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1. Introduction

This report outlines the steps taken in the Jupyter Notebook for data analysis and modeling using a stock price dataset. The analysis includes data loading, exploration, preprocessing, and the application of machine learning models to predict sentiment scores based on stock market data.

Problem Statement:

Stock price prediction and analysis require clean data to ensure accuracy. Issues like missing values, duplicate entries, and outliers must be handled before performing any analysis or modeling.

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2. Importing Libraries

Libraries Used:

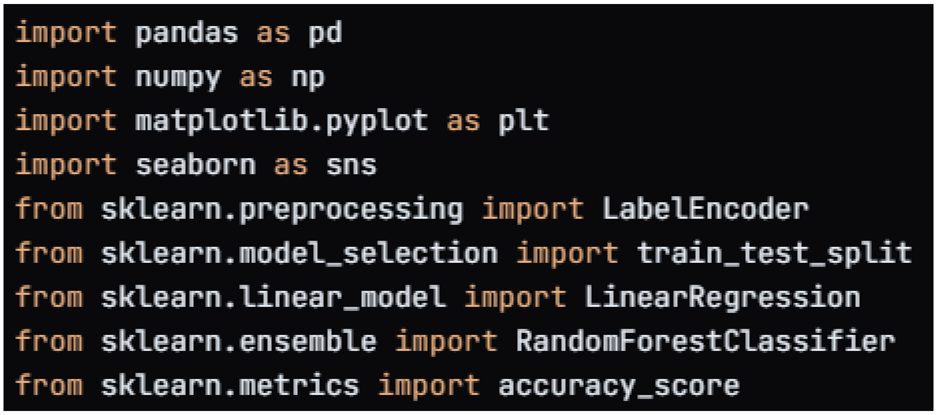
pandas: For data manipulation and analysis.

numpy: For numerical operations.

matplotlib.pyplot: For data visualization.

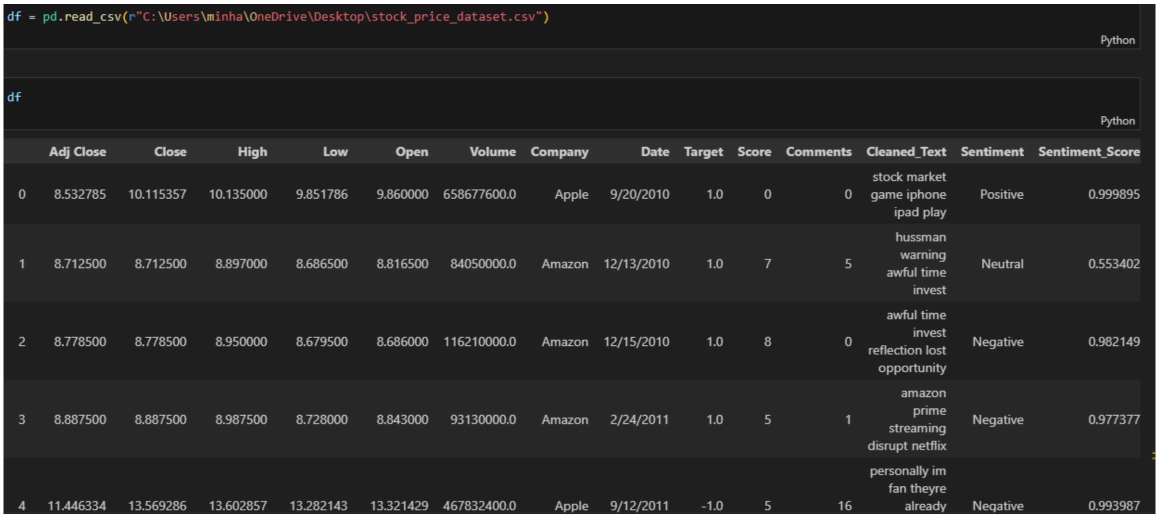
seaborn: For statistical data visualization.

