Technical TASK 1 :- Prediction using Supervised ML (Level - Beginner)

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In this task, we will predict the percentage of marks that a student is expected to score based upon the number of hours they studied. This is a simple linear regression task as it involves just two variables.

In [ ]:
```
# Importing all libraries required in this notebook
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LinearRegression
import matplotlib.pyplot as plt
import pandas as pd
import numpy as np
```

Step 1 :- Reading Data from online source

In [ ]:
```
### Reading data from remote link
data = pd.read_csv('http://bit.ly/w-data')
data.head(15)
```

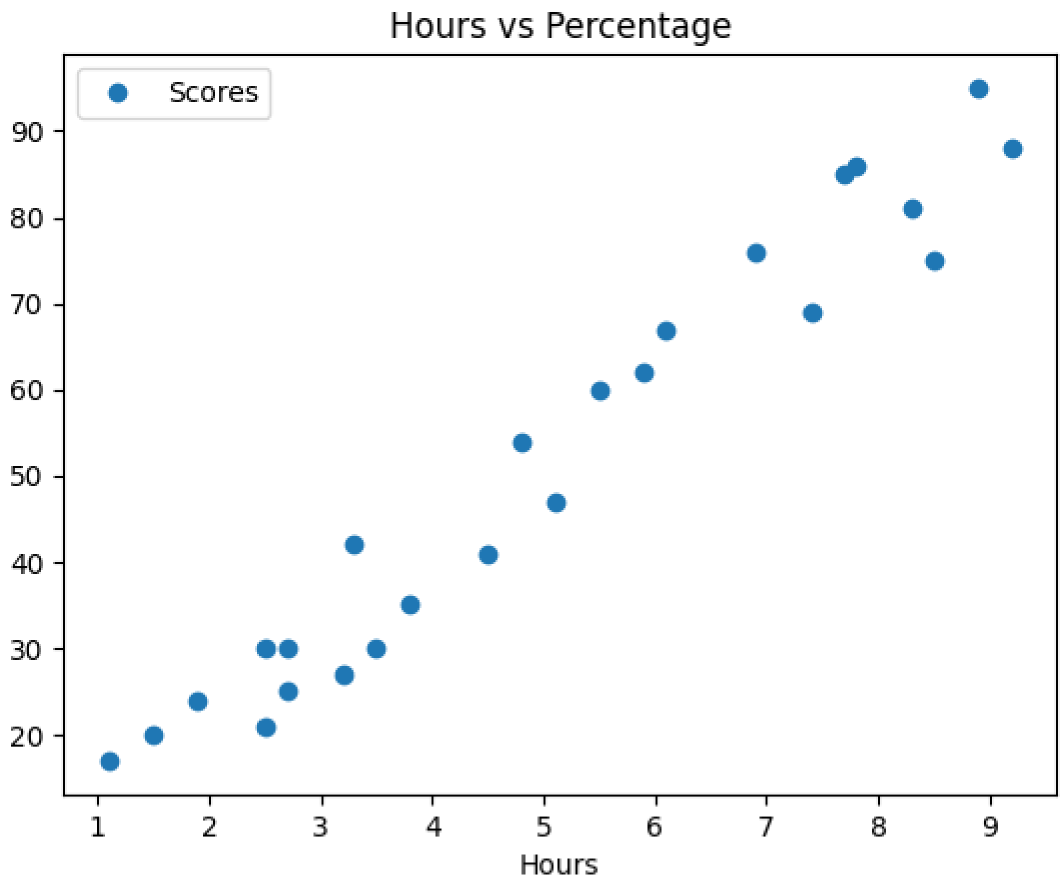
Out[ ]:

	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

Let's plot our data points on 2-D graph to eyeball our dataset and see if we can manually find any relationship between the data. We can create the plot with the following script.

Step 2 : Data Visualization

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



Step 3 :- Preparing The Data

The next step is to divide the data into "attributes" (inputs) and "labels" (outputs).

In [ ]:
```
x = data.iloc[:, :-1].values
y = data.iloc[:, 1].values
```

Step 4 :- Algorithm Training

Splitting the data into training data-set and test data-set. Then, start training the algorithm.

