In [1]:

```python
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import tensorflow as tf
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Dense, LSTM, Dropout
from sklearn.preprocessing import MinMaxScaler
```

```
---------------------------------------------------------------------------
ModuleNotFoundError                       Traceback (most recent call last)
Cell In[1], line 2
      1 import numpy as np
----> 2 import pandas as pd
      3 import matplotlib.pyplot as plt
      4 import tensorflow as tf

ModuleNotFoundError: No module named 'pandas'
```

In [2]:  ▶|    `!pip install pandas`

```
Collecting pandas
  Downloading pandas-2.1.3-cp39-cp39-win_amd64.whl.metadata (18 kB)
Requirement already satisfied: numpy<2,>=1.22.4 in c:\users\hp\.conda\envs\tensorflow\lib\site-packages (from
pandas) (1.26.0)
Requirement already satisfied: python-dateutil>=2.8.2 in c:\users\hp\.conda\envs\tensorflow\lib\site-packages
(from pandas) (2.8.2)
Collecting pytz>=2020.1 (from pandas)
  Downloading pytz-2023.3.post1-py2.py3-none-any.whl.metadata (22 kB)
Collecting tzdata>=2022.1 (from pandas)
  Downloading tzdata-2023.3-py2.py3-none-any.whl (341 kB)
     ---------------------------------------- 0.0/341.8 kB ? eta -:--:--
     ---- ----------------------------------- 41.0/341.8 kB 1.9 MB/s eta 0:00:01
     ---- ----------------------------------- 41.0/341.8 kB 1.9 MB/s eta 0:00:01
     --------- ------------------------------ 92.2/341.8 kB 655.4 kB/s eta 0:00:01
     -------------- ------------------------- 143.4/341.8 kB 774.0 kB/s eta 0:00:01
     -------------------- ------------------- 204.8/341.8 kB 888.4 kB/s eta 0:00:01
     -------------------------- ------------- 276.5/341.8 kB 1.0 MB/s eta 0:00:01
     ---------------------------------------- 341.8/341.8 kB 1.1 MB/s eta 0:00:00
Requirement already satisfied: six>=1.5 in c:\users\hp\.conda\envs\tensorflow\lib\site-packages (from python-d
```

In [3]:  ▶|    `import pandas as pd`

In [4]: ▶|
```python
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import tensorflow as tf
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Dense, LSTM, Dropout
from sklearn.preprocessing import MinMaxScaler
```

```
---------------------------------------------------------------------------
ModuleNotFoundError                       Traceback (most recent call last)
Cell In[4], line 3
      1 import numpy as np
      2 import pandas as pd
----> 3 import matplotlib.pyplot as plt
      4 import tensorflow as tf
      5 from tensorflow.keras.models import Sequential

ModuleNotFoundError: No module named 'matplotlib'
```

In [5]: ▶| 
```python
!pip install matplotlib
```

```
Collecting matplotlib
  Downloading matplotlib-3.8.1-cp39-cp39-win_amd64.whl.metadata (5.9 kB)
Collecting contourpy>=1.0.1 (from matplotlib)
  Downloading contourpy-1.2.0-cp39-cp39-win_amd64.whl.metadata (5.8 kB)
Collecting cycler>=0.10 (from matplotlib)
  Downloading cycler-0.12.1-py3-none-any.whl.metadata (3.8 kB)
Collecting fonttools>=4.22.0 (from matplotlib)
  Downloading fonttools-4.44.0-cp39-cp39-win_amd64.whl.metadata (156 kB)
     ---------------------------------------- 0.0/156.8 kB ? eta -:--:--
     --------- ------------------------- 41.0/156.8 kB 991.0 kB/s eta 0:00:01
     ------------------ ---------------- 81.9/156.8 kB 919.0 kB/s eta 0:00:01
     -------------------------- ------- 122.9/156.8 kB 901.1 kB/s eta 0:00:01
     ---------------------------------- 156.8/156.8 kB 939.2 kB/s eta 0:00:00
Collecting kiwisolver>=1.3.1 (from matplotlib)
  Downloading kiwisolver-1.4.5-cp39-cp39-win_amd64.whl.metadata (6.5 kB)
Requirement already satisfied: numpy<2,>=1.21 in c:\users\hp\.conda\envs\tensorflow\lib\site-packages (from ma
tplotlib) (1.26.0)
Requirement already satisfied: packaging>=20.0 in c:\users\hp\.conda\envs\tensorflow\lib\site-packages (from m
atplotlib) (23.1)
```