sklearn: For machine learning tasks including preprocessing, model selection, and evaluation.



```python
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.preprocessing import LabelEncoder
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LinearRegression
from sklearn.ensemble import RandomForestClassifier
from sklearn.metrics import accuracy_score
```

2.1 Loading the Dataset:



```python
df = pd.read_csv(r"C:\Users\minha\OneDrive\Desktop\stock_price_dataset.csv")
```

```python
df
```

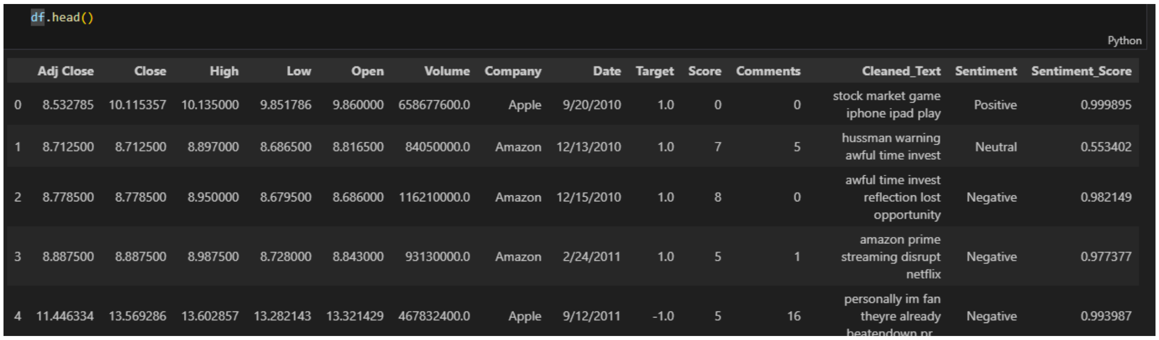
	Adj Close	Close	High	Low	Open	Volume	Company	Date	Target	Score	Comments	Cleaned_Text	Sentiment	Sentiment_Score
0	8.532785	10.115357	10.135000	9.851786	9.860000	658677600.0	Apple	9/20/2010	1.0	0	0	stock market game iphone ipad play	Positive	0.999895
1	8.712500	8.712500	8.897000	8.686500	8.816500	84050000.0	Amazon	12/13/2010	1.0	7	5	hussman warning awful time invest	Neutral	0.553402
2	8.778500	8.778500	8.950000	8.679500	8.686000	116210000.0	Amazon	12/15/2010	1.0	8	0	awful time invest reflection lost opportunity	Negative	0.982149
3	8.887500	8.887500	8.987500	8.728000	8.843000	93130000.0	Amazon	2/24/2011	1.0	5	1	amazon prime streaming disrupt netflix	Negative	0.977377
4	11.446334	13.569286	13.602857	13.282143	13.321429	467832400.0	Apple	9/12/2011	-1.0	5	16	personally im fan theyre already	Negative	0.993987

2.2 Exploring the Data:

Objective : To gain an initial understanding of the dataset's Structure and contents.

Key Features:

Adj Close, Close, High, Low, Open, Volume, Company, Date, Target, Score, Comments, Cleaned_Text, Sentiment, Sentiment_Score.



```python
df.head()
```

