TASK 1 - Prediction using Supervised ML

To Predict the percentage of marks of the students based on the number of hours they studied

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In [3]:
```
import math
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn import metrics
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LinearRegression
```

In [4]:
```
link = "https://raw.githubusercontent.com/AdiPersonalWorks/Random/master/student_scores
```

In [5]:
```
df = pd.read_csv(link)
```

In [6]:
```
df.head(10)
```

Out[6]:

	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

DATA UNDERSTANDING AND PRE PROCESSING

TO KNOW THE DIMENSIONS OF THE DATA

In [8]:
```
df.shape
```

Out[8]: (25, 2)

TO FIND AND ELIMINATE MISSING OR NULL VALUES IN THE GIVEN DATA SET

In [9]:
```
df.isnull().sum()
```

Out[9]:
```
Hours     0
Scores    0
dtype: int64
```

SO, WE CAN SEE THEIR ARE NO MISSING VALUES IN THE GIVEN DATA SET

TO FIND MORE INFORMATION ABOUT THE DATASET

In [10]:
```
df.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 [11]:
```
df.describe()
```

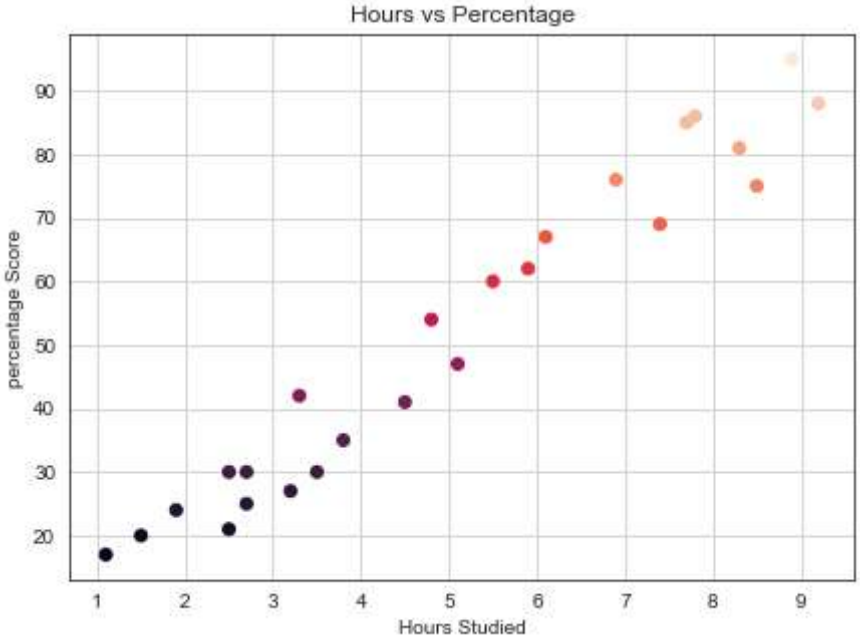
Out[11]:

	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

PLOTTING THE DATASET

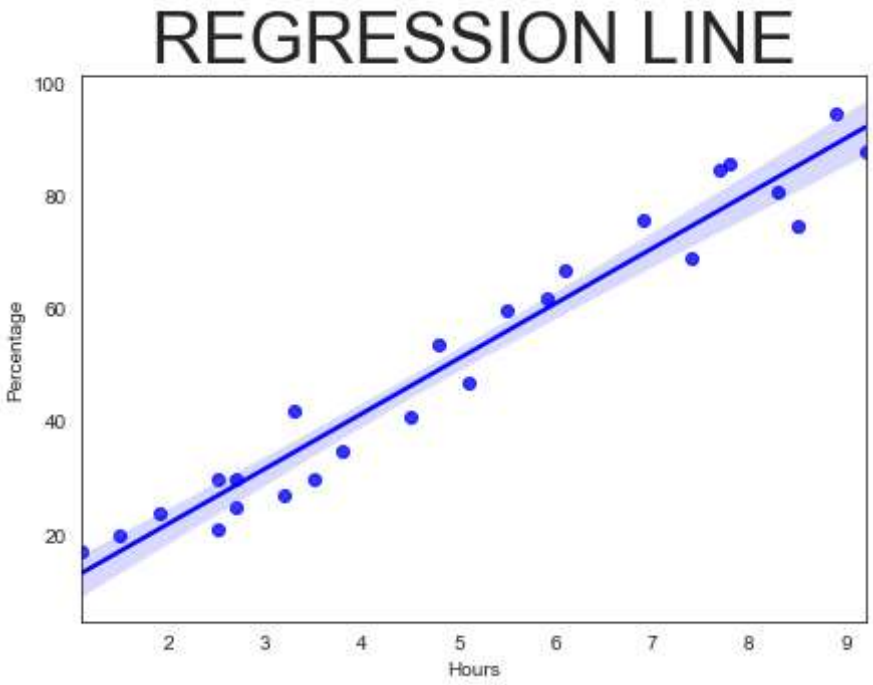
In [13]:
```
sns.set_style('white')
plt.rcParams["figure.figsize"] = [7,5]
y = df['Scores'].values
plt.scatter(df['Hours'].values,df['Scores'].values, c=y)
plt.title('Hours vs Percentage')
plt.xlabel('Hours Studied')
```

```
plt.ylabel('percentage Score')
plt.grid()
plt.show()
```



In [18]:

```
sns.set_style('white')
sns.regplot(x= df['Hours'], y = df['Scores'], color='blue')
plt.title('REGRESSION LINE',size = 35)
plt.ylabel('Percentage')
plt.xlabel('Hours')
plt.show()
```



From the plot above, a linear relationship is seen between the two variables 'Hours studied' and 'Percentage Score'.Therefore, a linear regression supervised machine model would best fit the data.

In [19]:
```
df.corr()
```

Out[19]:

	Hours	Scores
Hours	1.000000	0.976191
Scores	0.976191	1.000000

The correlation further supports the earlier finding about the linear association between the variables.

TRAINING THE MODEL

Splitting the Data

In [20]:
```
# Defining X and y from the Data
X = df.iloc[:, :-1].values
y = df.iloc[:, 1].values

#Creating the test train split first
X_train, X_test, y_train, y_test = train_test_split(X,y, test_size=0.2,random_state = 0
```

Fitting the Data into the Model

In [21]:
```
model = LinearRegression()
model.fit(X_train,  y_train)
print("---------Model Trained---------")
```

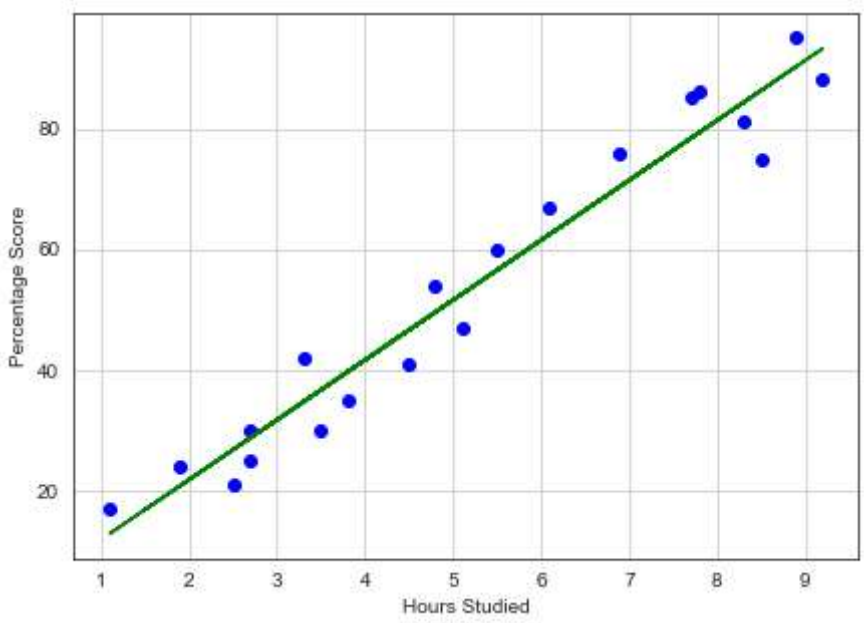
```
---------Model Trained---------
```

VISUALIZING THE MODEL

Plotting for the training data

In [22]:
```
line = model.coef_*X + model.intercept_

plt.rcParams["figure.figsize"] = [7,5]
plt.scatter(X_train, y_train, color='blue')
plt.plot(X, line, color='green');
plt.xlabel('Hours Studied')
plt.ylabel('Percentage Score')
plt.grid()
plt.show()
```



Predicting the Percentage of Marks

In [23]:
```
pred_y = model.predict(X_test)
prediction = pd.DataFrame({'Hours': [i[0] for i in X_test], 'Predicted Marks': [k for k
prediction.head()
```

Out[23]:

	Hours	Predicted Marks
0	1.5	16.884145
1	3.2	33.732261
2	7.4	75.357018
3	2.5	26.794801
4	5.9	60.491033

In [24]:
```
compare_scores = pd.DataFrame({'Actual Marks': y_test, 'Predicted Marks': pred_y})
compare_scores.head()
```

Out[24]:

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

Evaluating the Model

In [25]:
```
# Calculating the accuracy of the model
print('Mean Absolute Error :',metrics.mean_absolute_error(y_test, pred_y))
print('Root Mean Square Error :',math.sqrt(metrics.mean_squared_error(y_test, pred_y)))
```

```
Mean Absolute Error : 4.183859899002975
Root Mean Square Error : 4.6474476121003665
```

Check for overfitting and underfitting

In [26]:
```
# print the scores on training and test set

print('Training set score: {:.4f}'.format(model.score(X_train, y_train)))
print('Test set score: {:.4f}'.format(model.score(X_test, y_test)))
```

```
Training set score: 0.9516
Test set score: 0.9455
```

Since the train score and test score are quite comparable, there is no sign of overfitting.

What will be the predicted score of a student if he/she studies for 9.25 hrs/ day?

In [27]:
```
hours = 9.25
own_pred = model.predict([[hours]])
print("No of Hours = {}".format(hours))
print("Predicted Score = {}".format(own_pred[0]))
```

```
No of Hours = 9.25
Predicted Score = 93.69173248737538
```