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TASK: Prediction using Supervised Machine Learning using Simple Linear Regression

In this task we have to find the students scores based on their study hours. This is a simple Regression problem type because it has only two variables.

Import The Required Libraries

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
%matplotlib inline
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LinearRegression
from sklearn.metrics import mean_absolute_error
```

Reading The CSV file

```
kp = pd.read_csv('/content/StudentHoursScores.csv')
```

```
#print first five row
kp.head()
```

	Hours	Scores
0	7.7	79
1	5.9	60
2	4.5	45
3	3.3	33
4	1.1	12

```
#print random six row
kp.sample(6)
```

	Hours	Scores
4	1.1	12
8	2.7	29
11	9.2	88
15	3.2	32
18	9.6	96
21	3.0	30

Checking how many null values are there in dataset

```
1 kp.isna().sum()
```

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

Shape of dataset

```
1 kp.shape
```

```
(23, 2)
```

Descriptive analysis of the dataset using describe function¶

```
1 kp.describe()
```

	Hours	Scores

basic information about the dataset

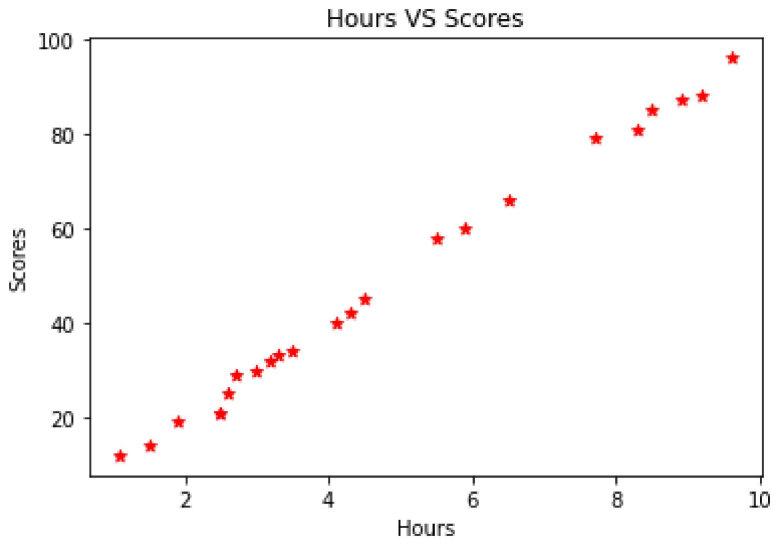
```
std       2.709068   27.103228
```

```
1 kp.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 23 entries, 0 to 22
Data columns (total 2 columns):
 #   Column  Non-Null Count  Dtype  
---  ------  --------------  -----  
 0   Hours   23 non-null     float64
 1   Scores  23 non-null     int64  
dtypes: float64(1), int64(1)
memory usage: 496.0 bytes
```

Plotting a scatter plot showing relationship between No of Hours vs scores

```
1 plt.xlabel('Hours')
2 plt.ylabel('Scores')
3 plt.title('Hours VS Scores')
4 plt.scatter(kp.Hours,kp.Scores,color='red',marker='*')
5 plt.show()
```



Conclusion:-

This "SCATTER PLOT" indicates positive linear relationship as much as hours You study is a chance of high scoring.

Two variables for the regression

```
X=np.array(kp.Hours)
Y=np.array(kp.Scores)
```

Reshaping the numpy array for vertical output

```
X=X.reshape(-1,1)
Y=Y.reshape(-1,1)
```

Preparing Data and splitting into train and test sets.

```
from sklearn.model_selection import train_test_split
X_train,X_test,Y_train,Y_test = train_test_split(X,Y,random_state = 0,test_size=0.2)
```

-> We have Splitted Our Data Using 80:20 RULE(PARETO)

```
print("X train.shape =", X_train.shape)
print("Y train.shape =", Y_train.shape)
print("X test.shape  =", X_test.shape)
print("Y test.shape  =", Y_test.shape)
```

```
X train.shape = (18, 1)
Y train.shape = (18, 1)
X test.shape  = (5, 1)
Y test.shape  = (5, 1)
```

Training the Model

```
from sklearn.linear_model import LinearRegression
linreg=LinearRegression()
```

```
##Fitting Training Data
linreg.fit(X_train,Y_train)
print("Training our algorithm is finished")
```

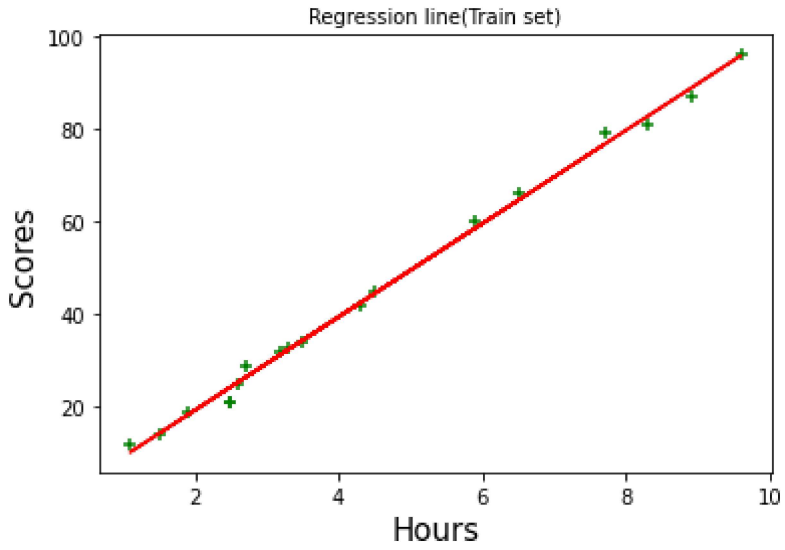
```
Training our algorithm is finished
```

```
print("B0 =",linreg.intercept_,"\nB1 =",linreg.coef_)## β0 is Intercept & Slope of the
```

```
B0 = [-0.80159397]
B1 = [[10.06743716]]
```

```
##plotting the REGRESSION LINE---
Y0 = linreg.intercept_ + linreg.coef_*X_train
```

```
##plotting on train data
plt.scatter(X_train,Y_train,color='green',marker='+')
plt.plot(X_train,Y0,color='red')
plt.xlabel("Hours",fontsize=15)
plt.ylabel("Scores",fontsize=15)
plt.title("Regression line(Train set)",fontsize=10)
plt.show()
```



Testing Data.

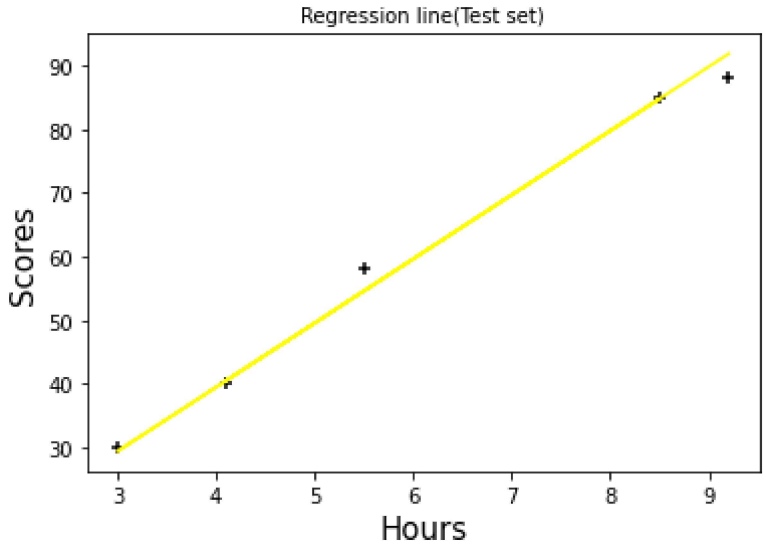
```
Y_pred=linreg.predict(X_test)##predicting the Scores for test data
print(Y_pred)
```

```
[[91.81882791]
 [54.56931042]
 [29.40071751]
 [84.7716219 ]
 [40.47489839]]
```

```
#now print the Y_test.
Y_test
```

```
array([[88],
       [58],
       [30],
       [85],
       [40]])
```

```
#plotting line on test data
plt.plot(X_test,Y_pred,color='yellow')
plt.scatter(X_test,Y_test,color='black',marker='+')
plt.xlabel("Hours",fontsize=15)
plt.ylabel("Scores",fontsize=15)
plt.title("Regression line(Test set)",fontsize=10)
plt.show()
```



Comparing Actual vs Predicted Scores

```
Y_test1 = list(Y_test)
prediction=list(Y_pred)
df_comp = pd.DataFrame({ 'Actual':Y_test1,'Result':prediction})
df_comp
```

	Actual	Result
0	[88]	[91.81882791035625]
1	[58]	[54.56931041529484]
2	[30]	[29.40071751322631]
3	[85]	[84.77162189777707]
4	[40]	[40.47489839013646]

ACCURACY OF THE MODEL

```
from sklearn import metrics
metrics.r2_score(Y_test,Y_pred)##Goodness of fit Test
```

```
0.9900509060111312
```

Predicting the Error

```
MSE = metrics.mean_squared_error(Y_test,Y_pred)
root_E = np.sqrt(metrics.mean_squared_error(Y_test,Y_pred))
Abs_E = np.sqrt(metrics.mean_squared_error(Y_test,Y_pred))
print("Mean Squared Error      = ",MSE)
print("Root Mean Squared Error = ",root_E)
print("Mean Absolute Error     = ",Abs_E)
```

```
Mean Squared Error      =  5.397980434600632
Root Mean Squared Error =  2.323355425801363
Mean Absolute Error     =  2.323355425801363
```

Predicting the score

```
Prediction_score = linreg.predict([[8.9]])
print("predicted score for a student studying 8.9 hours :",Prediction_score[0][0])
```

```
predicted score for a student studying 8.9 hours : 88.79859676210803
```

Conclusion:

From the above result we can say that if a studied for 8.9 then student will secured 88.79 MARKS.