Python

	Adj Close	Close	High	Low	Open	Volume	Company	Date	Target	Score	Comments	Cleaned_Text	Sentiment	Sentiment_Score
0	8.532785	10.115357	10.135000	9.851786	9.860000	658677600.0	Apple	9/20/2010	1.0	0	0	stock market game iphone ipad play	Positive	0.999895
1	8.712500	8.712500	8.897000	8.686500	8.816500	84050000.0	Amazon	12/13/2010	1.0	7	5	hussman warning awful time invest	Neutral	0.553402
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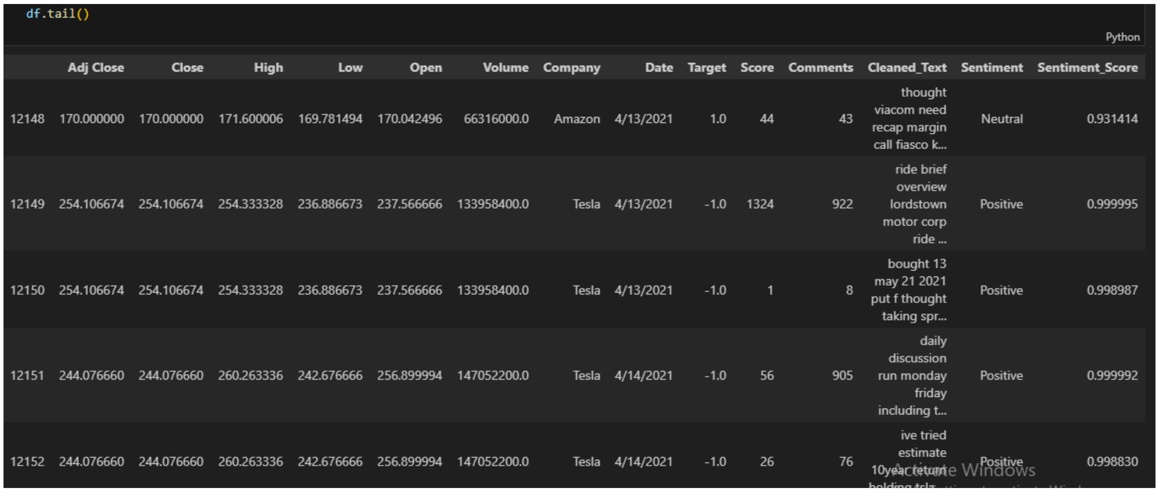
4	11.446334	13.569286	13.602857	13.282143	13.321429	467832400.0	Apple	9/12/2011	-1.0	5	16	personally im fan theyre already beatendown pr	Negative	0.993987

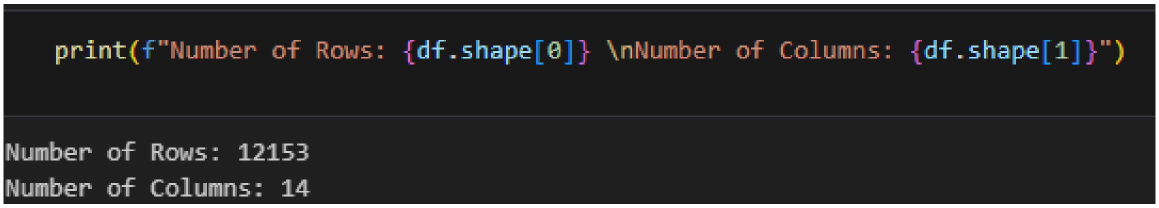


```python
df.tail()
```

Python

	Adj Close	Close	High	Low	Open	Volume	Company	Date	Target	Score	Comments	Cleaned_Text	Sentiment	Sentiment_Score
12148	170.000000	170.000000	171.600006	169.781494	170.042496	66316000.0	Amazon	4/13/2021	1.0	44	43	thought viacom need recap margin call fiasco k...	Neutral	0.931414
12149	254.106674	254.106674	254.333328	236.886673	237.566666	133958400.0	Tesla	4/13/2021	-1.0	1324	922	ride brief overview lordstown motor corp ride ...	Positive	0.999995
12150	254.106674	254.106674	254.333328	236.886673	237.566666	133958400.0	Tesla	4/13/2021	-1.0	1	8	bought 13 may 21 2021 put f thought taking spr...	Positive	0.998987
12151	244.076660	244.076660	260.263336	242.676666	256.899994	147052200.0	Tesla	4/14/2021	-1.0	56	905	daily discussion run monday friday including t...	Positive	0.999992
12152	244.076660	244.076660	260.263336	242.676666	256.899994	147052200.0	Tesla	4/14/2021	-1.0	26	76	ive tried estimate 10year return holding tslz	Positive	0.998830

