STUDENT MARKS PREDICTION

To create a Machine Learning Model that predicts Student Marks using Scikit-learn, you'll need a dataset with features that could influence the students' marks, such as study hours,etc. You can use regression models to predict the marks since they are continuous values.

Here's a step-by-step guide to building a simple machine learning model using Scikit-learn:

First, you need to install/import Scikit-learn, Pandas, and Matplotlib (for data visualization).

In [105…

```
#importing the librarier
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
%matplotlib inline
```

Prepare/Load the Student Dataset

Assume you have a dataset where the independent variables (features) are study hours (X) etc., and the dependent variable (target) is the Student Exam Marks (Y).

In [4]:

```
_StudDF = pd.read_csv(r'D:\Python_Code\CSVData\Student_Marks_Info.csv')
_StudDF
```

Out[4]:

	study_hours	student_marks
0	6.83	78.50
1	6.56	76.74
2	NaN	78.68
3	5.67	71.82
4	8.67	84.19
...	...	...
195	7.53	81.67
196	8.56	84.68
197	8.94	86.75
198	6.60	78.05
199	8.35	83.50

200 rows × 2 columns

In [5]:

```
#displays the first 5 rows from the dataframe object
_StudDF.head()
```

Out[5]:

	study_hours	student_marks
0	6.83	78.50
1	6.56	76.74
2	NaN	78.68
3	5.67	71.82
4	8.67	84.19

In [6]:
```
#displays the last 5 rows from the dataframe object
_StudDF.tail()
```

Out[6]:

	study_hours	student_marks
195	7.53	81.67
196	8.56	84.68
197	8.94	86.75
198	6.60	78.05
199	8.35	83.50

In [7]:
```
print('The Student Data Set consists of',_StudDF.shape[0],'rows and',_StudDF.shape[1],'columns.')
```

```
The Student Data Set consists of 200 rows and 2 columns.
```

In [8]:
```
_StudDF.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 200 entries, 0 to 199
Data columns (total 2 columns):
 #   Column         Non-Null Count  Dtype  
---  ------         --------------  -----  
 0   study_hours    195 non-null    float64
 1   student_marks  200 non-null    float64
dtypes: float64(2)
memory usage: 3.3 KB
```

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

Out[9]:
```
study_hours      5
student_marks    0
dtype: int64
```

In [10]:
```
_StudDF.describe()
```

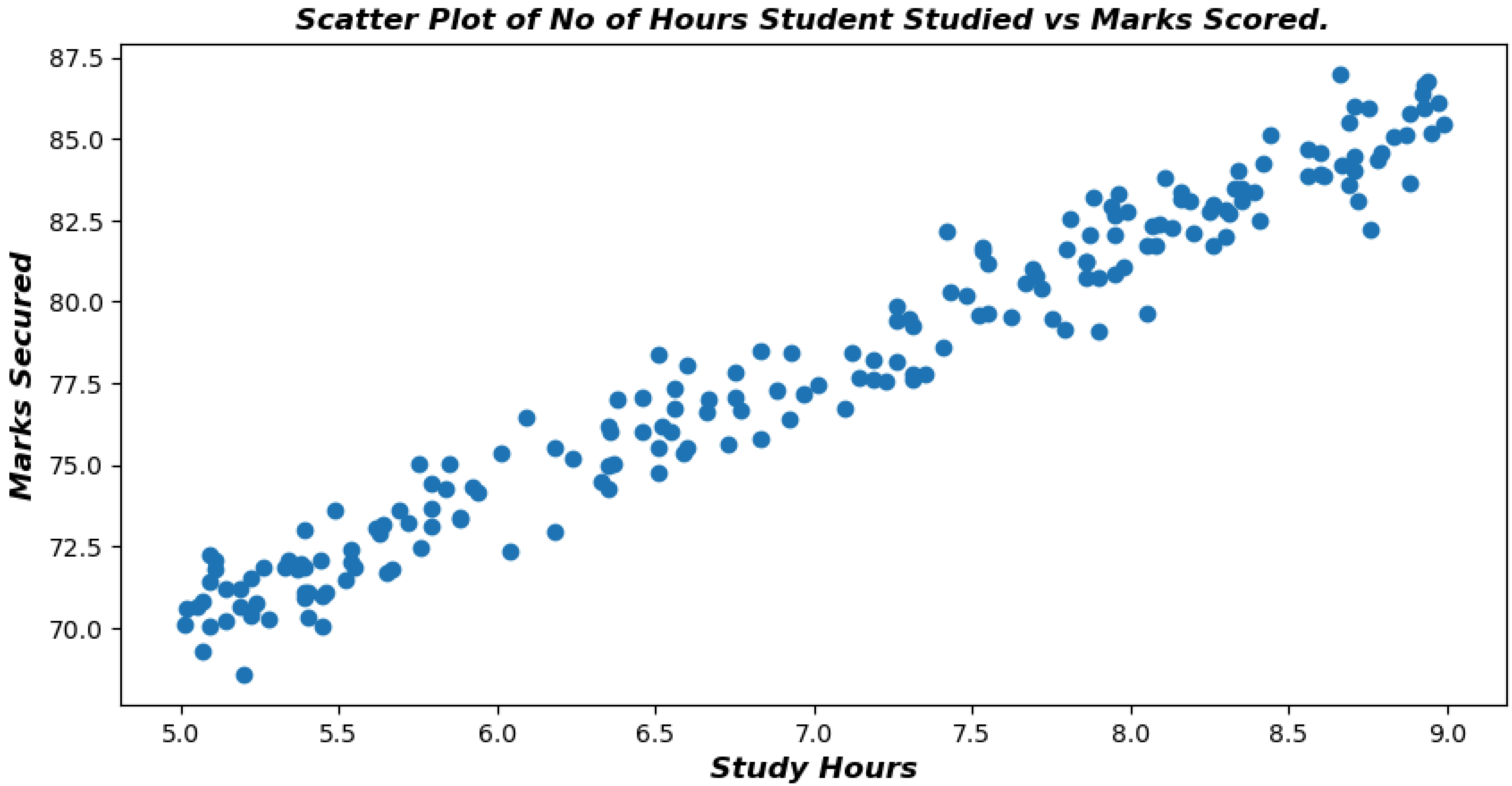
Out[10]:

	study_hours	student_marks
count	195.000000	200.00000
mean	6.995949	77.93375
std	1.253060	4.92570
min	5.010000	68.57000
25%	5.775000	73.38500
50%	7.120000	77.71000
75%	8.085000	82.32000
max	8.990000	86.99000

Visualize the Dataset through plots

In [12]:

```
plt.figure().set_figwidth(10)
plt.scatter(x=_StudDF['study_hours'],y=_StudDF['student_marks'])
plt.xlabel('Study Hours',fontsize='large',fontweight='bold', style='italic', loc='center')
plt.ylabel('Marks Secured',fontsize='large',fontweight='bold', style='italic', loc='center')
plt.title('Scatter Plot of No of Hours Student Studied vs Marks Scored.',fontsize='large',fontweight='bold', style='italic', l
plt.show()
```



Data Cleaning

In [14]:
```
_StudDF.isna().sum()
```

Out[14]:
```
study_hours      5
student_marks    0
dtype: int64
```

Insight: study_hours column has 5 null values hence replace the null values using mean.

In [16]:
```
_StudDF.describe()
```

Out[16]:

	study_hours	student_marks
count	195.000000	200.00000
mean	6.995949	77.93375
std	1.253060	4.92570
min	5.010000	68.57000
25%	5.775000	73.38500
50%	7.120000	77.71000
75%	8.085000	82.32000
max	8.990000	86.99000

In [17]:
```
_StudDF['study_hours'].mean()
```

Out[17]:
```
6.9959487179487185
```

In [18]:
```
_StudDF.isna().sum()
```

Out[18]:
```
study_hours      5
student_marks    0
dtype: int64
```

In [35]:
```
St_Hrs_Mean = _StudDF['study_hours'].mean()
_StudDF = _StudDF.fillna({'study_hours': St_Hrs_Mean})
```

In [43]:
```
_StudDF.isna().sum()
```

Out[43]:
```
study_hours      0
student_marks    0
dtype: int64
```

In [41]:
```
_StudDF.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 200 entries, 0 to 199
Data columns (total 2 columns):
 #   Column         Non-Null Count  Dtype  
---  ------         --------------  -----  
 0   study_hours    200 non-null    float64
 1   student_marks  200 non-null    float64
dtypes: float64(2)
memory usage: 3.3 KB
```

Split the Clean Data into Training and Testing sets

Scikit-learn provides a train_test_split function that splits the data into training and test sets.

This is important for evaluating the model's performance.

In [89]:
```
X = _StudDF.drop("student_marks", axis = "columns")
y = _StudDF.drop("study_hours", axis = "columns")
print("shape of X = ", X.shape)
print("shape of y = ", y.shape)
```

```
shape of X =  (200, 1)
shape of y =  (200, 1)
```

In [91]:
```
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)
```

In [93]:
```
print("shape of X_train = ", X_train.shape)
print("shape of y_train = ", y_train.shape)
print("shape of X_test = ", X_test.shape)
print("shape of y_test = ", y_test.shape)
```

```
shape of X_train =  (160, 1)
shape of y_train =  (160, 1)
shape of X_test =  (40, 1)
shape of y_test =  (40, 1)
```

In [95]:
```
from sklearn.linear_model import LinearRegression
model = LinearRegression()
```

In [97]:
```
model.fit(X_train,y_train)
```

Out[97]:
```
▾ LinearRegression
LinearRegression()
```

In [99]:
```
model.coef_
```

Out[99]:
```
array([[3.93037294]])
```

In [103…
```
model.intercept_ #c
```

Out[103…
```
array([50.45063632])
```

In [107…
```
m = np.round(model.coef_,2)
c = np.round(model.intercept_,2)
y  = m * 11 + c
y
```

Out[107…
```
array([[93.68]])
```

In [116…
```
np.round(model.predict([[11]]),2)
```

```
C:\Users\manik\anaconda3\Lib\site-packages\sklearn\base.py:493: UserWarning: X does not have valid feature names, but LinearReg
ression was fitted with feature names
  warnings.warn(
```

Out[116…
```
array([[93.68]])
```

Once the model is trained, you can evaluate it using the test data and calculate the accuracy or performance metrics like Mean Squared Error (MSE).

In [129…
```
from sklearn.metrics import mean_squared_error, r2_score
```

```
# Predict the target variable (marks) for the test set
y_pred = model.predict(X_test)

# Calculate performance metrics
mse = mean_squared_error(y_test, y_pred)
r2 = r2_score(y_test, y_pred)

print(f"Mean Squared Error: {np.round(mse,2)}")
print(f"R-squared: {np.round(r2,2)}")
```

```
Mean Squared Error: 1.04
R-squared: 0.95
```

In [118…

```
y_pred  = model.predict(X_test)
y_pred
```

Out[118…

```
array([[83.50507271],
       [70.84927186],
       [72.93236952],
       [85.35234799],
       [73.20749562],
       [84.48766595],
       [80.12495199],
       [81.85431608],
       [80.91102657],
       [82.20804964],
       [78.98514384],
       [84.84139951],
       [77.84533568],
       [77.68812077],
       [83.22994661],
       [85.78468901],
       [84.9593107 ],
       [72.61793968],
       [78.71001773],
       [79.18166248],
       [84.2911473 ],
       [85.6274741 ],
       [74.74034107],
       [81.3433676 ],
       [72.02838374],
       [80.40007809],
       [78.98514384],
       [82.09013845],
       [77.94732382],
       [82.24735337],
       [75.44780819],
       [84.60557713],
       [71.63534645],
       [75.48711192],
       [70.29901965],
       [78.98514384],
       [75.32989701],
       [84.52696967],
       [74.07217767],
       [71.4388278 ]])
```

In [120…

```
pd.DataFrame(np.c_[X_test, y_test, y_pred], columns = ["study_hours", "student_marks_original","student_marks_predicted"])
```

Out[120…

	study_hours	student_marks_original	student_marks_predicted
0	8.410000	82.50	83.505073
1	5.190000	71.18	70.849272
2	5.720000	73.25	72.932370
3	8.880000	83.64	85.352348
4	5.790000	73.64	73.207496
5	8.660000	86.99	84.487666
6	7.550000	81.18	80.124952
7	7.990000	82.75	81.854316
8	7.750000	79.50	80.911027
9	8.080000	81.70	82.208050
10	7.260000	79.41	78.985144
11	8.750000	85.95	84.841400
12	6.970000	77.19	77.845336
13	6.930000	78.45	77.688121
14	8.340000	84.00	83.229947
15	8.990000	85.46	85.784689
16	8.780000	84.35	84.959311
17	5.640000	73.19	72.617940
18	7.190000	78.21	78.710018
19	7.310000	77.59	79.181662
20	8.610000	83.87	84.291147
21	8.950000	85.15	85.627474

