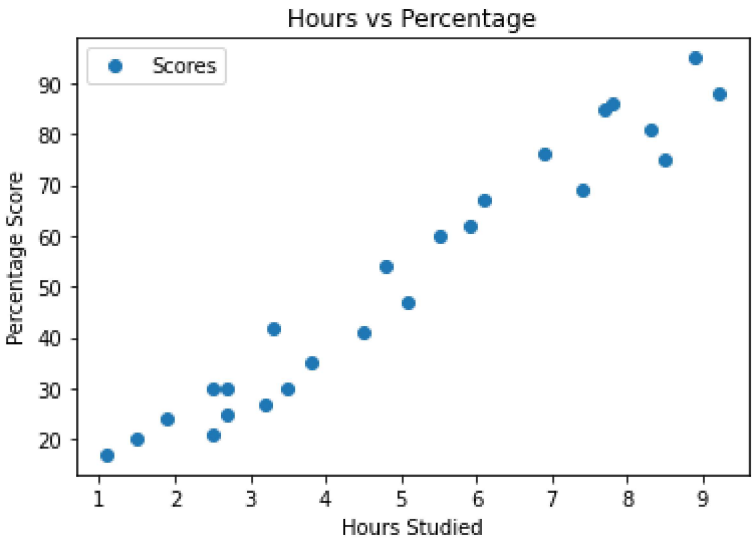
Out[6]:

	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

Visualize the data

Let's plot our data points on 2-D graph to eyeball our dataset and see if we can manually find any relationship between the data.

In [7]:
```
data.plot(x='Hours', y='Scores', style='o')
plt.title('Hours vs Percentage')
plt.xlabel('Hours Studied')
plt.ylabel('Percentage Score')
plt.show()
```



we can clearly see that there is a positive linear relation between the number of hours studied and percentage of score.

Preparing the data

The next step is to divide the data into "attributes" (inputs) and "labels" (outputs).

In [8]:
```
X = data.iloc[:, :-1].values
y = data.iloc[:, 1].values
```

In [9]:
```
X
```

Out[9]:
```
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 [10]:
```
y
```

Out[10]:
```
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 [11]:
```
y[ :5]
```

Out[11]:
```
array([21, 47, 27, 75, 30], dtype=int64)
```

Now that we have our attributes and labels, the next step is to split this data into training and test sets. We'll do this by using Scikit-Learn's built-in train_test_split() method:

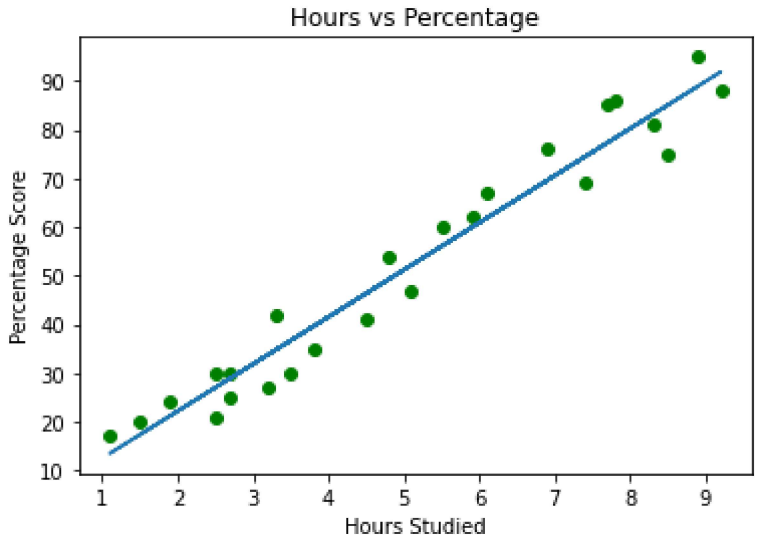
In [12]:
```
from sklearn.model_selection import train_test_split
X_train, X_test, y_train, y_test = train_test_split(X, y,
                            test_size=0.2, random_state=42)
```

Training the Algorithm

In [13]:
```
from sklearn.linear_model import LinearRegression
regressor = LinearRegression()
regressor.fit(X_train, y_train)

print("Training complete.")
```

```
Training complete.
```

In [14]:
```
line = regressor.coef_*X+regressor.intercept_             # Plotting the regressio



plt.scatter(X, y ,  color='green' )                      # Plotting for the test d
plt.plot(X, line);
plt.title('Hours vs Percentage')
plt.xlabel('Hours Studied')
plt.ylabel('Percentage Score')
plt.show()
```



In [15]:
```
print('Test Score')
print(regressor.score(X_test, y_test))
print('Trainning Score')
print(regressor.score(X_train, y_train))
```

```
Test Score
0.9678055545167994
Trainning Score
0.9491209376364416
```

Making Predictions

Now that we have trained our algorithm, it's time to make some predictions.

In [16]:
```
print(X_test)                                   # Testing data - In Hours
y_pred = regressor.predict(X_train)             # Predicting the scores
```

```
[[8.3]
 [2.5]
 [2.5]
 [6.9]
 [5.9]]
```

In [17]:
```
y_test
```

Out[17]:
```
array([81, 30, 21, 76, 62], dtype=int64)
```

In [18]:
```
y_pred
```

Out[18]:
```
array([28.96850337, 34.77775026, 52.20549094, 39.61878934, 17.35000959,
       33.80954245, 46.39624405, 88.99738793, 85.12455667, 36.71416589,
       28.96850337, 21.22284085, 49.3008675 , 61.8875691 , 78.34710196,
       56.0783222 , 77.37889414, 13.47717832, 74.4742707 , 91.90201137])
```

In [19]:
```
y_pred[:5]
```

Out[19]:
```
array([28.96850337, 34.77775026, 52.20549094, 39.61878934, 17.35000959])
```

In [20]:
```
s_data = pd.DataFrame({'Actual': y_test, 'Predicted': y_pred[:5]})        # Compar
s_data
```

Out[20]:

	Actual	Predicted
0	81	28.968503
1	30	34.777750
2	21	52.205491
3	76	39.618789
4	62	17.350010

In [21]:
```
print("The score of student who studied for 9.30 hours a day ",regressor.predict([
```

```
The score of student who studied for 9.30 hours a day  [92.87021919]
```

Model Evaluation Metrics

In [22]:
```
print('Mean Squared Error:',
      mean_squared_error(y_test, y_pred[:5]))

print('Mean Absolute Error:',
      mean_absolute_error(y_test, y_pred[:5]))
```

```
Mean Squared Error: 1404.2200673968694
Mean Absolute Error: 33.80918778157651
```