2.3 Checking Data Shape:



```python
print(f"Number of Rows: {df.shape[0]} \nNumber of Columns: {df.shape[1]}")
```

```
Number of Rows: 12153
Number of Columns: 14
```

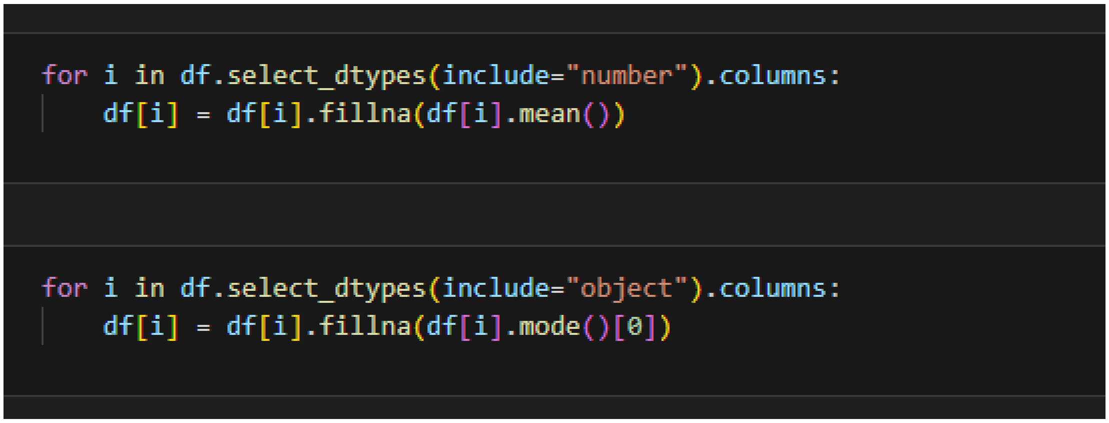
3. Data Preprocessing Steps

3.1 Handling Missing Data

- Checked for missing values in Open, Close, High, Low, and Volume columns.
- Used mean/median imputation to fill missing numerical data.
- Forward fill/backward fill used for time-series consistency.

- Numerical columns are filled with their mean .

- Categorical columns are filled with their mode.

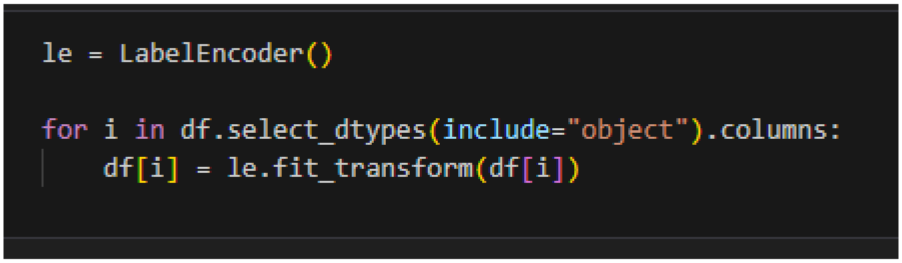


```
for i in df.select_dtypes(include="number").columns:
    df[i] = df[i].fillna(df[i].mean())
```

```
for i in df.select_dtypes(include="object").columns:
    df[i] = df[i].fillna(df[i].mode()[0])
```

3.2 Encoding Categorical Variables:

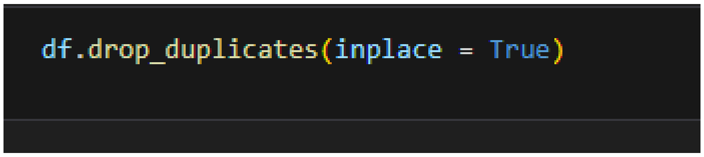
- Convert categorical features into numerical format using ‘**LabelEncoder’,** which is essential for machine learning algorithms that require numerical input.



```
le = LabelEncoder()

for i in df.select_dtypes(include="object").columns:
    df[i] = le.fit_transform(df[i])
```