In [ ]:
```
x_train, x_test, y_train, y_test = train_test_split(x, y, test_size=0.2, random_state = 0)
regressor = LinearRegression()
regressor.fit(x_train.reshape(-1,1), y_train)
```

Out[ ]:
```
▾ LinearRegression
LinearRegression()
```

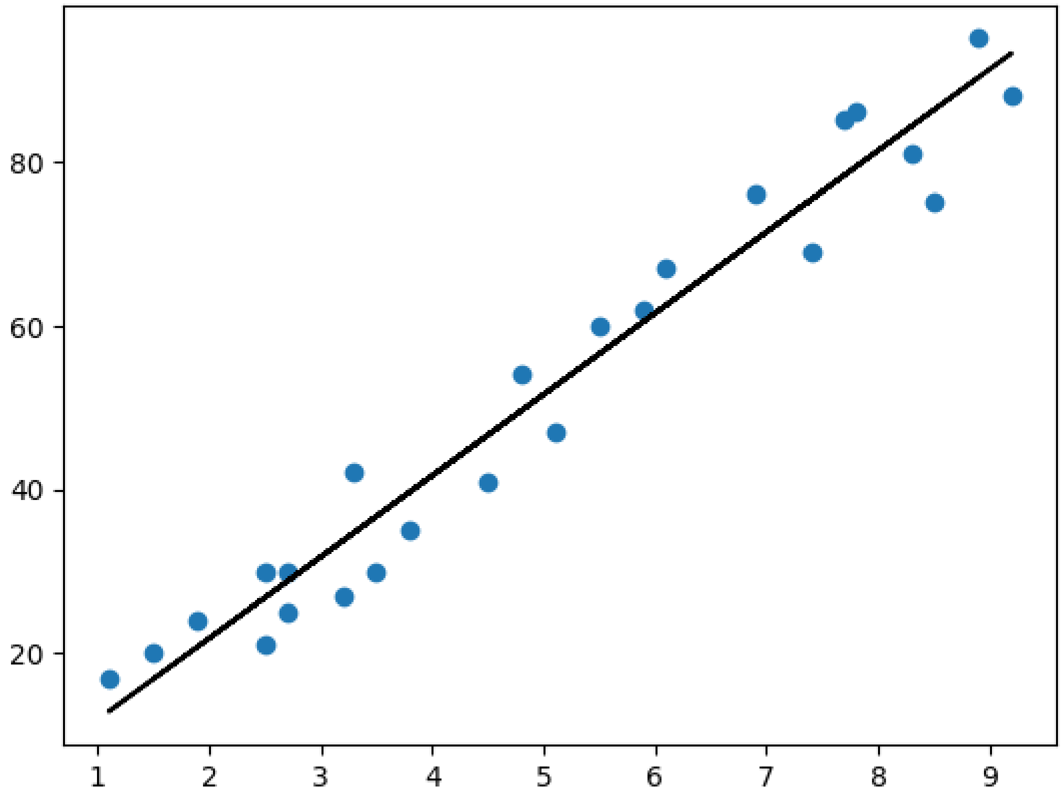
In [ ]:
```
print("Training Done!!")
```

```
Training Done!!
```

Step 5 :- Ploting the line of regression

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

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



Step 6 :- Making Predictions

Now that we have trained our algorithm, it's time to make some predictions.

In [ ]:
```
### Testing data - In Hours
print(x_test)

### Predicting the scores
y_pred = regressor.predict(x_test)
```

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

Step 7 :- Comparing Actual vs Predicted

In [ ]:
```
### Comparing Actual vs Predicted
data = pd.DataFrame({'Actual': y_test, 'Predicted': y_pred})
```

