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Task No.1 - Prediction using Supervised Machine Learning

- We would be **predicting the marks of student** based on the number of hours the student invests on studying by using **Linear Regression Algorithm**
- We will be using simple linear regression to build our model and to make predictions.This is a **simple linear regression** task as it involves just 2 variables.

Table of Content

Technical Stack : Sikit Learn, Numpy, Pandas, Matplotlib

Step No. 1

Importing Neccessary Libraries

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


from sklearn.model_selection import train_test_split
from sklearn.linear_model import LinearRegression
from sklearn import metrics
%matplotlib inline
```

Step No.2

```
url = "http://bit.ly/w-data"
df = pd.read_csv(url)
print(df)
print("Data imported successfully")
df.head()
```

```
    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
Data imported successfully
```

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

Step No.3

```
print("Info of the data")
print(df.describe())
print("shape of the data -",df.shape)
```

```
Info of the data
           Hours     Scores
```

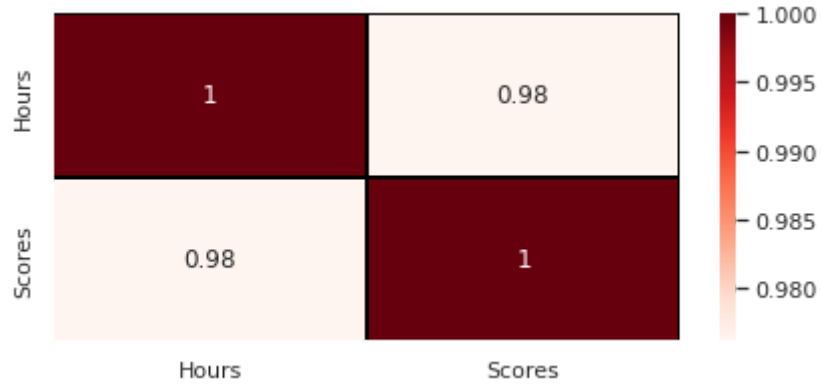
```
       count  25.000000  25.000000
       mean    5.012000  51.480000
       std     2.525094  25.286887
       min     1.100000  17.000000
       25%     2.700000  30.000000
       50%     4.800000  47.000000
       75%     7.400000  75.000000
       max     9.200000  95.000000
       shape of the data - (25, 2)
```

Correlation between Hours and Scores

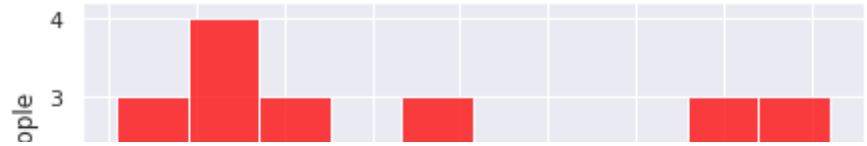
```
corr=df.corr()
corr
```

	Hours	Scores
Hours	1.000000	0.976191
Scores	0.976191	1.000000

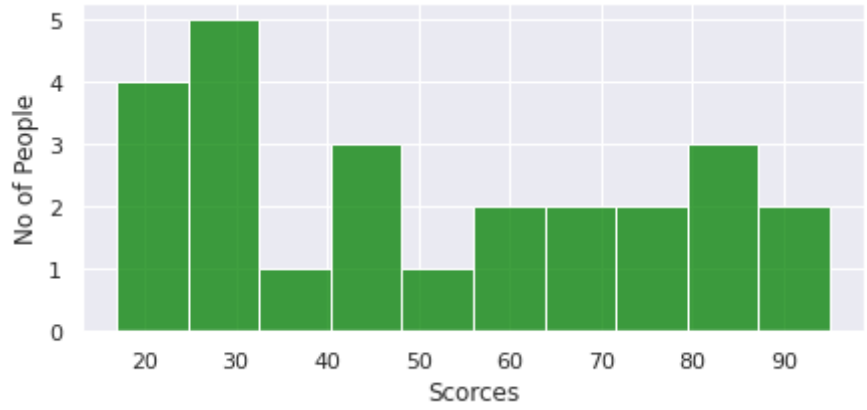
```
fig, ax = plt.subplots(figsize=(7,3))
sns.set(font_scale=1)
ax = sns.heatmap(corr, cmap = 'Reds',annot = True, linewidths=0.5, linecolor='black')
plt.show()
```




```
fig,ax= plt.subplots(figsize=(7,3))
sns.set(font_scale=1)
ax = sns.histplot(df['Hours'],bins=10,color=['red'])
ax.set_xlabel('Hours')
ax.set_ylabel('No of People')
plt.show()
```

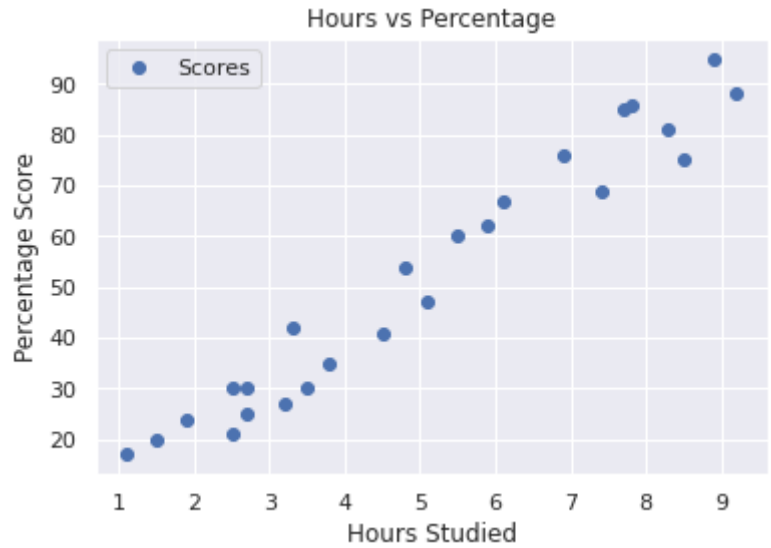