3.3 Removing Duplicates:

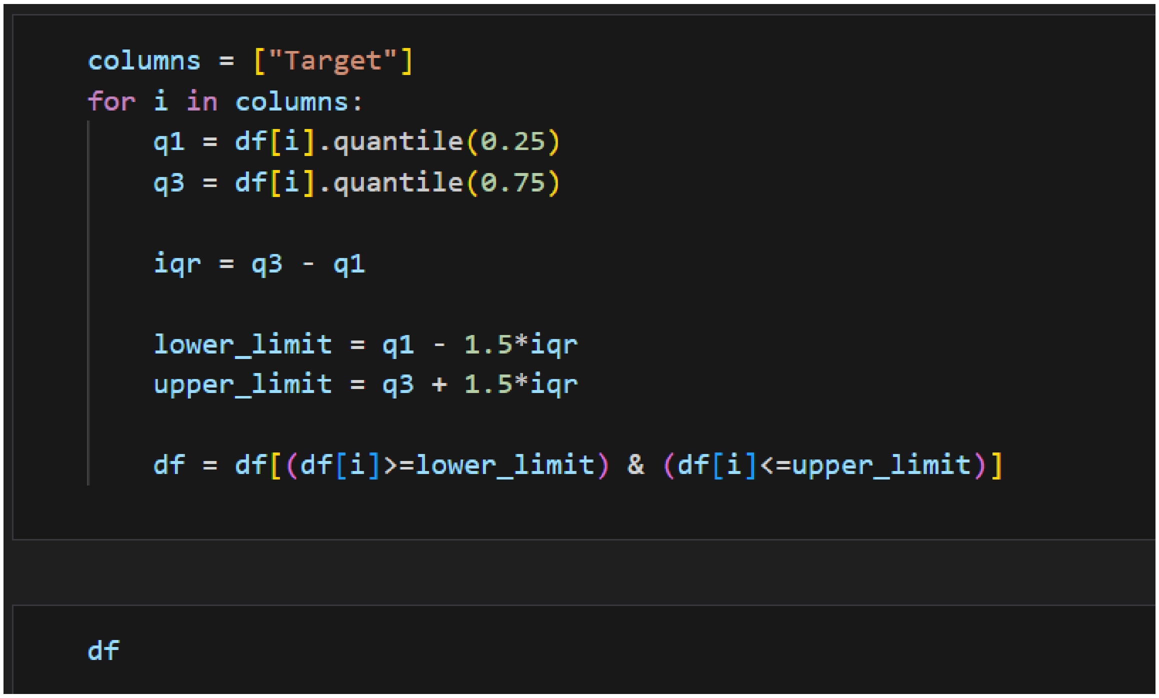
- Identified and removed duplicate records using pandas to prevent redundancy.



```
df.drop_duplicates(inplace = True)
```

3.4 Outlier Detection

- Applied the IQR (Interquartile Range) method and z-score analysis to detect and remove outliers in stock prices.



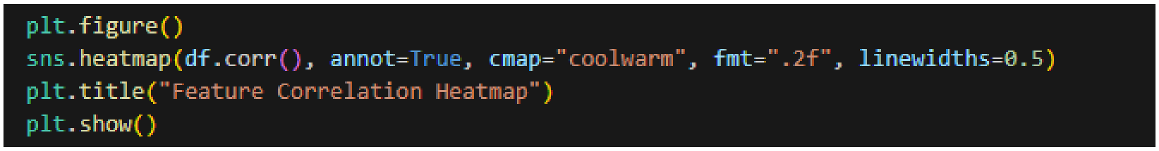
```python
columns = ["Target"]
for i in columns:
    q1 = df[i].quantile(0.25)
    q3 = df[i].quantile(0.75)

    iqr = q3 - q1

    lower_limit = q1 - 1.5*iqr
    upper_limit = q3 + 1.5*iqr

    df = df[(df[i]>=lower_limit) & (df[i]<=upper_limit)]
```

```python
df
```

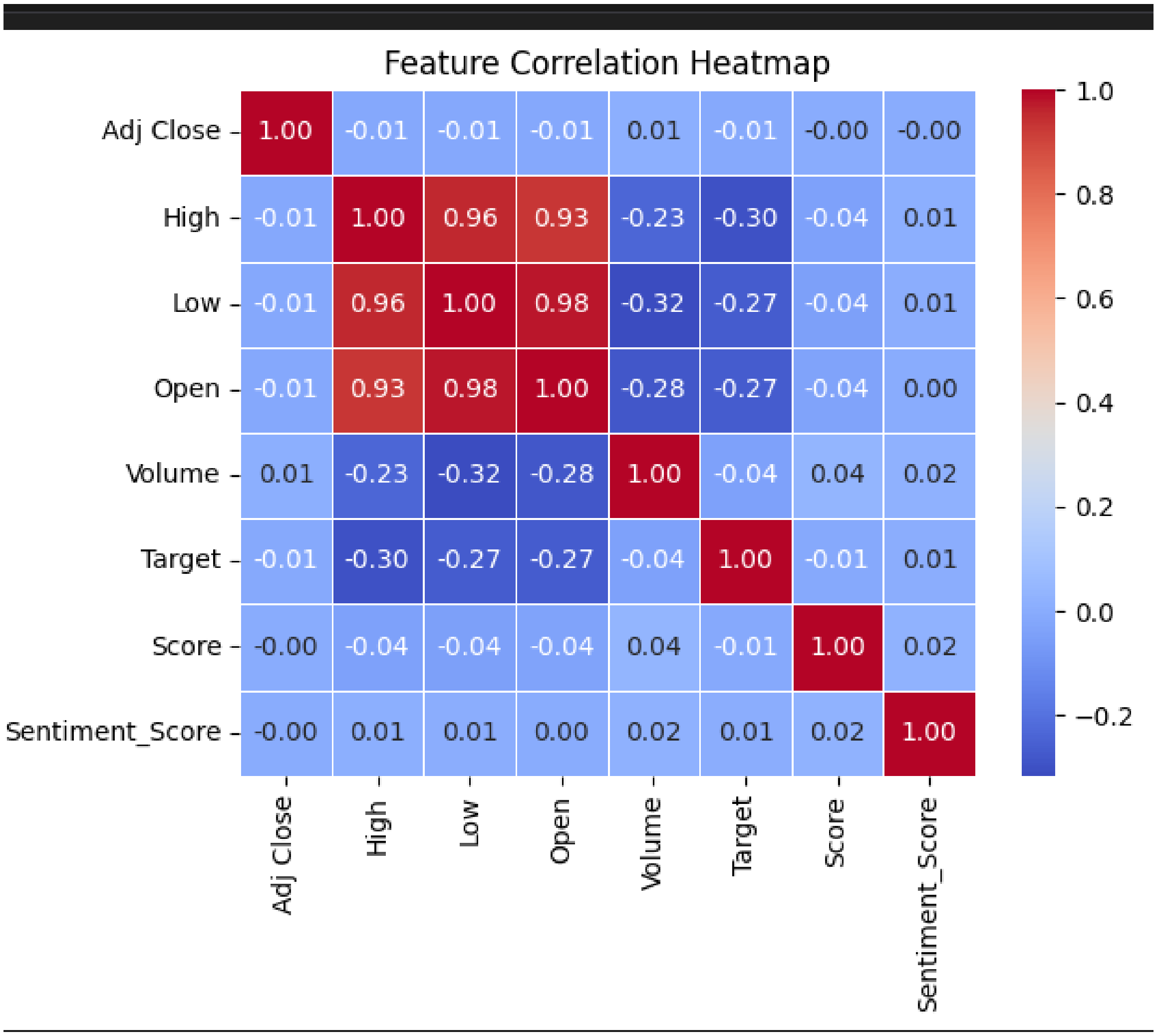
4. Data visualization:

Correlation Heatmap:

A heatmap is generated to visualize the correlation between different Features in the dataset.

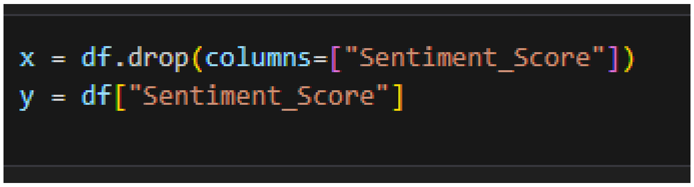


```python
plt.figure()
sns.heatmap(df.corr(), annot=True, cmap="coolwarm", fmt=".2f", linewidths=0.5)
plt.title("Feature Correlation Heatmap")
plt.show()
```



5. Preparing Data for Modeling:

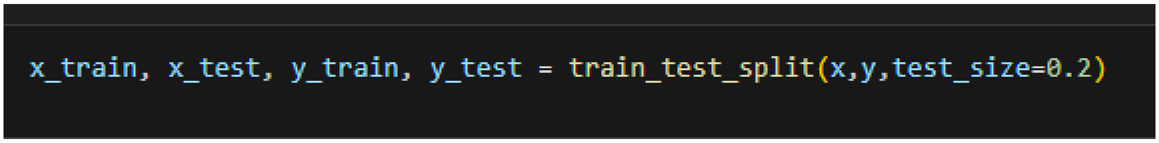
Defining Features and Target Variable: Features (x) are defined by dropping the target variable (Sentiment_Score), which is stored in y. is stored in y.



```
x = df.drop(columns=["Sentiment_Score"])
y = df["Sentiment_Score"]
```

Splitting the Dataset:

The dataset is split into training and testing sets using an 80-20 split.

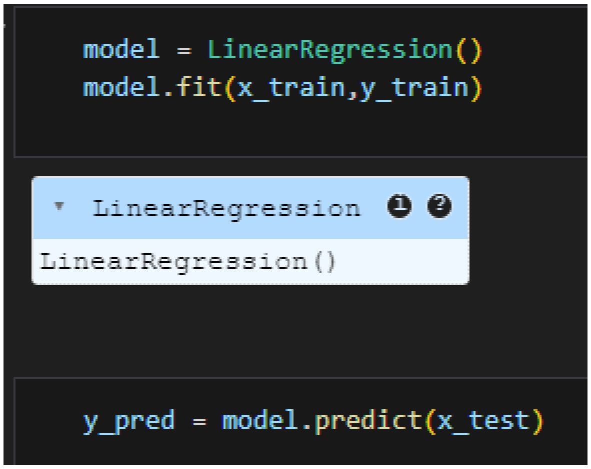


```
x_train, x_test, y_train, y_test = train_test_split(x,y,test_size=0.2)
```

---

6. Model Training and Evaluation

Linear Regression Model : A Linear Regression model is instantiated, trained, and predications are made on the test set.

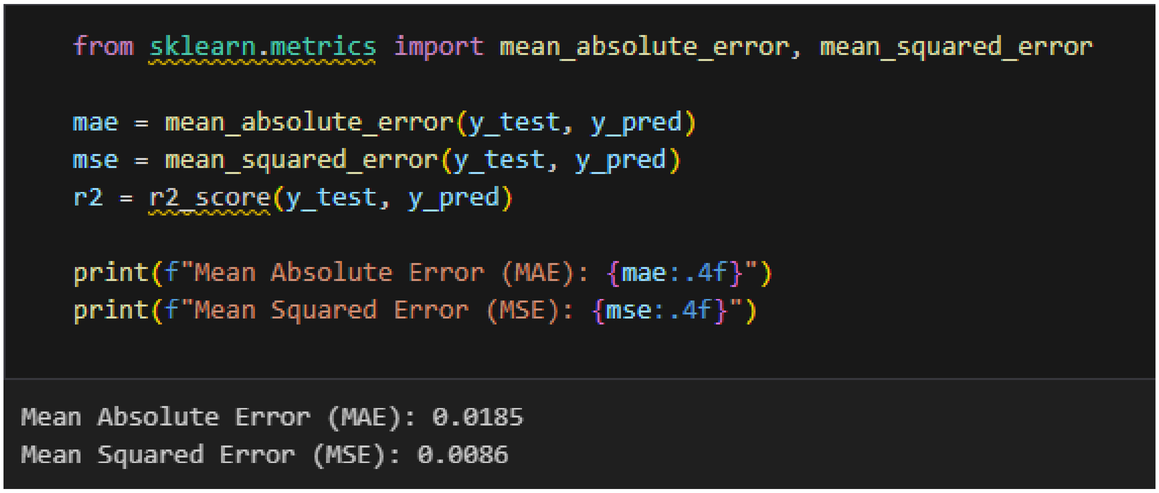


```
model = LinearRegression()
model.fit(x_train,y_train)
```

```
▾ LinearRegression
LinearRegression()
```

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

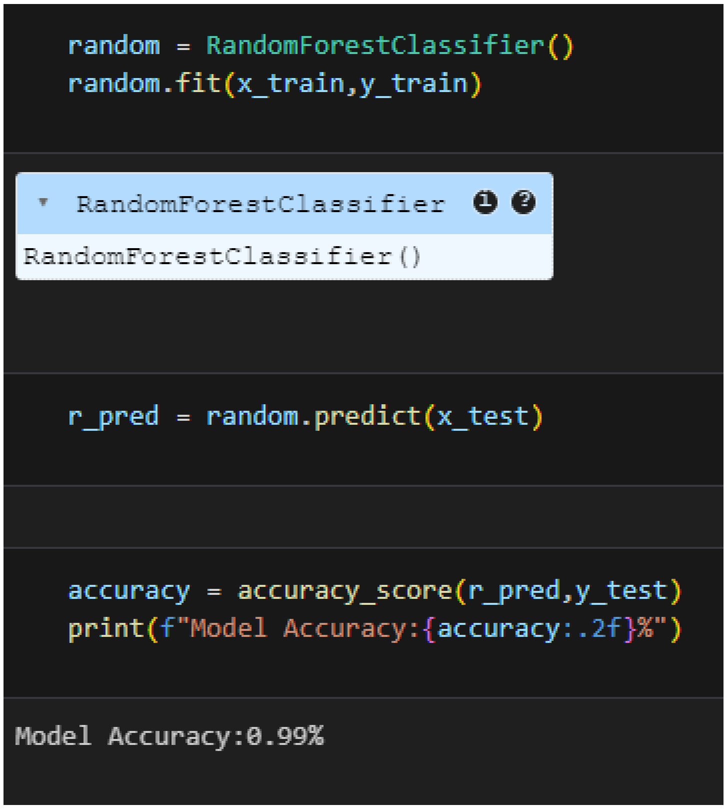
Performance metrics: Mean Absolute Error (MAE) and Mean Squared Error (MSE) are calculated to evaluate the model's performance.



```
from sklearn.metrics import mean_absolute_error, mean_squared_error

mae = mean_absolute_error(y_test, y_pred)
mse = mean_squared_error(y_test, y_pred)
r2 = r2_score(y_test, y_pred)

print(f"Mean Absolute Error (MAE): {mae:.4f}")
print(f"Mean Squared Error (MSE): {mse:.4f}")
```

```
Mean Absolute Error (MAE): 0.0185
Mean Squared Error (MSE): 0.0086
```

Random Forest Classifier: A Radom Forest Classifier is trained and evaluated for its accuracy.



```
random = RandomForestClassifier()
random.fit(x_train,y_train)
```

```
▾ RandomForestClassifier  i ?
RandomForestClassifier()
```

```
r_pred = random.predict(x_test)
```

```
accuracy = accuracy_score(r_pred,y_test)
print(f"Model Accuracy:{accuracy:.2f}%")
```

```
Model Accuracy:0.99%
```