	study_hours	student_marks_original	student_marks_predicted
22	6.180000	72.96	74.740341
23	7.860000	80.72	81.343368
24	5.490000	73.61	72.028384
25	7.620000	79.53	80.400078
26	7.260000	78.17	78.985144
27	8.050000	79.63	82.090138
28	6.995949	76.83	77.947324
29	8.090000	82.38	82.247353
30	6.360000	76.04	75.447808
31	8.690000	85.48	84.605577
32	5.390000	71.87	71.635346
33	6.370000	75.04	75.487112
34	5.050000	70.67	70.299020
35	7.260000	79.87	78.985144
36	6.330000	74.49	75.329897
37	8.670000	84.19	84.526970
38	6.010000	75.36	74.072178
39	5.340000	72.10	71.438828

Fine-tune your model

In [132…
```
model
```

Out[132…

```
▾ LinearRegression
LinearRegression()
```

In [134…

```
model.score(X_test,y_test)
```

Out[134…

```
0.9521841793508594
```

In [136…

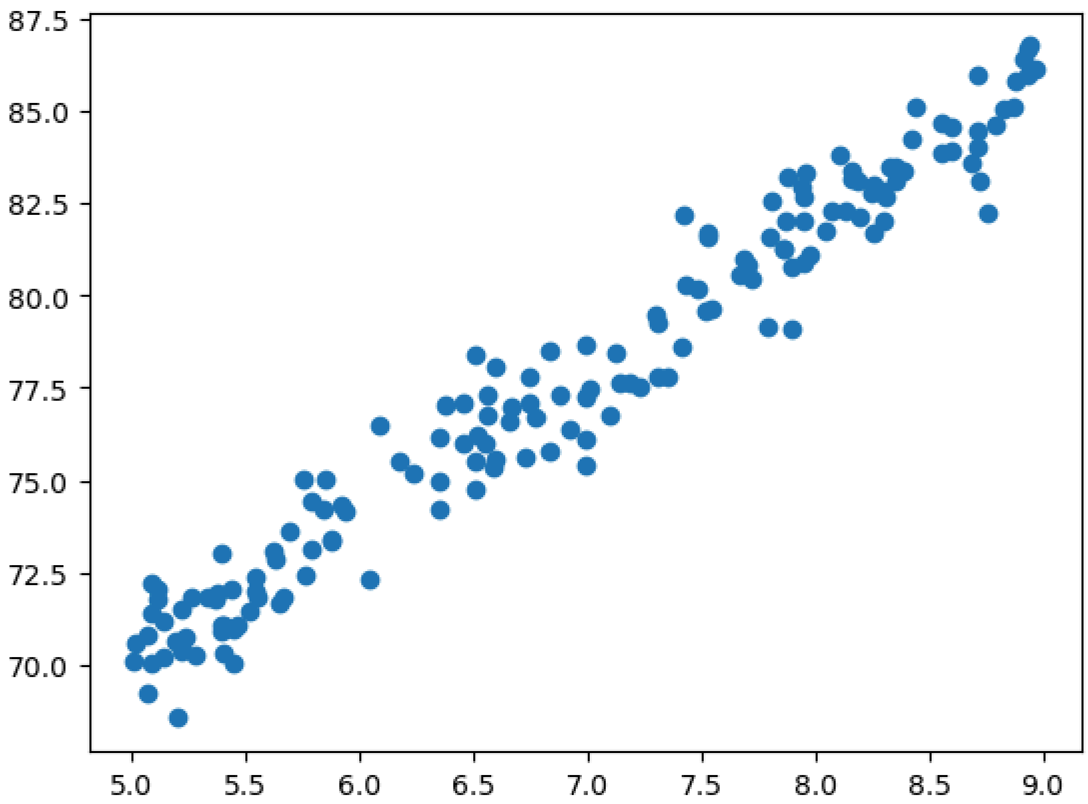
```
model.score(X_train,y_train)
```

Out[136…

```
0.9584528455152638
```

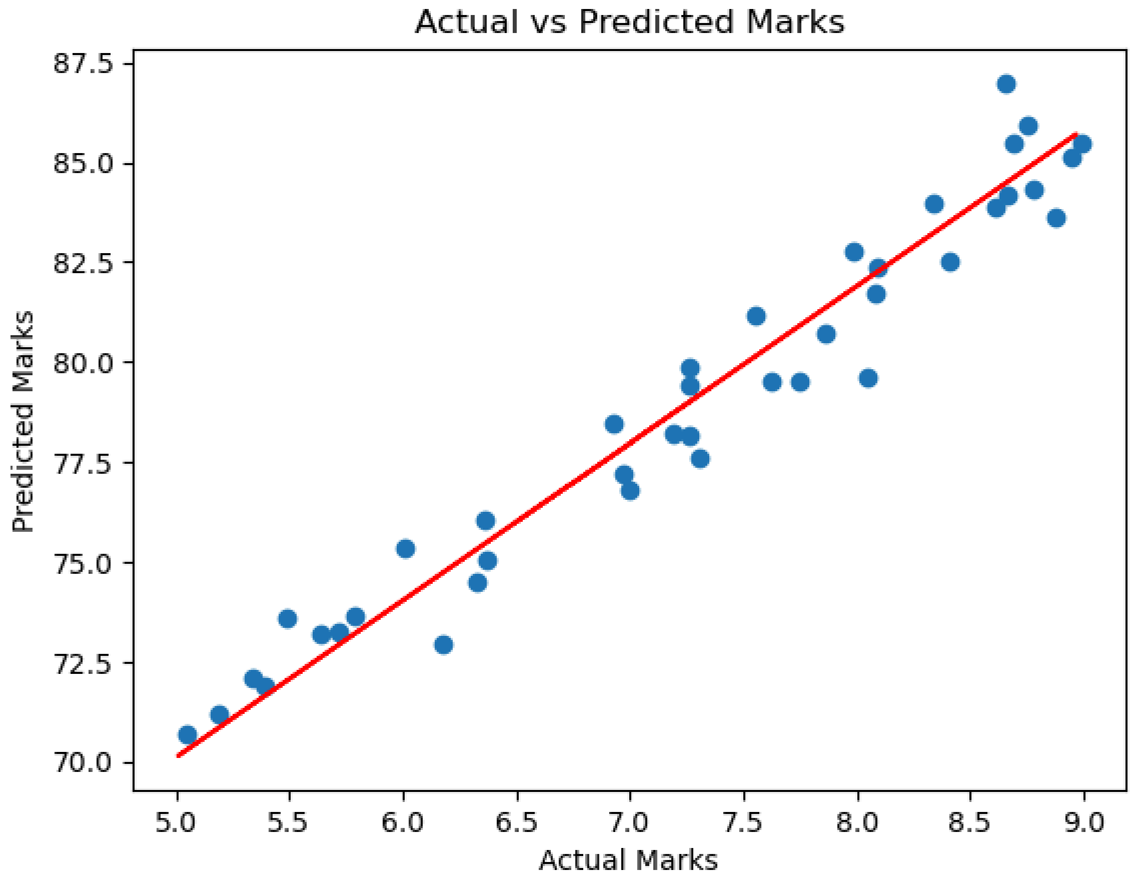
In [138…

```
plt.scatter(X_train,y_train)
plt.show()
```



In [144…

```
plt.scatter(X_test, y_test)
plt.plot(X_train, model.predict(X_train), color = "r")
plt.xlabel("Actual Marks")
plt.ylabel("Predicted Marks")
plt.title("Actual vs Predicted Marks")
plt.show()
```



Save the Predicted Model by creating a Pickel file using Joblib library and saving the pickel file in a directory.

In [149…

```
import joblib # create pipeline
```

In [151…

```
joblib.dump(model, r"D:\Python_Code\Student_Marks_Prediction\PredictMarks.pkl")
```

Out[151…

```
['D:\\Python_Code\\Student_Marks_Prediction\\PredictMarks.pkl']
```

Call the pickel file and evaluate the Marks by passing No of hrs studied.

In [160…
```
modelMarksPredict = joblib.load(r"D:\Python_Code\Student_Marks_Prediction\PredictMarks.pkl")
```

In [166…
```
modelMarksPredict.predict([[8.41]])
```

```
C:\Users\manik\anaconda3\Lib\site-packages\sklearn\base.py:493: UserWarning: X does not have valid feature names, but LinearReg
ression was fitted with feature names
  warnings.warn(
```

Out[166…
```
array([[83.50507271]])
```

In [ ]:
```
```