Importing the Dependencies

In [ ]:
```
import numpy as np
import pandas as pd
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import StandardScaler
import matplotlib.pyplot as plt
from sklearn import metrics
from sklearn.linear_model import LinearRegression
from sklearn.svm import SVR
from sklearn.metrics import r2_score,mean_squared_error,mean_absolute_error,rc
```

In [ ]:
```
import warnings
warnings.filterwarnings("ignore", message="X does not have valid feature names
```

Data Collection and Analysis

In [ ]:
```
df  = pd.read_csv('/content/ITC.NS.csv')
df.head()
```

Out[ ]:

	Date	Open	High	Low	Close	Adj Close	Volume
0	01-01-1996	5.550000	5.600000	5.533333	5.583333	3.323907	985500.0
1	02-01-1996	5.466666	5.566666	5.288888	5.372222	3.198226	7470000.0
2	03-01-1996	5.133333	5.254444	5.101111	5.200000	3.095698	15160500.0
3	04-01-1996	5.200000	5.332222	5.144444	5.297777	3.153908	12397500.0
4	05-01-1996	5.297777	5.277777	5.188888	5.202222	3.097020	5008500.0

In [ ]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 6890 entries, 0 to 6889
Data columns (total 7 columns):
 #   Column     Non-Null Count  Dtype
---  ------     --------------  -----
 0   Date       6890 non-null   object
 1   Open       6879 non-null   float64
 2   High       6879 non-null   float64
 3   Low        6879 non-null   float64
 4   Close      6879 non-null   float64
 5   Adj Close  6879 non-null   float64
 6   Volume     6879 non-null   float64
dtypes: float64(6), object(1)
memory usage: 376.9+ KB
```

In [ ]:
```
df.shape
```

Out[ ]: (6890, 7)

In [ ]:
```
df.describe()
```

Out[ ]:

	Open	High	Low	Close	Adj Close	V
count	6879.000000	6879.000000	6879.000000	6879.000000	6879.000000	6.87900
mean	121.511181	122.859461	120.011619	121.426830	99.025659	4.40242
std	106.444634	107.405065	105.373130	106.383687	94.769531	9.92748
min	4.182222	4.182222	4.144444	4.182222	2.489788	0.00000
25%	18.222221	18.541666	17.889999	18.169999	11.208004	8.77665
50%	72.599998	74.416664	71.000000	72.583336	51.009666	1.37196
75%	219.666672	222.266663	217.333328	219.933334	181.465515	2.58141
max	432.799988	433.450012	429.350006	431.450012	431.450012	1.29416

Transform Data

In [ ]:
```
columns_to_2decimal = ['Open', 'High', 'Low', 'Close']
decimal_places = 2

df[columns_to_2decimal] = np.round(df[columns_to_2decimal],decimal_places)
df
```

Out[ ]:

	Date	Open	High	Low	Close	Adj Close	Volume
0	01-01-1996	5.55	5.60	5.53	5.58	3.323907	985500.0
1	02-01-1996	5.47	5.57	5.29	5.37	3.198226	7470000.0
2	03-01-1996	5.13	5.25	5.10	5.20	3.095698	15160500.0
3	04-01-1996	5.20	5.33	5.14	5.30	3.153908	12397500.0
4	05-01-1996	5.30	5.28	5.19	5.20	3.097020	5008500.0
...	...	...	...	...	...	...	...
6885	10-05-2023	423.95	426.35	422.20	425.35	425.350006	9754485.0
6886	11-05-2023	427.25	427.40	418.90	420.40	420.399994	15982423.0
6887	12-05-2023	420.40	422.70	416.05	420.45	420.450012	11135894.0
6888	15-05-2023	420.00	428.70	419.05	427.80	427.799988	9151102.0
6889	16-05-2023	430.00	430.00	423.50	423.95	423.950012	7994197.0

6890 rows × 7 columns

In [ ]:

```
columns_to_drop = ['Adj Close']
df.drop(columns=columns_to_drop, inplace = True) # inplace=true implies that r

columns_order = ['Date', 'Open', 'High', 'Low', 'Volume', 'Close']
df = df[columns_order]
df.head(2)
```

Out[ ]:

	Date	Open	High	Low	Volume	Close
0	01-01-1996	5.55	5.60	5.53	985500.0	5.58
1	02-01-1996	5.47	5.57	5.29	7470000.0	5.37

In [ ]:

```
df['Date'] = pd.to_datetime(df['Date'], format="%d-%m-%Y", errors='coerce')
df['Date'] = df['Date'].dt.strftime('%d-%m-%Y')
df.head(2)
```

Out[ ]:

	Date	Open	High	Low	Volume	Close
0	01-01-1996	5.55	5.60	5.53	985500.0	5.58
1	02-01-1996	5.47	5.57	5.29	7470000.0	5.37

Handling Missing and Duplicate Values

In [ ]:

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

Out[ ]:

	0
Date	0
Open	11
High	11
Low	11
Volume	11
Close	11

dtype: int64

In [ ]:

```
df['Open'] = df['Open'].fillna(df['Open'].mean())  # Replace NaN with the colu
df['High'] = df['High'].fillna(df['High'].mean())
df['Low'] = df['Low'].fillna(df['Low'].mean())
df['Volume'] = df['Volume'].fillna(df['Volume'].mean())
df['Close'] = df['Close'].fillna(df['Close'].mean())
```

In [ ]:

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

Out[ ]:

	0
Date	0
Open	0
High	0
Low	0
Volume	0
Close	0

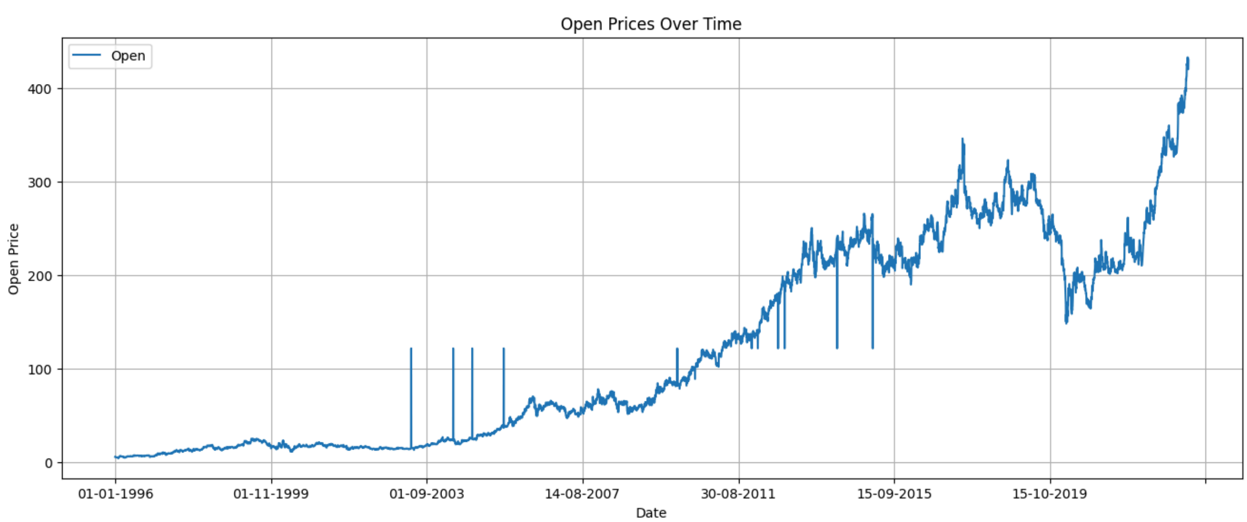
dtype: int64

In [ ]:
```
# Finding the duplicate values

print(df.duplicated().sum()) # gives the duplicate values in the dataset
```

```
0
```

Data Visualization

In [ ]:
```
df.set_index('Date', inplace=True)

# Plot the 'Open' prices with the Date as the x-axis
df['Open'].plot(figsize=(16, 6), title='Open Prices Over Time', legend=True)
plt.xlabel('Date')  # Label the x-axis
plt.ylabel('Open Price')  # Label the y-axis
plt.grid(True)
plt.show()
```



In [ ]:
```
corr = df.corr()['Close']
corr
```

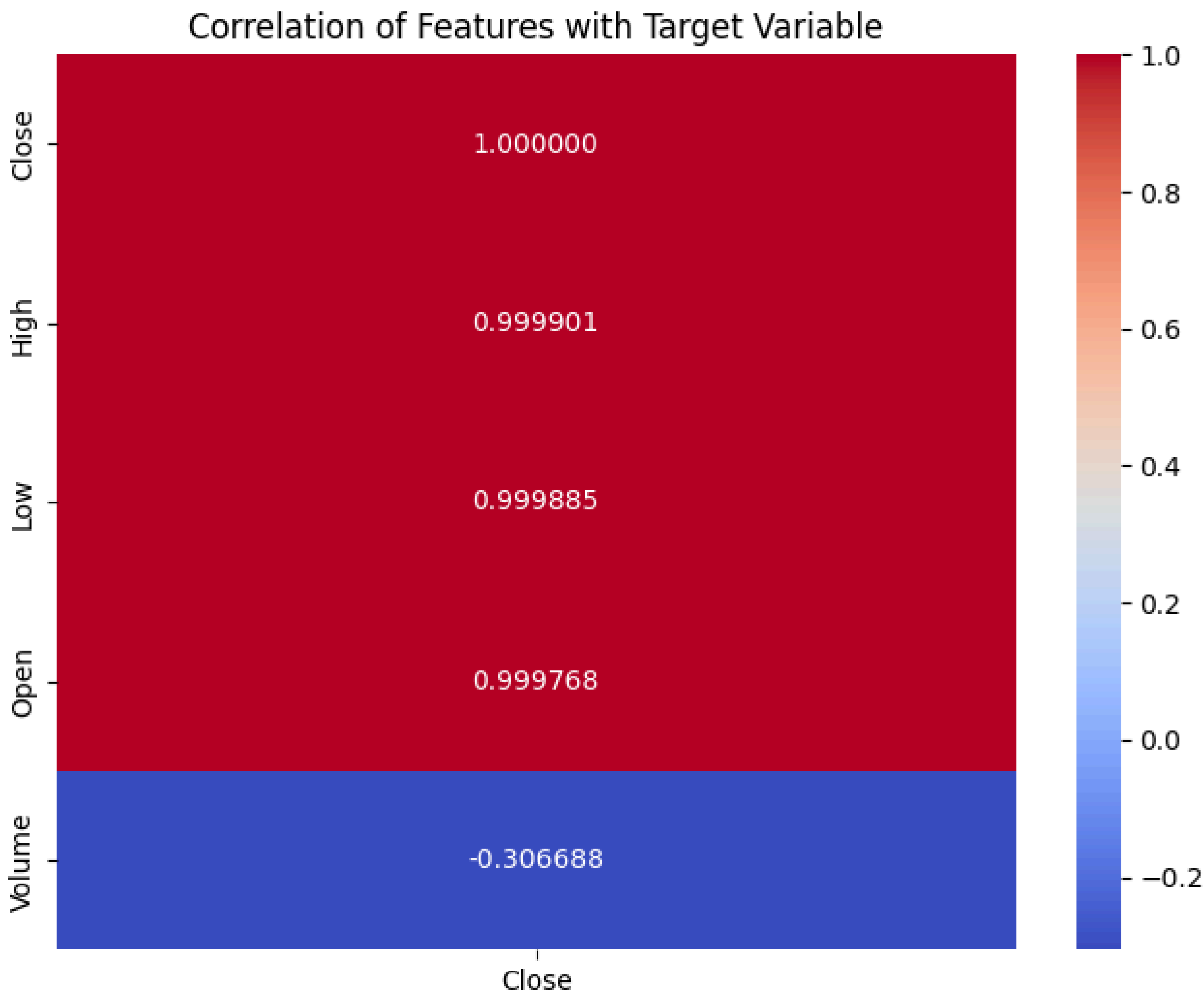
Out[ ]:

	Close
Open	0.999768
High	0.999901
Low	0.999885
Volume	-0.306688
Close	1.000000

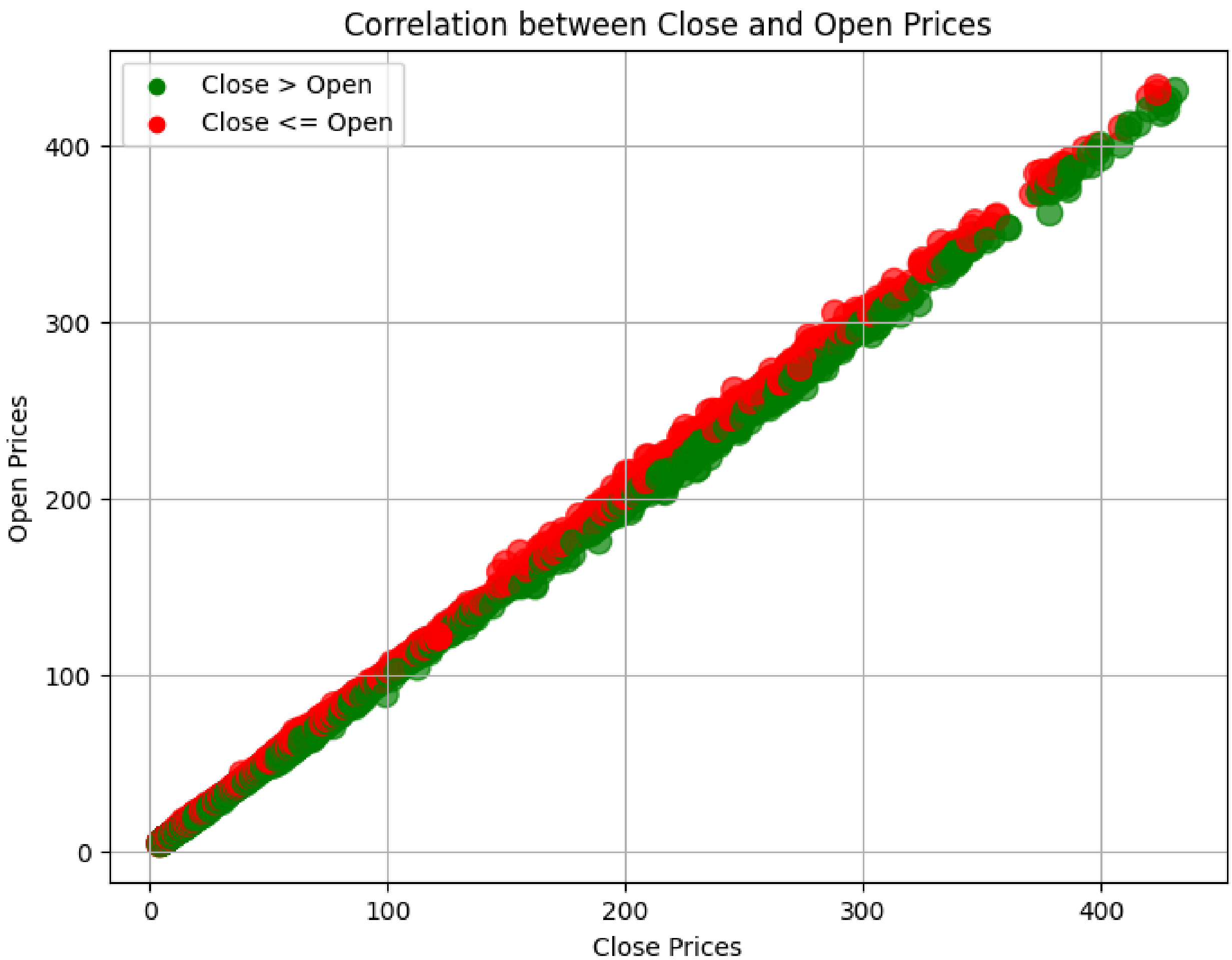
dtype: float64

In [ ]:

```
import seaborn as sns
import matplotlib.pyplot as plt

# Plot the heatmap
plt.figure(figsize=(8, 6))
sns.heatmap(df.corr()[['Close']].sort_values(by='Close', ascending=False),
            annot=True, cmap='coolwarm',fmt='.6f')
plt.title("Correlation of Features with Target Variable")
plt.show()
```

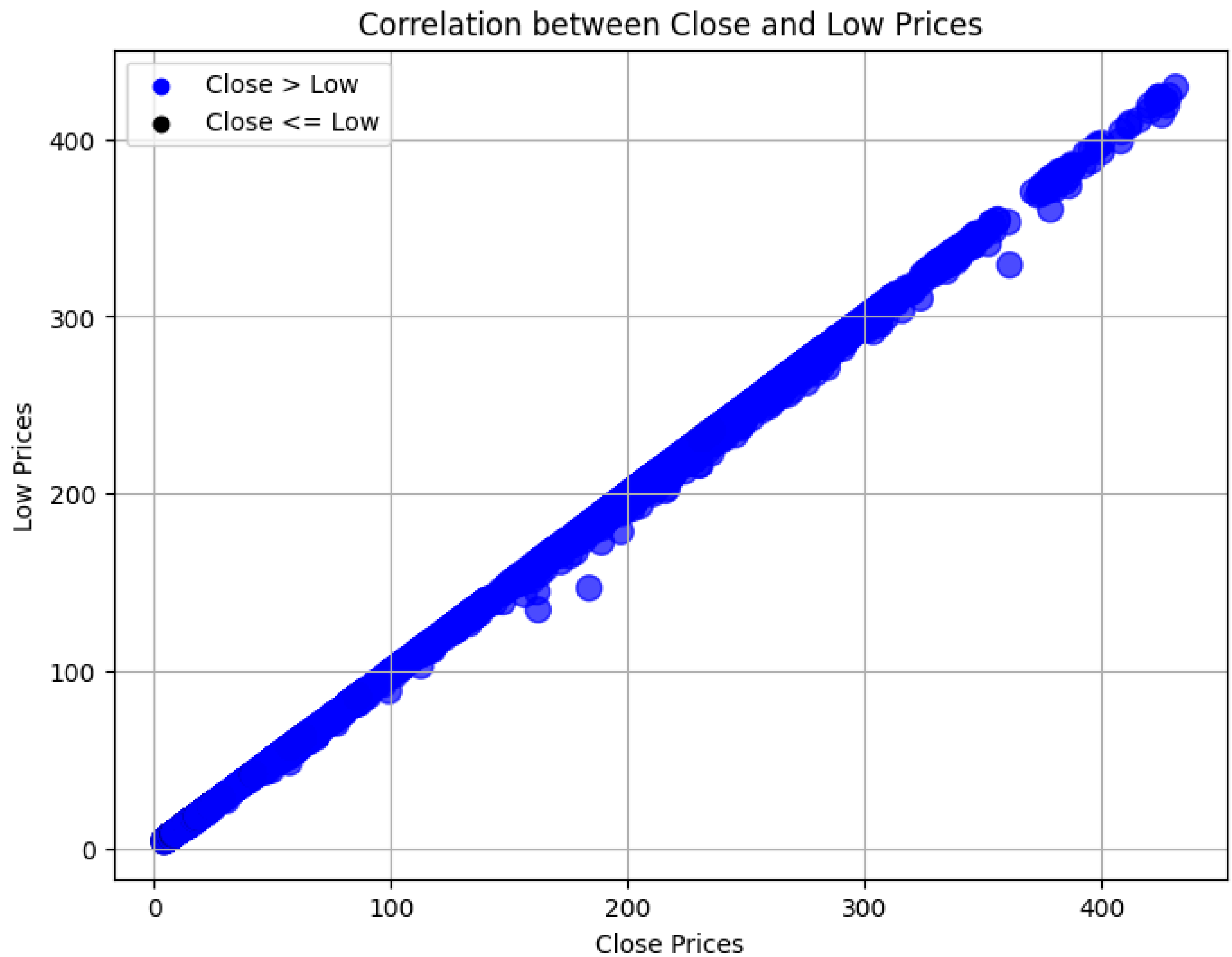


In [ ]:
```
# Define colors based on a condition: e.g., 'Close' > 'Open'
colors = np.where(df['Close'] > df['Open'], 'green', 'red')

# Scatter plot
plt.figure(figsize=(8, 6))
plt.scatter(df['Close'], df['Open'], c=colors, alpha=0.7, s=100)
plt.title("Correlation between Close and Open Prices")
plt.xlabel("Close Prices")
plt.ylabel("Open Prices")

# Add legend manually
plt.scatter([], [], c='green', label='Close > Open')
plt.scatter([], [], c='red', label='Close <= Open')
plt.legend()

plt.grid(True)
plt.show()
```



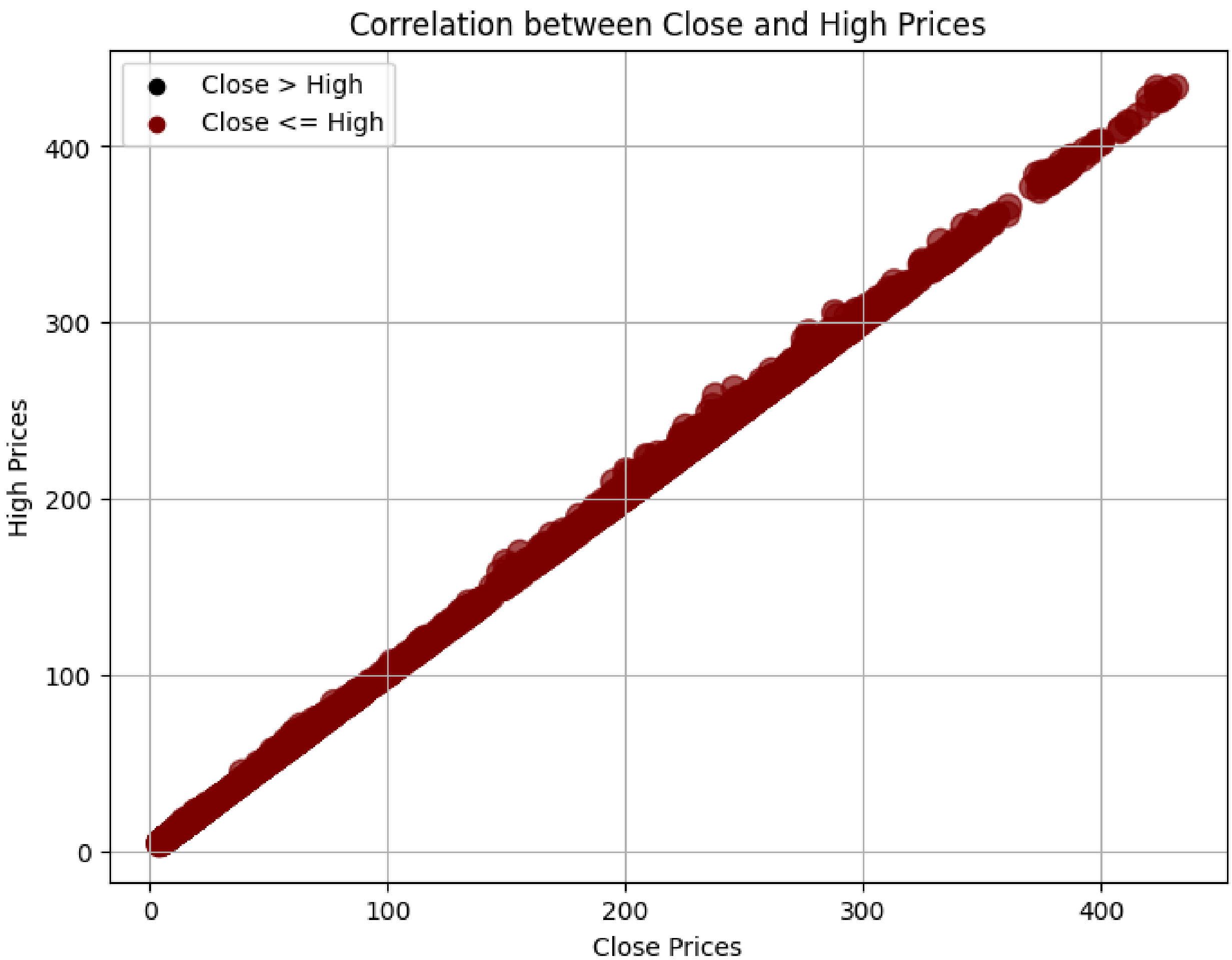
In [ ]:

```
# Define colors based on a condition: e.g., 'Close' > 'Low'
colors = np.where(df['Close'] > df['Low'], 'blue', 'black')

# Scatter plot
plt.figure(figsize=(8, 6))
plt.scatter(df['Close'], df['Low'], c=colors, alpha=0.7, s=100)
plt.title("Correlation between Close and Low Prices")
plt.xlabel("Close Prices")
plt.ylabel("Low Prices")

# Add legend manually
plt.scatter([], [], c='blue', label='Close > Low')
plt.scatter([], [], c='black', label='Close <= Low')
plt.legend()

plt.grid(True)
plt.show()
```



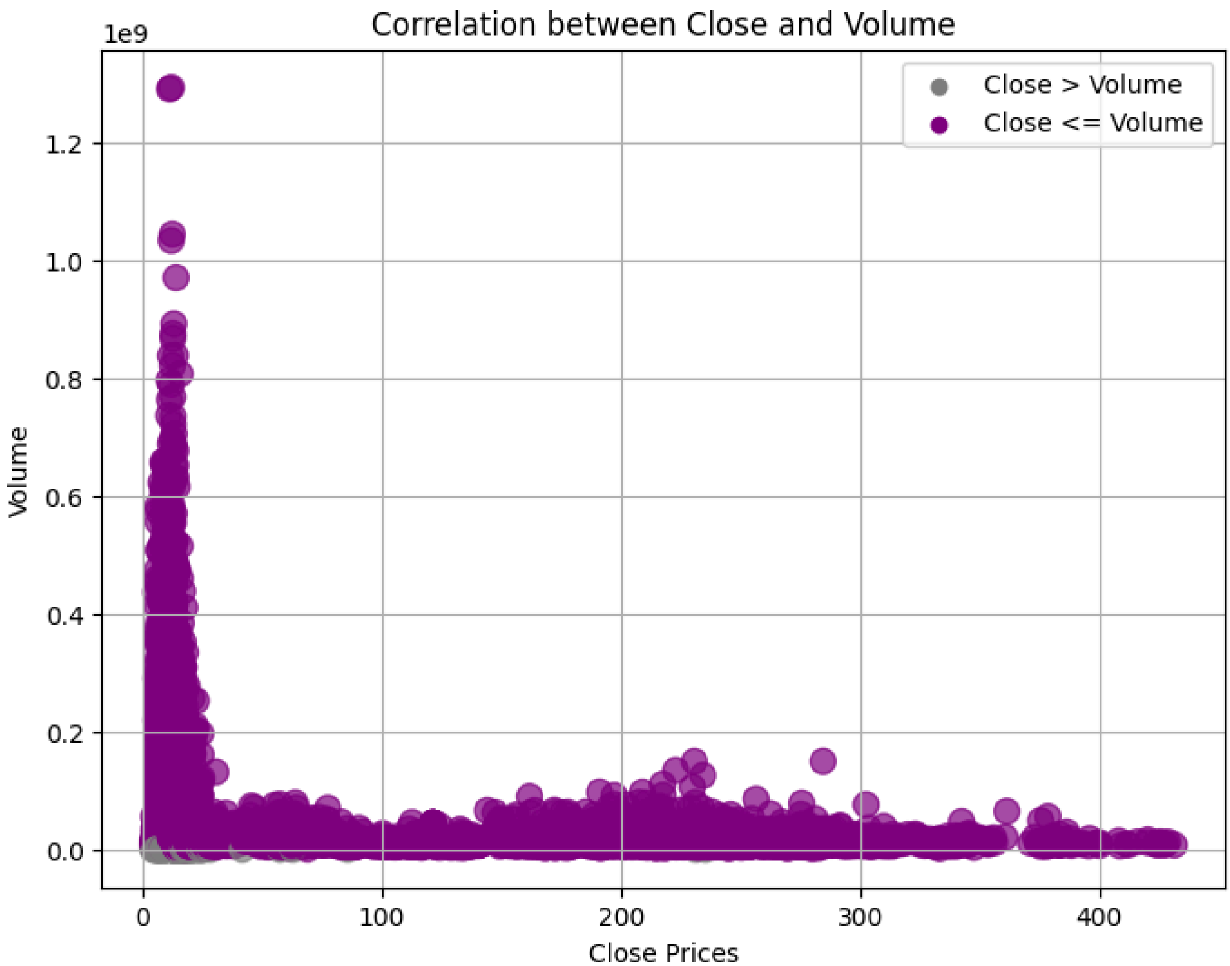
In [ ]:

```
# Define colors based on a condition: e.g., 'Close' > 'High'
colors = np.where(df['Close'] > df['High'], 'black', 'maroon')

# Scatter plot
plt.figure(figsize=(8, 6))
plt.scatter(df['Close'], df['High'], c=colors, alpha=0.7, s=100)
plt.title("Correlation between Close and High Prices")
plt.xlabel("Close Prices")
plt.ylabel("High Prices")

# Add legend manually
plt.scatter([], [], c='black', label='Close > High')
plt.scatter([], [], c='maroon', label='Close <= High')
plt.legend()

plt.grid(True)
plt.show()
```



In [ ]:

```
# Define colors based on a condition: e.g., 'Close' > 'Volume'
colors = np.where(df['Close'] > df['Volume'], 'grey', 'purple')

# Scatter plot
plt.figure(figsize=(8, 6))
plt.scatter(df['Close'], df['Volume'], c=colors, alpha=0.7, s=100)
plt.title("Correlation between Close and Volume")
plt.xlabel("Close Prices")
plt.ylabel("Volume")

# Add legend manually
plt.scatter([], [], c='grey', label='Close > Volume')
plt.scatter([], [], c='purple', label='Close <= Volume')
plt.legend()

plt.grid(True)
plt.show()
```



Spliting the data to training data and test data

In [ ]:
```
x = df.drop(columns='Close',axis=1)
y = df['Close']
```

In [ ]:
```
x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.2,random_state=
```

In [ ]:
```
x_train.shape,x_test.shape,y_train.shape,y_test.shape
```

Out[ ]:
```
((5512, 4), (1378, 4), (5512,), (1378,))
```

Data Standardization

In [ ]:
```
scaler = StandardScaler()
scaler.fit(x_train)
```

Out[ ]:

```
▾ StandardScaler
StandardScaler()
```

In [ ]:

```
x_train = scaler.transform(x_train)
x_test = scaler.transform(x_test)
```

In [ ]:

```
print(x_train)
```

```
[[-0.95465118 -0.95771878 -0.95432392 -0.19161583]
 [ 1.75622969  1.75417145  1.77971363 -0.37312791]
 [ 0.09917298  0.09142023  0.105226   -0.32805496]
 ...
 [ 1.22048248  1.20044884  1.22572852 -0.39016636]
 [ 1.5024547   1.47614588  1.44361984 -0.35539657]
 [-0.95822282 -0.95147834 -0.95584299  0.27844565]]
```

In [ ]:

```
print(x_test)
```

```
[[-0.99863884 -0.99870078 -0.99961113  0.10617874]
 [ 0.58134546  0.57267922  0.57015575 -0.1978014 ]
 [-0.99393931 -0.99553399 -0.99068661 -0.33398784]
 ...
 [-0.06935242 -0.06747813 -0.0782964  -0.36601289]
 [ 1.39530525  1.42026135  1.39377542 -0.20869583]
 [-0.54532151 -0.54873712 -0.54256155 -0.3714666 ]]
```

Model Training using Linear Regression

In [ ]:

```
LRmodel = LinearRegression()
LRmodel.fit(x_train,y_train)
y_pred = LRmodel.predict(x_test)
print(y_pred)
```

```
[ 15.79830509 182.28063245  16.48930378 ... 114.17185558 272.4732109
  63.99756266]
```

In [ ]:

```
y_pred.shape
```

Out[ ]:

```
(1378,)
```

In [ ]:

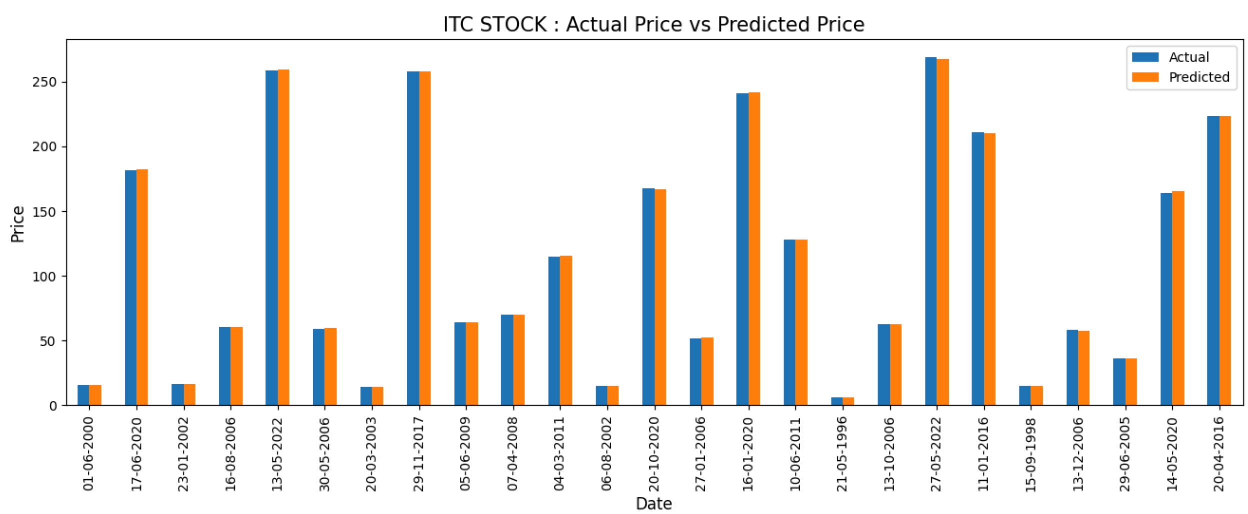
```
dframe = pd.DataFrame({'Actual':y_test,'Predicted':y_pred})
dframe.head(10)
```

Out[ ]:

Date	Actual	Predicted
01-06-2000	15.46	15.798305
17-06-2020	181.20	182.280632
23-01-2002	16.50	16.489304
16-08-2006	60.30	60.552873
13-05-2022	258.60	259.193598
30-05-2006	58.83	59.379062
20-03-2003	13.91	13.938119
29-11-2017	258.05	257.660222
05-06-2009	63.78	64.356517
07-04-2008	70.12	69.780115

In [ ]:

```
graph = dframe.head(25)
graph.plot(kind='bar',figsize=(16,5))
plt.title("ITC STOCK : Actual Price vs Predicted Price", fontsize=15)
plt.xlabel("Date", fontsize=12)
plt.ylabel("Price", fontsize=12)
plt.show()
```



Model Evaluation for Linear Regression Model

In [ ]:

```
r2_score(y_test, y_pred)
```

Out[ ]: 0.999884066238908

In [ ]:
```
print('Mean Absolute Error',metrics.mean_absolute_error(y_test,y_pred))
print('Mean Squared Error',metrics.mean_squared_error(y_test,y_pred))
import math
print ('Root Mean Squared Error',math.sqrt(metrics.mean_squared_error(y_test,y
```

```
Mean Absolute Error 0.564774466912428
Mean Squared Error 1.3041262317038838
Root Mean Squared Error 1.1419834638487039
```

Predictive Model using Linear Regression

In [ ]:
```
input_data = (120,130,123,980000)

#changing input data to a numpy array
input_data_as_numpy_array = np.asarray(input_data)

# reshape the numpy array
input_data_reshaped = input_data_as_numpy_array.reshape(1,-1)

# standardizing the data
std_data = scaler.transform(input_data_reshaped)

prediction = LRmodel.predict(std_data)
print(prediction)
# predicting the close price
```

```
[130.12984327]
```

In [ ]:
```
input_data = (465.45,466.45,462.60,8823805)

#changing input data to a numpy array
input_data_as_numpy_array = np.asarray(input_data)

# reshape the numpy array
input_data_reshaped = input_data_as_numpy_array.reshape(1,-1)

# standardizing the data
std_data = scaler.transform(input_data_reshaped)

prediction = LRmodel.predict(std_data)
print(prediction)
# predicting the close price
```

```
[463.87728268]
```

Model Training using Support Vector Regressor

In [ ]:
```
svr_model = SVR(kernel='linear', C=50, epsilon=0.2)
svr_model.fit(x_train, y_train)
```

Out[ ]:

▾ SVR

SVR(C=50, epsilon=0.2, kernel='linear')

In [ ]:

```
prediction = svr_model.predict(x_test)
print(prediction)
```

```
[ 15.78699691 182.18550435  16.50436631 ... 114.10188452 272.44207497
  64.00406944]
```

In [ ]:

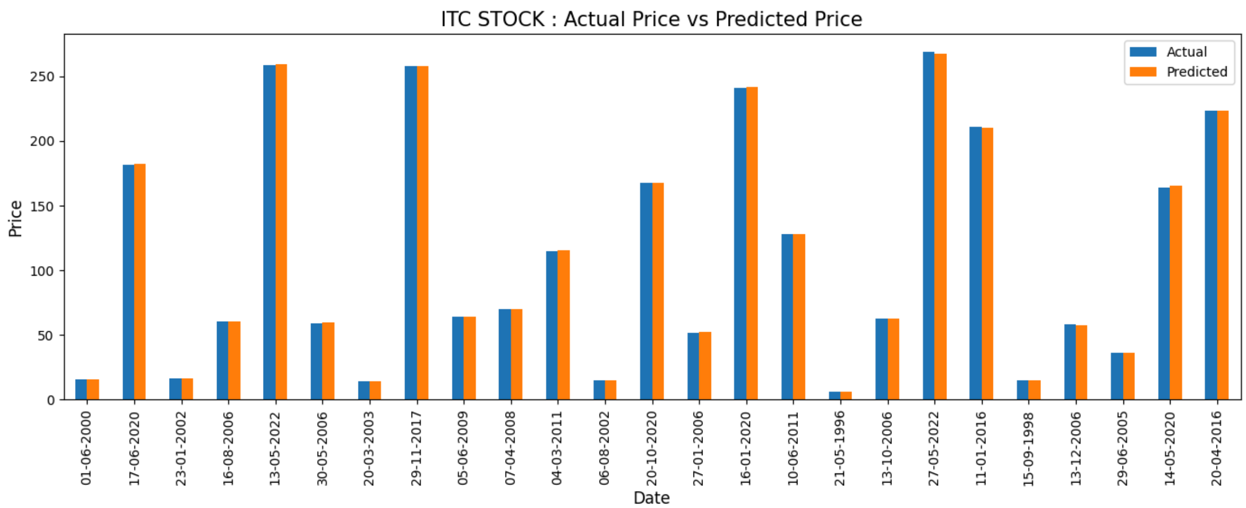
```
dframeS = pd.DataFrame({'Actual':y_test,'Predicted':prediction})
dframeS.head(10)
```

Out[ ]:

Date	Actual	Predicted
01-06-2000	15.46	15.786997
17-06-2020	181.20	182.185504
23-01-2002	16.50	16.504366
16-08-2006	60.30	60.593271
13-05-2022	258.60	259.317527
30-05-2006	58.83	59.337018
20-03-2003	13.91	13.951485
29-11-2017	258.05	257.735181
05-06-2009	63.78	64.132758
07-04-2008	70.12	69.751918

In [ ]:

```
graphS = dframeS.head(25)
graphS.plot(kind='bar',figsize=(16,5))
plt.title("ITC STOCK : Actual Price vs Predicted Price", fontsize=15)
plt.xlabel("Date", fontsize=12)
plt.ylabel("Price", fontsize=12)
plt.show()
```



Model Evaluation for Support Vector Regressor Model

In [ ]:
```
r2_score(y_test, prediction)
```

Out[ ]:
```
0.9998759043005752
```

In [ ]:
```
print('Mean Absolute Error',metrics.mean_absolute_error(y_test,prediction))
print('Mean Squared Error',metrics.mean_squared_error(y_test,prediction))
import math
print ('Root Mean Squared Error',math.sqrt(metrics.mean_squared_error(y_test,p
```

```
Mean Absolute Error 0.5604446370532994
Mean Squared Error 1.3959389856524873
Root Mean Squared Error 1.181498618557164
```

Predictive Model for Support Vector Regressor

In [ ]:
```
input_data = (120,130,123,980000)

#changing input data to a numpy array
input_data_as_numpy_array = np.asarray(input_data)

# reshape the numpy array
input_data_reshaped = input_data_as_numpy_array.reshape(1,-1)

# standardizing the data
std_data = scaler.transform(input_data_reshaped)

pred = svr_model.predict(std_data)
print(pred)
# predicting the close price
```

```
[130.41050458]
```

```
In [ ]: input_data = (465.45,466.45,462.60,8823805)

#changing input data to a numpy array
input_data_as_numpy_array = np.asarray(input_data)

# reshape the numpy array
input_data_reshaped = input_data_as_numpy_array.reshape(1,-1)

# standardizing the data
std_data = scaler.transform(input_data_reshaped)

pred = svr_model.predict(std_data)
print(pred)
# predicting the close price
```

```
[463.93927574]
```