In [6]: ▶| 
```python
import matplotlib.pyplot
```

In [10]: ▶| 
```python
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import tensorflow as tf
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Dense, LSTM, Dropout
```

In [14]: ▶| 
```python
df=pd.read_csv("TSLA.csv")
```

In [15]:  ▶| df

Out[15]:

| | Date | Open | High | Low | Close | Adj Close | Volume |
|---|---|---|---|---|---|---|---|
| 0 | 2010-06-29 | 3.800000 | 5.000000 | 3.508000 | 4.778000 | 4.778000 | 93831500 |
| 1 | 2010-06-30 | 5.158000 | 6.084000 | 4.660000 | 4.766000 | 4.766000 | 85935500 |
| 2 | 2010-07-01 | 5.000000 | 5.184000 | 4.054000 | 4.392000 | 4.392000 | 41094000 |
| 3 | 2010-07-02 | 4.600000 | 4.620000 | 3.742000 | 3.840000 | 3.840000 | 25699000 |
| 4 | 2010-07-06 | 4.000000 | 4.000000 | 3.166000 | 3.222000 | 3.222000 | 34334500 |
| ... | ... | ... | ... | ... | ... | ... | ... |
| 2831 | 2021-09-27 | 773.119995 | 799.000000 | 769.309998 | 791.359985 | 791.359985 | 28070700 |
| 2832 | 2021-09-28 | 787.200012 | 795.640015 | 766.179993 | 777.559998 | 777.559998 | 25381400 |
| 2833 | 2021-09-29 | 779.799988 | 793.500000 | 770.679993 | 781.309998 | 781.309998 | 20942900 |
| 2834 | 2021-09-30 | 781.000000 | 789.130005 | 775.000000 | 775.479980 | 775.479980 | 17956000 |
| 2835 | 2021-10-01 | 778.400024 | 780.780029 | 763.590027 | 775.219971 | 775.219971 | 17005900 |

2836 rows × 7 columns

In [16]:  ▶| df.head()

Out[16]:

| | Date | Open | High | Low | Close | Adj Close | Volume |
|---|---|---|---|---|---|---|---|
| 0 | 2010-06-29 | 3.800 | 5.000 | 3.508 | 4.778 | 4.778 | 93831500 |
| 1 | 2010-06-30 | 5.158 | 6.084 | 4.660 | 4.766 | 4.766 | 85935500 |
| 2 | 2010-07-01 | 5.000 | 5.184 | 4.054 | 4.392 | 4.392 | 41094000 |
| 3 | 2010-07-02 | 4.600 | 4.620 | 3.742 | 3.840 | 3.840 | 25699000 |
| 4 | 2010-07-06 | 4.000 | 4.000 | 3.166 | 3.222 | 3.222 | 34334500 |

In [17]: ▶| `df.shape`

Out[17]: (2836, 7)

In [18]: ▶| `df.info()`

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 2836 entries, 0 to 2835
Data columns (total 7 columns):
 #   Column     Non-Null Count  Dtype
---  ------     --------------  -----
 0   Date       2836 non-null   object
 1   Open       2836 non-null   float64
 2   High       2836 non-null   float64
 3   Low        2836 non-null   float64
 4   Close      2836 non-null   float64
 5   Adj Close  2836 non-null   float64
 6   Volume     2836 non-null   int64
dtypes: float64(5), int64(1), object(1)
memory usage: 155.2+ KB
```

In [20]: ▶| 
```python
plt.figure(figsize=(12,6))
plt.title('Close Price History')
plt.plot(df['Close'])
plt.xlabel('Date', fontsize=18)
plt.ylabel('Close Price USD ($)', fontsize=18)
plt.show()
```
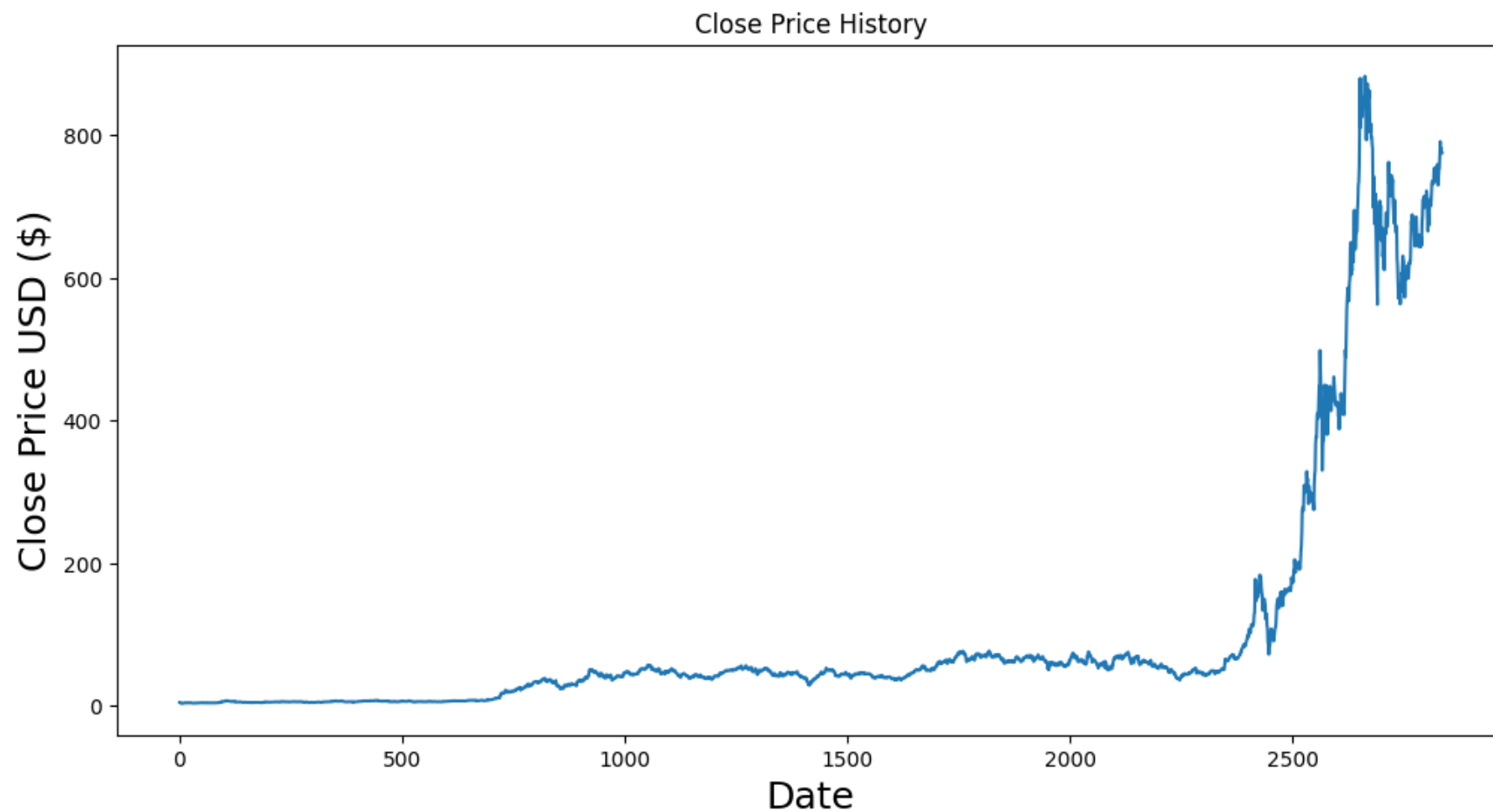


In [21]: ▶| 
```python
data = df.filter(['Close']).values
```

In [24]:  ▶|  `!pip install scikit-learn`

```
- ------------------------------------ 0.3/9.3 MB 933.3 kB/s eta 0:00:10
- ------------------------------------ 0.4/9.3 MB 919.0 kB/s eta 0:00:10
- ------------------------------------ 0.4/9.3 MB 926.8 kB/s eta 0:00:10
-- ----------------------------------- 0.5/9.3 MB 1.0 MB/s eta 0:00:09
-- ----------------------------------- 0.5/9.3 MB 954.7 kB/s eta 0:00:10
-- ----------------------------------- 0.6/9.3 MB 1.0 MB/s eta 0:00:09
-- ----------------------------------- 0.7/9.3 MB 1.0 MB/s eta 0:00:09
--- ---------------------------------- 0.7/9.3 MB 1.0 MB/s eta 0:00:09
--- ---------------------------------- 0.8/9.3 MB 1.1 MB/s eta 0:00:08
--- ---------------------------------- 0.9/9.3 MB 1.1 MB/s eta 0:00:08
--- ---------------------------------- 0.9/9.3 MB 1.1 MB/s eta 0:00:08
---- --------------------------------- 1.0/9.3 MB 1.1 MB/s eta 0:00:08
---- --------------------------------- 1.0/9.3 MB 1.1 MB/s eta 0:00:08
---- --------------------------------- 1.1/9.3 MB 1.1 MB/s eta 0:00:08
----- -------------------------------- 1.2/9.3 MB 1.2 MB/s eta 0:00:07
----- -------------------------------- 1.3/9.3 MB 1.2 MB/s eta 0:00:07
----- -------------------------------- 1.4/9.3 MB 1.2 MB/s eta 0:00:07
------ ------------------------------- 1.4/9.3 MB 1.2 MB/s eta 0:00:07
------ ------------------------------- 1.5/9.3 MB 1.3 MB/s eta 0:00:07
------ ------------------------------- 1.6/9.3 MB 1.3 MB/s eta 0:00:07
```

In [25]:  ▶|
```python
import sklearn as sl
```

In [26]:  ▶|
```python
import pandas as pd
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import MinMaxScaler
```

In [27]:  ▶|
```python
scaler = MinMaxScaler(feature_range=(0,1))
scaled_data = scaler.fit_transform(data)
```

In [28]:

```python
train_data = scaled_data[:int(len(scaled_data)*0.8)]
x_train = []
y_train = []

for i in range(60, len(train_data)):
    x_train.append(train_data[i-60:i, 0])
    y_train.append(train_data[i, 0])

x_train, y_train = np.array(x_train), np.array(y_train)
x_train = np.reshape(x_train, (x_train.shape[0], x_train.shape[1], 1))
```

In [29]: ▶

```python
model = Sequential()
model.add(LSTM(50, return_sequences=True, input_shape=(x_train.shape[1], 1)))
model.add(Dropout(0.2))
model.add(LSTM(50, return_sequences=True))
model.add(Dropout(0.2))
model.add(LSTM(50))
model.add(Dropout(0.2))
model.add(Dense(1))

model.compile(optimizer='adam', loss='mean_squared_error')

model.fit(x_train, y_train, epochs=50, batch_size=32)
```

```
Epoch 1/50
69/69 [==============================] - 12s 74ms/step - loss: 1.3705e-04
Epoch 2/50
69/69 [==============================] - 6s 86ms/step - loss: 3.4841e-05
Epoch 3/50
69/69 [==============================] - 8s 122ms/step - loss: 2.9038e-05
Epoch 4/50
69/69 [==============================] - 7s 99ms/step - loss: 2.9832e-05
Epoch 5/50
69/69 [==============================] - 7s 97ms/step - loss: 2.5794e-05
Epoch 6/50
69/69 [==============================] - 8s 109ms/step - loss: 2.2998e-05
Epoch 7/50
69/69 [==============================] - 8s 114ms/step - loss: 2.1408e-05
Epoch 8/50
69/69 [==============================] - 7s 100ms/step - loss: 2.2461e-05
Epoch 9/50
69/69 [==============================] - 7s 95ms/step - loss: 1.9927e-05
Epoch 10/50
69/69 [==============================] - 8s 114ms/step - loss: 2.0807e-05
Epoch 11/50
69/69 [==============================] - 7s 107ms/step - loss: 1.8953e-05
Epoch 12/50
69/69 [==============================] - 7s 103ms/step - loss: 1.7675e-05
Epoch 13/50
69/69 [==============================] - 6s 91ms/step - loss: 1.7119e-05
Epoch 14/50
69/69 [==============================] - 6s 94ms/step - loss: 1.8346e-05
Epoch 15/50
69/69 [==============================] - 6s 94ms/step - loss: 1.4986e-05
Epoch 16/50
69/69 [==============================] - 6s 92ms/step - loss: 2.1821e-05
Epoch 17/50
69/69 [==============================] - 7s 94ms/step - loss: 1.6994e-05
Epoch 18/50
69/69 [==============================] - 6s 92ms/step - loss: 1.4579e-05
Epoch 19/50
69/69 [==============================] - 7s 94ms/step - loss: 1.4869e-05
Epoch 20/50
69/69 [==============================] - 7s 104ms/step - loss: 1.5372e-05
Epoch 21/50
```

```
69/69 [==============================] - 7s 98ms/step - loss: 1.7082e-05
Epoch 22/50
69/69 [==============================] - 7s 97ms/step - loss: 1.3960e-05
Epoch 23/50
69/69 [==============================] - 6s 92ms/step - loss: 1.4991e-05
Epoch 24/50
69/69 [==============================] - 7s 101ms/step - loss: 1.4071e-05
Epoch 25/50
69/69 [==============================] - 7s 97ms/step - loss: 1.4062e-05
Epoch 26/50
69/69 [==============================] - 7s 96ms/step - loss: 1.4129e-05
Epoch 27/50
69/69 [==============================] - 7s 102ms/step - loss: 1.4131e-05
Epoch 28/50
69/69 [==============================] - 6s 91ms/step - loss: 1.4229e-05
Epoch 29/50
69/69 [==============================] - 7s 95ms/step - loss: 1.5120e-05
Epoch 30/50
69/69 [==============================] - 7s 95ms/step - loss: 1.4434e-05
Epoch 31/50
69/69 [==============================] - 7s 103ms/step - loss: 1.4135e-05
Epoch 32/50
69/69 [==============================] - 7s 101ms/step - loss: 1.4314e-05
Epoch 33/50
69/69 [==============================] - 6s 94ms/step - loss: 1.4394e-05
Epoch 34/50
69/69 [==============================] - 6s 94ms/step - loss: 1.3191e-05
Epoch 35/50
69/69 [==============================] - 6s 91ms/step - loss: 1.2400e-05
Epoch 36/50
69/69 [==============================] - 7s 95ms/step - loss: 1.2975e-05
Epoch 37/50
69/69 [==============================] - 6s 92ms/step - loss: 1.2830e-05
Epoch 38/50
69/69 [==============================] - 6s 94ms/step - loss: 1.2521e-05
Epoch 39/50
69/69 [==============================] - 7s 98ms/step - loss: 1.2876e-05
Epoch 40/50
69/69 [==============================] - 6s 91ms/step - loss: 1.1884e-05
Epoch 41/50
69/69 [==============================] - 7s 95ms/step - loss: 1.5174e-05
Epoch 42/50
```

```
69/69 [==============================] - 6s 92ms/step - loss: 1.3079e-05
Epoch 43/50
69/69 [==============================] - 7s 98ms/step - loss: 1.1705e-05
Epoch 44/50
69/69 [==============================] - 7s 98ms/step - loss: 1.1989e-05
Epoch 45/50
69/69 [==============================] - 7s 94ms/step - loss: 1.1333e-05
Epoch 46/50
69/69 [==============================] - 7s 97ms/step - loss: 1.2413e-05
Epoch 47/50
69/69 [==============================] - 6s 94ms/step - loss: 1.2226e-05
Epoch 48/50
69/69 [==============================] - 7s 100ms/step - loss: 1.1279e-05
Epoch 49/50
69/69 [==============================] - 6s 93ms/step - loss: 1.1877e-05
Epoch 50/50
69/69 [==============================] - 6s 93ms/step - loss: 1.2206e-05
```

Out[29]:  `<keras.callbacks.History at 0x2004e864280>`

In [30]:
```python
test_data = scaled_data[int(len(scaled_data)*0.8) - 60:]
x_test = []
y_test = data[int(len(data)*0.8):, :]

for i in range(60, len(test_data)):
    x_test.append(test_data[i-60:i, 0])

x_test = np.array(x_test)
x_test = np.reshape(x_test, (x_test.shape[0], x_test.shape[1], 1))

predictions = model.predict(x_test)
predictions = scaler.inverse_transform(predictions)
```
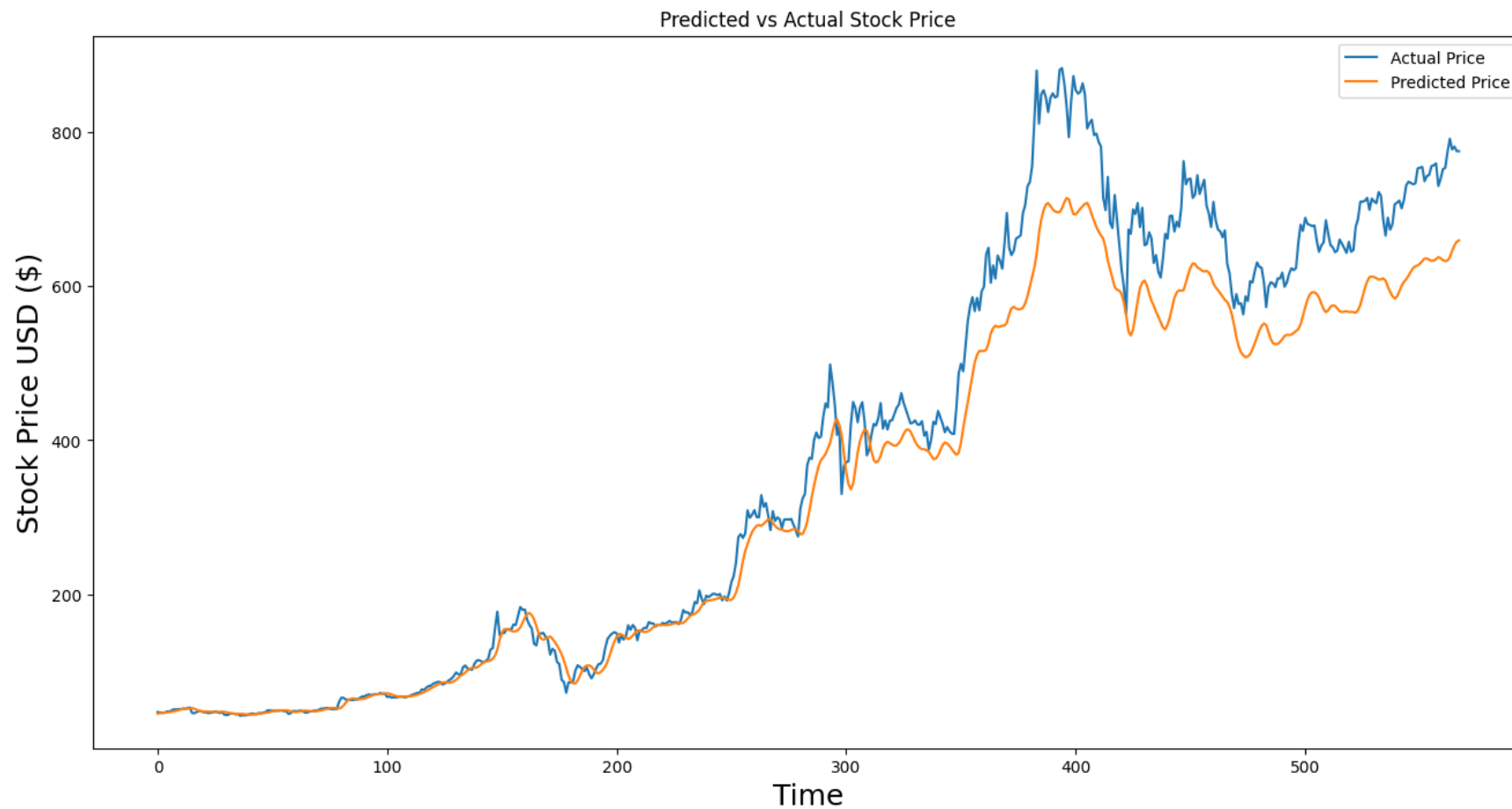
```
18/18 [==============================] - 4s 41ms/step
```

In [31]:  ▶|
```python
plt.figure(figsize=(16,8))
plt.title('Predicted vs Actual Stock Price')
plt.plot(y_test, label='Actual Price')
plt.plot(predictions, label='Predicted Price')
plt.xlabel('Time', fontsize=18)
plt.ylabel('Stock Price USD ($)', fontsize=18)
plt.legend()
plt.show()
```

In [ ]: