Importing libraries

In [1]:

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import warnings
warnings.filterwarnings("ignore")
```

Importing Dataset

In [2]:

```
df=pd.read_csv(r'C:\Users\Asus\Downloads\student_info.csv')
```

In [3]:

```
df
```

Out[3]:

	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 [4]:

```
df.head()
```

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

In [5]:

```
df.shape
```

Out[5]:

```
(200, 2)
```

In [6]:

```
df.describe()
```

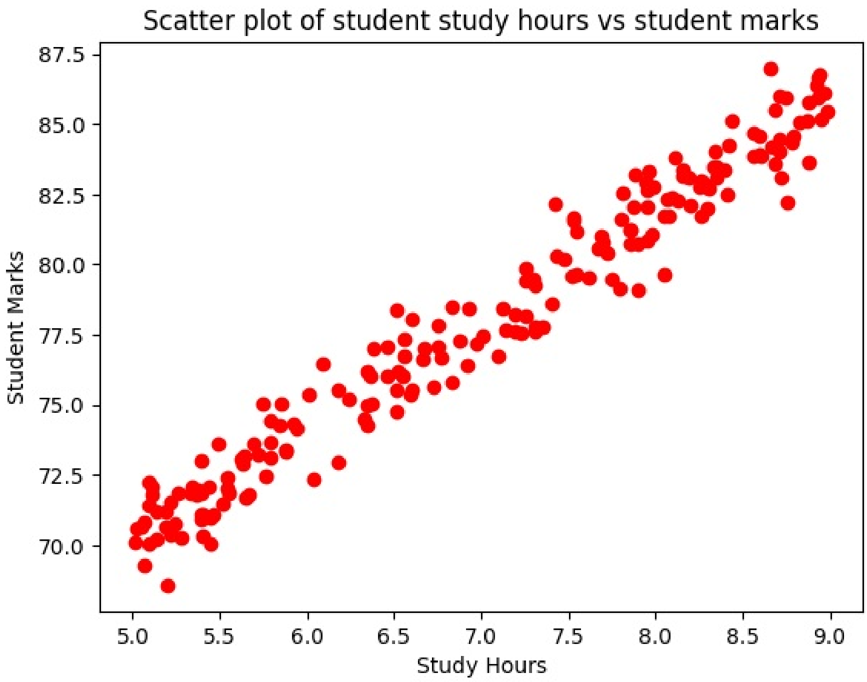
Out[6]:

	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 Data

In [7]:

```
plt.scatter(x=df.study_hours,y=df.student_marks,color='red')
plt.title('Scatter plot of student study hours vs student marks' )
plt.xlabel('Study Hours')
plt.ylabel('Student Marks')
plt.show()
```



Check missing values

In [8]:

```
df.isna().any()
```

Out[8]:

```
study_hours       True
student_marks    False
dtype: bool
```

In [9]:

```
df.isnull().sum()
```

Out[9]:

```
study_hours      5
student_marks    0
dtype: int64
```

Insight

There are 5 missing values in study_hours in dataset.

In [10]:

```
df.mean()
```

Out[10]:

```
study_hours       6.995949
student_marks    77.933750
dtype: float64
```

In [11]:

```
df2 = df.fillna(df.mean())
```

In [12]:

```
df2.head()
```

Out[12]:

	study_hours	student_marks
0	6.830000	78.50
1	6.560000	76.74
2	6.995949	78.68
3	5.670000	71.82
4	8.670000	84.19

In [13]:

```
df2.isnull().sum()
```

Out[13]:

```
study_hours      0
student_marks    0
dtype: int64
```

Insight

Now there is no missing values present in dataset.

Split the dataset(Dependant and Independant)

In [14]:

```
x=df2.drop('student_marks',axis=1)
y=df2.drop('study_hours',axis=1)
print('Shape of x =', x.shape)
print('shape of y =',y.shape)
```

```
Shape of x = (200, 1)
shape of y = (200, 1)
```

Split the dataset into train and test

In [15]:

```
from sklearn.model_selection import train_test_split
X_train,X_test,y_train,y_test=train_test_split(x,y,test_size=0.20,random_state=0)
print('Shape of X_train =',X_train.shape)
print('Shape of X_test =',X_test.shape)
print('Shape of y_train =',y_train.shape)
print('Shape of y_test =',y_test.shape)
```

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

In [16]:

```
from sklearn.linear_model import LinearRegression
from sklearn.tree import DecisionTreeRegressor
from sklearn.ensemble import RandomForestRegressor
from sklearn.svm import SVR
from sklearn.neighbors import KNeighborsRegressor
from xgboost import XGBRegressor
from sklearn.metrics import mean_absolute_error,mean_squared_error,r2_score
```

In [17]:

```
regressors = {
    'Linear Regression' : LinearRegression(),
    'Decision Tree' : DecisionTreeRegressor(),
    'Random Forest' : RandomForestRegressor(),
    'Support Vector Machines' : SVR(gamma=1),
    'K-nearest Neighbors' : KNeighborsRegressor(n_neighbors=1),
    'XGBoost' : XGBRegressor()

}
results=pd.DataFrame(columns=['MAE','MSE','R2-score'])
for method,func in regressors.items():
    model = func.fit(X_train,y_train)


    pred = model.predict(X_test)
    results.loc[method]= [np.round(mean_absolute_error(y_test,pred),3),
                          np.round(mean_squared_error(y_test,pred),3),
                          np.round(r2_score(y_test,pred),3)
                         ]
```

In [18]:

```
results.sort_values('R2-score',ascending=False).style.background_gradient(cmap='plasma_r',subset=['R2-score'])
```

Out[18]:

	MAE	MSE	R2-score
Linear Regression	0.857000	1.044000	0.952000
Support Vector Machines	0.865000	1.161000	0.947000
Random Forest	1.096000	1.884000	0.914000
XGBoost	1.059000	1.869000	0.914000
Decision Tree	1.241000	2.452000	0.888000
K-nearest Neighbors	1.305000	2.584000	0.882000

Insight

From above result table we can see that Linear Regression model shows best performance on our dataset.

Lets train the model and checking predection

In [19]:

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

In [20]:

```
lr.fit(X_train,y_train)
```

Out[20]:

```
▾ LinearRegression
LinearRegression()
```

In [21]:

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

Out[21]:

```
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 [22]:

```
lr.coef_
```

Out[22]:

```
array([[3.93037294]])
```

```
In [23]: lr.intercept_
```

```
Out[23]: array([50.45063632])
```

Lets check model prediction

```
In [24]: lr.predict([[4]])[0][0].round(2)
```

```
Out[24]: 66.17
```

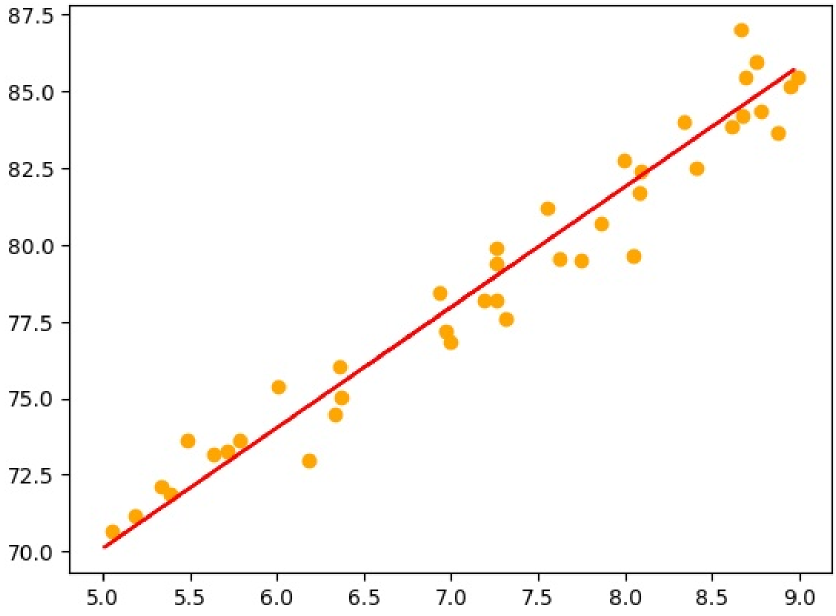
```
In [25]: pd.DataFrame(np.c_[X_test, y_test, y_pred], columns = ["study_hours",
         "student_marks_original","student_marks_predicted"])
```

Out[25]:

	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
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

```
In [26]: plt.scatter(X_test, y_test,color='orange')
         plt.plot(X_train, lr.predict(X_train), color = "r")
```

Out[26]:
```
[<matplotlib.lines.Line2D at 0x122d4a778e0>]
```



Save ML model

In [27]:
```python
import joblib
import os
joblib.dump(lr, "student_mark_predictor123.pkl")
```

Out[27]:
```
['student_mark_predictor123.pkl']
```

In [28]:
```python
# Load the saved model from the file
loaded_model = joblib.load("student_mark_predictor123.pkl")
```

In [29]:
```python
loaded_model.predict([[8]])[0][0]
```

Out[29]:
```
81.8936198079513
```

Now we Deploy the model

In [ ]:
```python
import numpy as np
import pandas as pd
from flask import Flask,render_template,request
import joblib
app=Flask(__name__)
model=joblib.load(r'C:\Users\Asus\Desktop\Data science Imp\sep\Student Mark Predictor Project Deployment\Student mark Predictor Deployment\student_mark_predictor123.pkl')



df = pd.DataFrame()

@app.route('/')
def home():
    return render_template('index.html')

@app.route('/predict',methods=['POST'])
def predict():
    global df

    input_features = [int(x) for x in request.form.values()]
    features_value = np.array(input_features)

    #validate input hours
    if input_features[0] <0 or input_features[0] >24:
        return render_template('index.html', prediction_text='Please enter valid hours between 1 to 24 if you live on the Earth')


    output = model.predict([features_value])[0][0].round(2)

    # input and predicted value store in df then save in csv file
    df= pd.concat([df,pd.DataFrame({'Study Hours':input_features,'Predicted Output':[output]})],ignore_index=True)
    print(df)
    df.to_csv('smp_data_from_app.csv')

    return render_template('index.html', prediction_text='You will get [{}%] marks, when you do study [{}] hours per day '.format(output, int(features_value[0])))




if __name__ == "__main__":
    app.run(host='127.0.0.1', port=5000)
```

```
 * Serving Flask app '__main__'
 * Debug mode: off
WARNING: This is a development server. Do not use it in a production deployment. Use a production WSGI server instead.
 * Running on http://127.0.0.1:5000
Press CTRL+C to quit
127.0.0.1 - - [04/Nov/2023 18:09:24] "GET / HTTP/1.1" 200 -
127.0.0.1 - - [04/Nov/2023 18:09:24] "GET /static/images/1.jpg HTTP/1.1" 304 -
D:\Users\User\Downloads\jup_pyth\lib\site-packages\sklearn\base.py:465: UserWarning: X does not have valid feature names, but LinearRegression was fitted with feature names
  warnings.warn(
127.0.0.1 - - [04/Nov/2023 18:09:27] "POST /predict HTTP/1.1" 200 -
127.0.0.1 - - [04/Nov/2023 18:09:27] "GET /static/images/1.jpg HTTP/1.1" 304 -
   Study Hours  Predicted Output
0            6             74.03
```