```
fig,ax= plt.subplots(figsize=(7,3))
sns.set(font_scale=1)
ax = sns.histplot(df['Scores'],bins=10,color=['Green'])
ax.set_xlabel('Scorces')
ax.set_ylabel('No of People')
plt.show()
```




```
# Plotting the distribution of scores

df.plot(x='Hours', y='Scores', style='o')
plt.title('Hours vs Percentage')
plt.xlabel('Hours Studied')
plt.ylabel('Percentage Score')
plt.show()
```



From above graph we can see that it shows positive linear relation betwn 2 parameters(hours & score)

Step No. 4

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

Step No. 5

Splitting the data into training and testing sets

```
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state = 0)
```

```
from sklearn.linear_model import LinearRegression
model = LinearRegression()
model.fit(X_train, y_train)

print("model training successfull")
```

```
model training successfull
```

```
accuracy = model.score(X_test, y_test)
print("Training Accuracy = ", accuracy)
```

```
Training Accuracy =  0.9454906892105354
```

Step No. 6

Best fit line of regression

```
line = model.coef_*X+model.intercept_

# Plotting for the test data
plt.scatter(X, y)
plt.title('Regression Plot',size = 20)
plt.ylabel('Percentage Score', size = 12)
plt.xlabel('Hours Studied', size = 12)
plt.plot(X, line,color='red');
plt.show()
```

Steps No. 7

Prediction

```
print("test data",X_test)
y_pred = model.predict(X_test)
```

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

Step No. 8

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

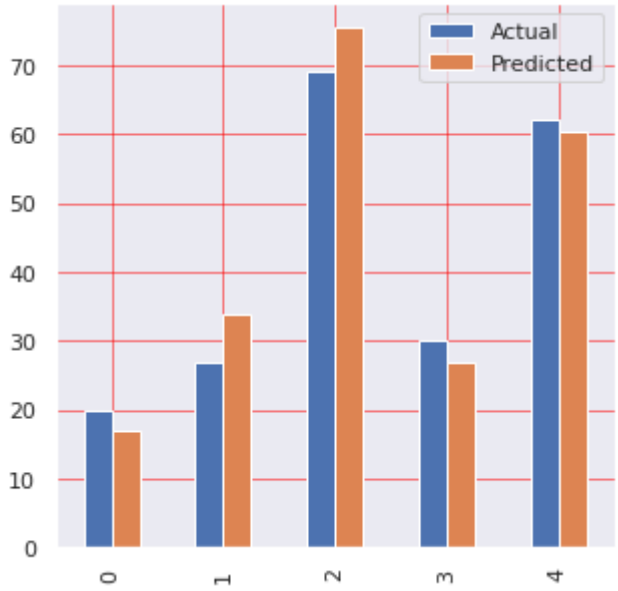
	Actual	Predicted
0	20	16.884145
1	27	33.732261
2	69	75.357018
3	30	26.794801
4	62	60.491033

```
print("Test Score =",model.score(X_test,y_test))
```

```
Test Score = 0.9454906892105354
```

Graphical View of actual v/s predicted

```
df.plot(kind='bar',figsize=(5,5))
plt.grid(which='major', linewidth='0.5', color='red')
plt.grid(which='minor', linewidth='0.5', color='blue')
plt.show()
```



Now testing model with our own data

```
hours = 9.25
test = np.array([hours])
test = test.reshape(-1, 1)
own = model.predict(test)
print("No of Hours = {}".format(hours))
print("Predicted Score = {}".format(own[0]))
```

```
No of Hours = 9.25
Predicted Score = 93.69173248737539
```

so here for 9.25 hrs study, student can score 93.69 according to our model.

Step No. 9

```
print('Mean Absolute Error:',metrics.mean_absolute_error(y_test, y_pred))
print('Mean Squared Error:', metrics.mean_squared_error(y_test, y_pred))
print('Root Mean Squared Error:', np.sqrt(metrics.mean_squared_error(y_test, y_pred)))
print('R-2:', metrics.r2_score(y_test, y_pred))
```

```
Mean Absolute Error: 4.183859899002982
Mean Squared Error: 21.598769307217456
Root Mean Squared Error: 4.647447612100373
R-2: 0.9454906892105354
```

R-2 gives the score of model fit and in this case we have R-2 = 0.9454906892105355 which is actually a great score for this model.

Conclusion :

Here I successfully completed Prediction using Supervised ML task and was able to evaluate the model's performance.

Thanks for watching ☺

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