THE SPARKS FOUNDATION: DATA SCIENCE AND BUSINESS ANALYTICS

Task 1: Prediction using Supervised ML

AIM: Predict the percentage of a student based on the number of study hours

AUTHOR: Nikita Nikam

LANGUAGE USED: Python 3

IDE: Jupyter Notebook

TYPE: Linear Regression

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 [2]:

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
```

In [3]:

```
# 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[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
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 [4]:

```
student_data.shape

#Here we can see that there are 25 rows and 2 columns in the dataset
```

Out[4]:

```
(25, 2)
```

In [5]:

```
student_data.describe()
```

Out[5]:

	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 [6]:

```
student_data.isnull().sum()

#Here we can see that there are no NULL values in the dataset that can affect the
```

Out[6]:

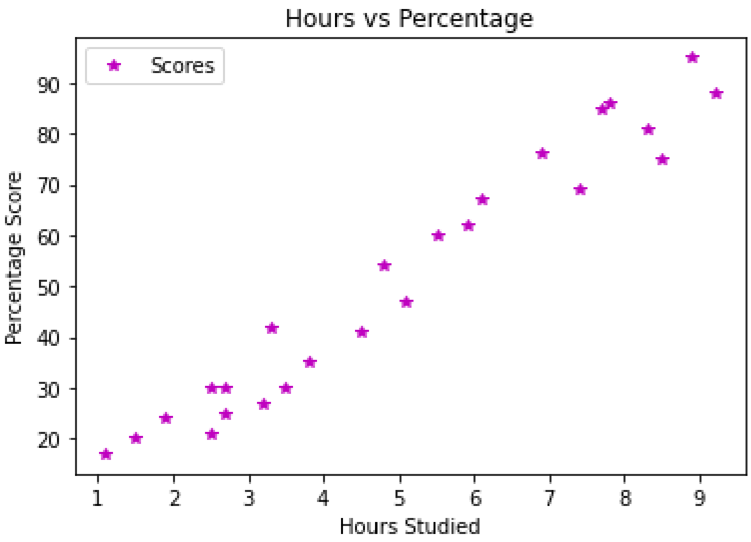
```
Hours     0
Scores    0
dtype: int64
```

Step 2: Visualize and Analyze the Dataset

In [25]:

```
# Plotting the distribution of scores and number of hours studied on a 2D graph

student_data.plot(x='Hours', y='Scores', style='*',color='m')
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 increased, the percentage scored also increased.

Step 3: Prepare the Data

In [8]:

```
# We are extracting values of Hours Data into variable X and the values of Scores

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

In [9]:
```
#Number of hours studied
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]:
```
#Scores Obtained
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]:
```
# We now split the data into train and test datasets using Scikit-Learn's built-i

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 [12]:

```
X_train
```

Out[12]:

```
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 [13]:

```

X_test
```

Out[13]:

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

In [14]:

```
y_train
```

Out[14]:

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

In [15]:

```
y_test
```

Out[15]:

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

Step 4: Design and Train the Machine Learning Model

In [16]:

```
from sklearn.linear_model import LinearRegression

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

print("Training complete.")
```

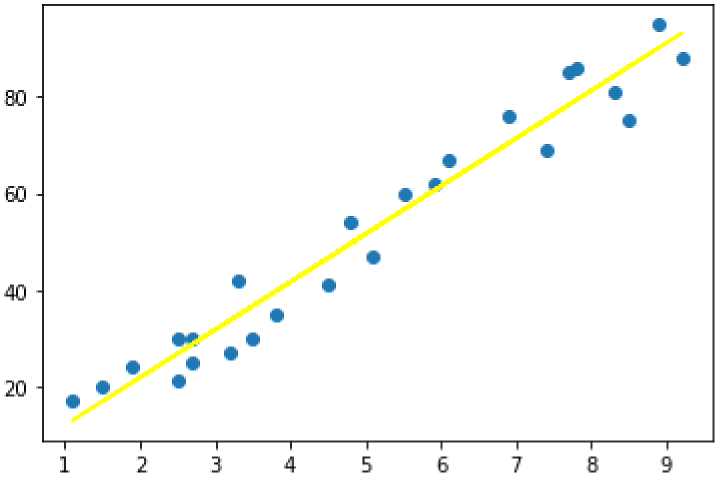
```
Training complete.
```

Step 5: Visualize the Model

In [26]:

```
# Plotting the regression line
line = regressor.coef_*X+regressor.intercept_

# Plotting for the test data
plt.scatter(X, y)
plt.plot(X, line, color='yellow');
plt.show()
```



Step 6: Make Predictions

In [18]:

```
print(X_test) # Testing data - In Hours
y_pred = regressor.predict(X_test) # Predicting the scores
```

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

In [19]:

```
# Comparing Actual vs Predicted
df = pd.DataFrame({'Actual': y_test, 'Predicted': y_pred})
df
```

Out[19]:

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

In [20]:
```
# 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.

1. Mean Absolute Error

In [21]:
```
from sklearn import metrics

print('Mean Absolute Error:', metrics.mean_absolute_error(y_test, y_pred))
```

```
Mean Absolute Error: 4.183859899002975
```

2. Max Error

In [22]:
```
print('Max Error:', metrics.max_error(y_test, y_pred))
```

```
Max Error: 6.732260779489849
```

3. Mean Squared Error

In [23]:
```
print('Mean Squared Error:', metrics.mean_squared_error(y_test, y_pred))
```

```
Mean Squared Error: 21.598769307217406
```

In [ ]: