THE SPARKS FOUNDATION

Task 1 : To Explore Supervised Machine Learning

In this notebook we are using Python Scikit-Learn library for machine learning to implement simple linear regression functions.

Simple Linear Regression

1.In this regression task we will be predicting the percentage of marks that a student is expected to score based upon the number of hours studied.

2.This is a simple linear regression tas involving just two variables.

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Importing Libraries

In [3]:
```
# Importing all required libraries
import pandas as pd # used for data processing and analysis
import numpy as np  # used for various array's operation
import matplotlib.pyplot as plt  # used for data visualization
%matplotlib inline
```

Loading Dataset

In [9]:
```
#reading datwa remote link
url = "http://bit.ly/w-data"
s_data = pd.read_csv(url)
print ("Data imported successfully")

s_data.head(5)
```

```
Data imported successfully
```

Out[9]:

	Hours	Scores
0	2.5	21
1	5.1	47
2	3.2	27
3	8.5	75
4	3.5	30

In [10]:
```
s_data.shape # get no. of rows and columns from dataset
```

Out[10]: (25, 2)

In [11]:
```
s_data.describe() # get summary of statistical details pertaining to columns of dataset
```

Out[11]:

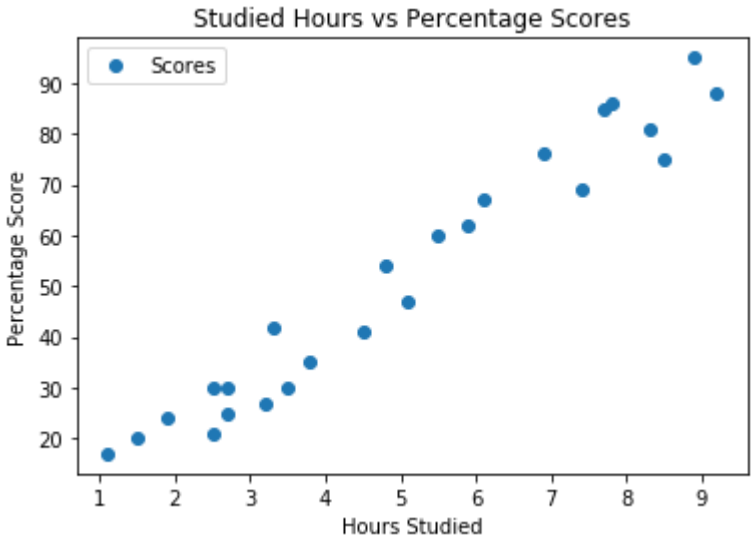
	Hours	Scores
count	25.000000	25.000000
mean	5.012000	51.480000
std	2.525094	25.286887
min	1.100000	17.000000
25%	2.700000	30.000000
50%	4.800000	47.000000
75%	7.400000	75.000000
max	9.200000	95.000000

In [12]:
```
s_data.info()  # get concise summary/ basic information of dataset
```

```
<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
```

Ploting Graph

In [14]:
```
# Plotting the distribution of scores
data.plot(x='Hours', y='Scores', style='o')
plt.title('Studied Hours vs Percentage Scores')
plt.xlabel('Hours Studied')
plt.ylabel('Percentage Score')
plt.show()
```



From the graph above, 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 [15]:
```
X = s_data.iloc[:, :-1].values  # attributes as inputs
Y = s_data.iloc[:, 1].values  # labels as outputs
```

In [16]:
```
print('inputs:\n')
print(X)
```

```
inputs:

[[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 [17]:
```
print('outputs:\n')
print(Y)
```

```
outputs:

[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]
```

Spiliting the dataset into Training and Testing datasets

In [20]:
```
# importing the method called train_test_split from sklearn's model_selection
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
```

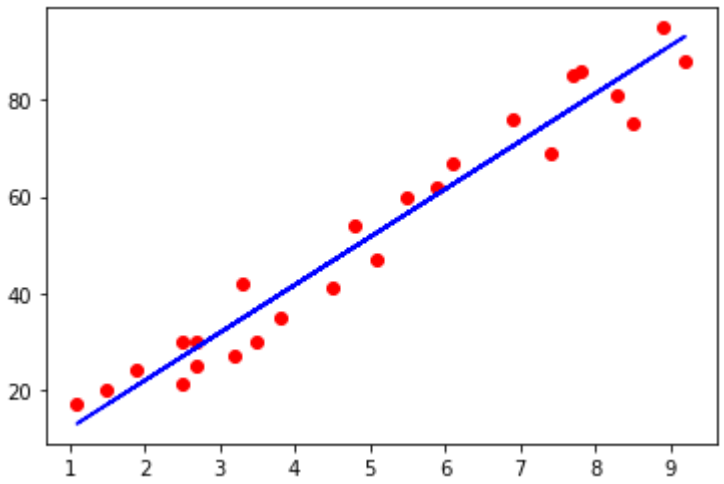
Training the Algorithm

In [21]:
```
from sklearn.linear_model import LinearRegression
regressor = LinearRegression()
regressor.fit(X_train, Y_train)

print("Training complete.")
```

```
Training complete.
```

Plotting Regression

In [22]:
```
# Plotting the regression line
line = regressor.coef_*X + regressor.intercept_

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



Making Predictions

In [23]:
```
# first printing the testing data (in hours)
print(X_test)
```

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

In [24]:
```
# now we'll predict the scores (in presentage)
Y_predict = regressor.predict(X_test) # Predicting the scores
print(Y_predict)
```

```
[16.88414476 33.73226078 75.357018   26.79480124 60.49103328]
```

In [25]:
```
# Comparing Actual data vs Predicted data
df = pd.DataFrame({'Actual': Y_test, 'Predicted': Y_predict})
df
```

Out[25]:

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

Predicting score if a student studies for 9.25 hours

In [26]:
```
# now I will predcit with my own data
hours = 9.25
my_predict = regressor.predict([[hours]])
print("No of Hours a student sudies = {}".format(hours))
print("Predicted Score of marks in % = {}".format(my_predict[0]))
```

```
No of Hours a student sudies = 9.25
Predicted Score of marks in % = 93.69173248737538
```

Evaluating the model

In [28]:
```
from sklearn import metrics
print('Mean Absolute Error:', metrics.mean_absolute_error(Y_test, Y_predict))
```

```
Mean Absolute Error: 4.183859899002975
```

In [29]:
```
print('Mean Squared Error:', metrics.mean_squared_error(Y_test, Y_predict))
```

```
Mean Squared Error: 21.5987693072174
```

In [30]:
```
print('Root Mean Squared Error:', np.sqrt(metrics.mean_squared_error(Y_test, Y_predict)))
```

```
Root Mean Squared Error: 4.6474476121003665
```

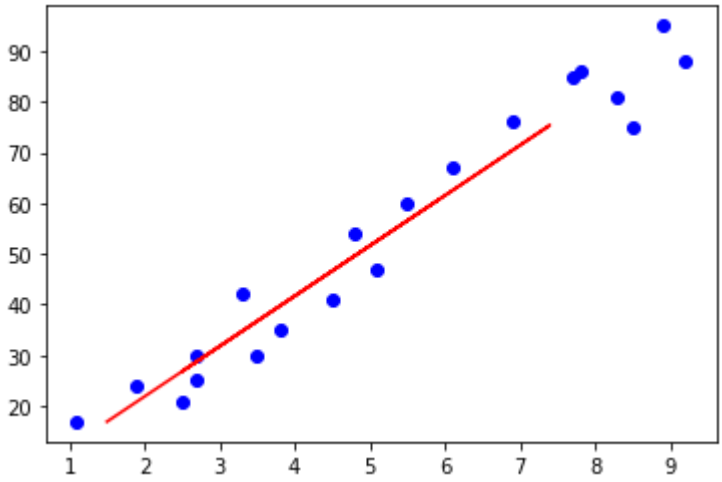
Checking Accurancy of the Model

R Squared value is close to 1, this is a good model

In [31]:
```
regressor.score(X,Y)
```

Out[31]:
```
0.9526947647057274
```

In [32]:
```
plt.scatter(X_train, Y_train, color='blue')
plt.plot(X_test,Y_predict, color='red')
plt.show()
```



Our model is 95.26% accurate