In [ ]:
```
data
```

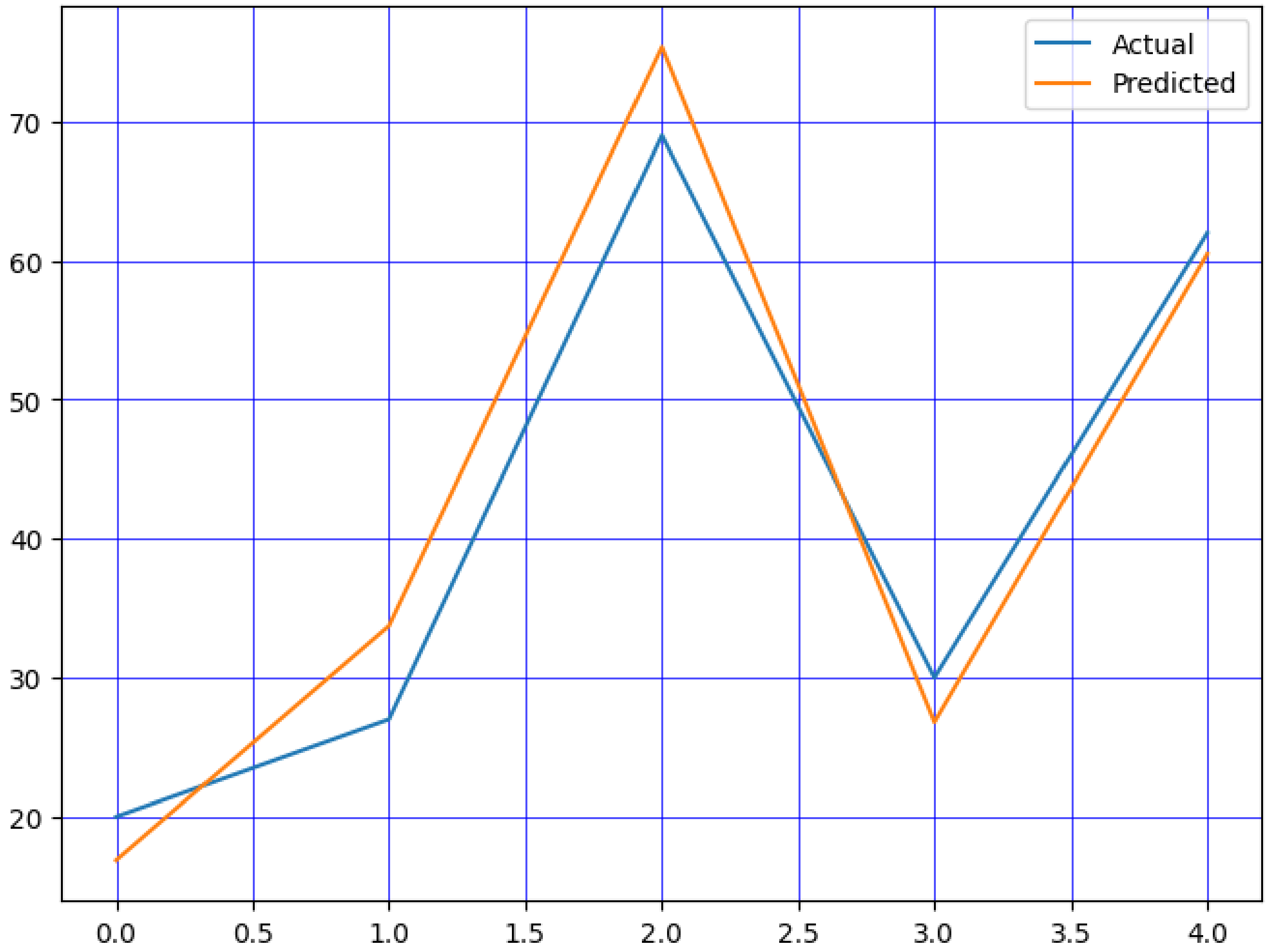
Out[ ]:

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

In [ ]:
```
### Estimating the Training Data and Test Data Score
print("Training score:", regressor.score(x_train, y_train))
print("Testing score:", regressor.score(x_test, y_test))
```

```
Training score: 0.9515510725211552
Testing score: 0.9454906892105355
```

In [ ]:
```
### Ploting the line graph to depict the diffrence between the actual and predicted value.
data.plot(kind='line', figsize=(8,6))
plt.grid(which='major', linewidth='0.5', color = 'black')
plt.grid(which='major', linewidth='0.5', color = 'blue')
plt.show()
```



In [ ]:
```
### Testing your own data.
hours = 9.25
test = np.array([hours])
test = test.reshape(-1,1)
own_pred = regressor.predict(test)
print ("No. of Hours = {}".format(hours))
print ("Predicted Score = {}".format(own_pred[0]))
```

```
No. of Hours = 9.25
Predicted Score = 93.69173248737535
```

Step 8 :- Evaluating the model

The final step is to evaluate the performance of algorithm. This step is particularly important to compare how well different algorithms perform on a particular dataset. For simplicity here, we have chosen the mean square error. There are many such metrics.

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

```
Mean Absolute Error: 4.183859899002975
Mean Squared Error: 21.598769307217406
Root mean squared Error: 4.647447612100367
```