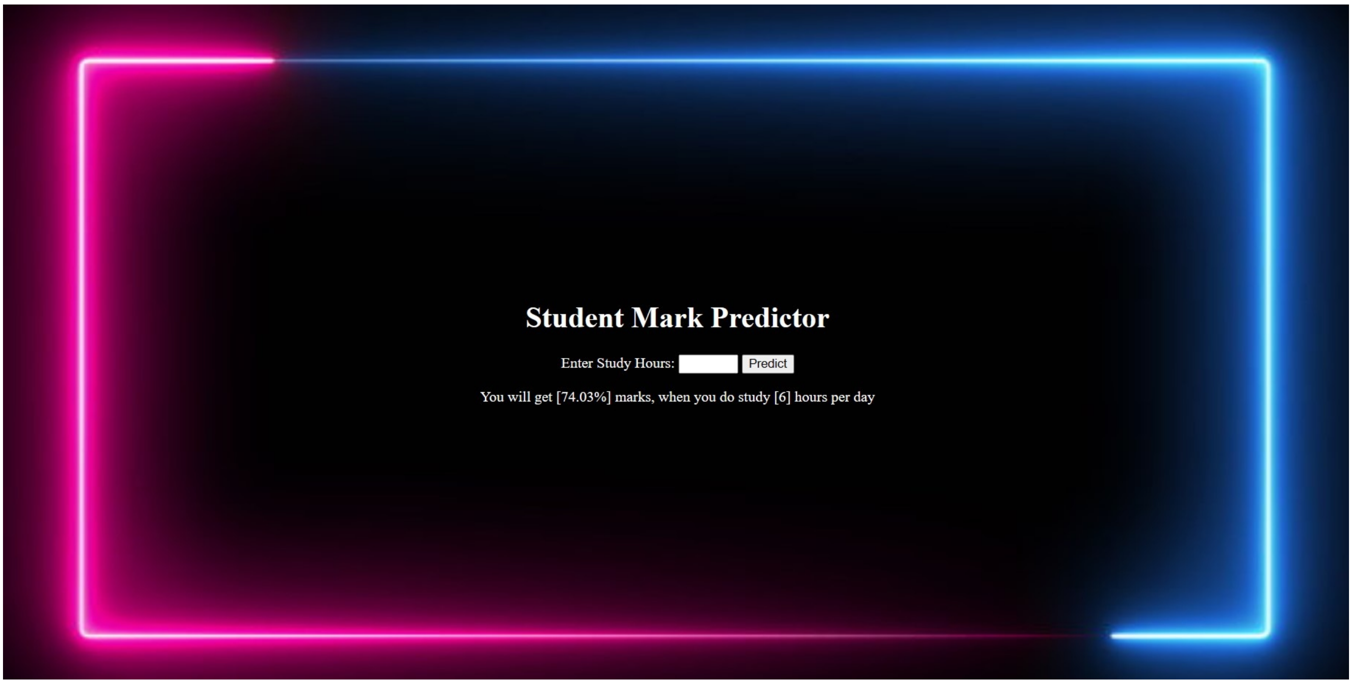
In [2]:

```
from IPython.display import Image

# Specify the path to the image file
image_path = r'C:\Users\Asus\Pictures\Saved Pictures\Screenshot 2023-11-04 180952.jpg'

# Display the image
Image(filename=image_path)
```

Out[2]:



Student Mark Predictor

You will get [74.03%] marks, when you do study [6] hours per day

Insight

We deploy our model on web application local host and our model predicting student marks on student study hours.

Conclusion

•Throughout this project, I gained valuable experience in conducting Exploratory Data Analysis (EDA) using Pandas and various data visualization libraries.

•I utilized libraries like Matplotlib, Plotly, and Seaborn to gain deeper insights into the dataset, visualizing trends, patterns, and relationships.

•The importance of data preprocessing became evident as it allowed us to handle missing values and data irregularities effectively. Additionally, I learned how to create new features, enhancing the predictive power of the models.

•Analysis of the dataset provided insights into which machine learning model would perform best, considering factors such as low residual and RMSE scores.

•The project emphasized the importance of a structured approach to model selection and evaluation. It highlighted the significance of starting with a suitable model and progressively refining it for improved accuracy.

•The deployment phase of the project was a valuable learning experience. Deploying the predictive model through a web interface using Flask allowed users to make predictions conveniently.

•This project has equipped me with valuable skills and knowledge in data analysis, feature engineering, model selection, and evaluation. It emphasized the importance of a structured approach to data science projects, including model deployment, and the value of selecting and optimizing models based on their performance and suitability for the task at hand. These learnings will undoubtedly benefit me in future data science endeavors, both in analysis and deployment scenarios.

In [ ]: