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Task 1: Stock Price Prediction using LSTM Model

Importing Libraries

In [1]:
```
import yfinance as yf
import pandas as pd
import numpy as np
import tensorflow as tf
import pandas_datareader as web
import os
from keras.models import Sequential
from keras.layers import LSTM, Dense
from sklearn.preprocessing import StandardScaler
import matplotlib.pyplot as plt
plt.style.use('fivethirtyeight')

pd.options.mode.chained_assignment = None
```

In [2]:
```
df = pd.read_csv('C:\\Users\\LENOVO\\OneDrive\\Documents\\TSLA.csv')
```

In [3]:
```
os.getcwd()
```

Out[3]: 'C:\\Users\\LENOVO'

In [4]:
```
os.chdir("C:\\Users\\LENOVO\\OneDrive\\Documents")
```

In [5]:
```
df = pd.read_csv('TSLA.csv')
```

In [6]:
```
df
```

Out[6]:

	Date	Open	High	Low	Close	Adj Close	Volume
0	2018-05-15	19.000668	19.130667	18.700001	18.945333	18.945333	142788000
1	2018-05-16	18.922001	19.254000	18.770666	19.098667	19.098667	85110000
2	2018-05-17	19.059999	19.279333	18.931334	18.969334	18.969334	66309000
3	2018-05-18	18.976667	18.976667	18.266666	18.454666	18.454666	108778500
4	2018-05-21	18.755333	19.432667	18.753332	18.966000	18.966000	137739000
...	...	...	...	...	...	...	...
1253	2023-05-08	173.720001	173.800003	169.190002	171.789993	171.789993	112249400
1254	2023-05-09	168.949997	169.820007	166.559998	169.149994	169.149994	88965000
1255	2023-05-10	172.550003	174.429993	166.679993	168.539993	168.539993	119840700
1256	2023-05-11	168.699997	173.570007	166.789993	172.080002	172.080002	103889900
1257	2023-05-12	176.070007	177.380005	167.229996	167.979996	167.979996	157577100

1258 rows × 7 columns

Visualize the Closing Price

In [7]:
```
plt.figure(figsize=(16,6))
plt.title('Closing Price of Stock')
plt.plot(df['Close'])
plt.xlabel('Time')
plt.ylabel('Closing Price ($)')
plt.show()
```

Create a new dataframe with only Close Column

In [8]:
```
data = df.filter(['Close'])
```

Convert the dataframe to numpy array

In [9]:
```
dataset = data.values
```

Train 80 percent of number of rows

In [10]:
```
training_data_len = int(np.ceil( len(dataset) *0.8 ))

training_data_len
```

Out[10]: 1007

Scale the data

In [11]:
```
scaler = StandardScaler()
scaled_data = scaler.fit_transform(dataset)
print("MEAN of processed data: ",scaled_data.mean())
print("Standard Deviation of processed data: ",scaled_data.std())
```

```
MEAN of processed data:  0.0
Standard Deviation of processed data:  1.0
```

Split the data into x_train and y_train

In [12]:
```
train_data = scaled_data[0:int(training_data_len), :]
```

In [13]:
```
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])
```

Convert the x_train and y_train to numpy arrays

In [14]:
```
x_train, y_train = np.array(x_train), np.array(y_train)
```

Reshape the data - x_train

In [15]:
```
x_train = np.reshape(x_train, (x_train.shape[0], x_train.shape[1], 1))
print(x_train.shape)
```

```
(947, 60, 1)
```

Build LSTM Model

In [16]:
```
model = Sequential()
model.add(LSTM(100, return_sequences=True, input_shape= (x_train.shape[1], 1)))
model.add(LSTM(100, return_sequences=False))
model.add(Dense(50))
model.add(Dense(25))
model.add(Dense(1))
```

Compile the model

In [17]:
```
model.compile(optimizer='adam', loss='mean_squared_error')
model.summary()
```

```
Model: "sequential"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 lstm (LSTM)                 (None, 60, 100)           40800

 lstm_1 (LSTM)               (None, 100)               80400

 dense (Dense)               (None, 50)                5050

 dense_1 (Dense)             (None, 25)                1275

 dense_2 (Dense)             (None, 1)                 26

=================================================================
Total params: 127,551
Trainable params: 127,551
Non-trainable params: 0
_________________________________________________________________
```

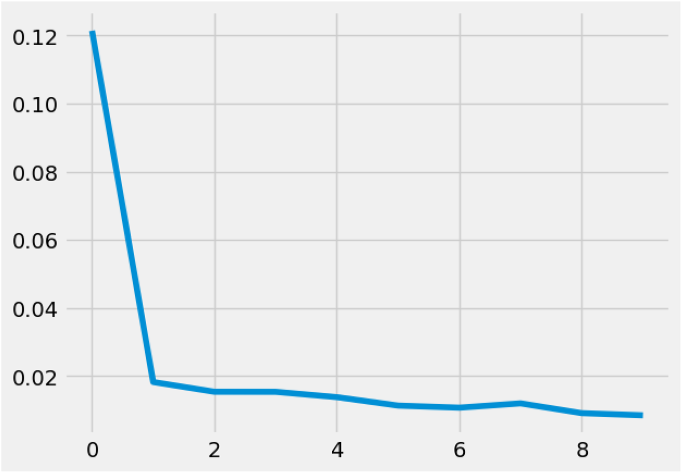
Train the model

In [18]:
```
history = model.fit(x_train, y_train, epochs=10, batch_size=32)
```

```
Epoch 1/10
30/30 [==============================] - 25s 179ms/step - loss: 0.1214
Epoch 2/10
30/30 [==============================] - 5s 160ms/step - loss: 0.0183
Epoch 3/10
30/30 [==============================] - 5s 154ms/step - loss: 0.0154
Epoch 4/10
30/30 [==============================] - 4s 146ms/step - loss: 0.0154
Epoch 5/10
30/30 [==============================] - 5s 151ms/step - loss: 0.0138
Epoch 6/10
30/30 [==============================] - 4s 147ms/step - loss: 0.0113
Epoch 7/10
30/30 [==============================] - 5s 166ms/step - loss: 0.0107
Epoch 8/10
30/30 [==============================] - 5s 160ms/step - loss: 0.0120
Epoch 9/10
30/30 [==============================] - 4s 130ms/step - loss: 0.0091
Epoch 10/10
30/30 [==============================] - 5s 153ms/step - loss: 0.0085
```

In [19]:
```
plt.plot(history.history['loss'])
```

Out[19]: [<matplotlib.lines.Line2D at 0x17fbd89f750>]



Create the data - x_test and y_test

In [20]:
```
test_data = scaled_data[training_data_len - 60: , :]
```

In [21]:
```
x_test = []
y_test = dataset[training_data_len:, :]
for i in range(60, len(test_data)):
    x_test.append(test_data[i-60:i, 0])
```

Convert the data to a numpy array

In [22]:
```
x_test = np.array(x_test)
```

Reshape the data - x_test

In [23]:
```
x_test = np.reshape(x_test, (x_test.shape[0], x_test.shape[1], 1 ))
```

Evaluate the model

In [24]:
```
train_loss = model.evaluate(x_train, y_train, verbose=0)
train_loss = model.evaluate(x_test, y_test, verbose=0)
print(f"Train Loss: {train_loss:.4f}")
print(f"Test Loss: {train_loss:.4f}")
```

```
Train Loss: 47550.5977
Test Loss: 47550.5977
```

Price Value Prediction

In [25]:
```
predictions = model.predict(x_test)
predictions = scaler.inverse_transform(predictions)
```

```
8/8 [==============================] - 4s 58ms/step
```

Calculate RMSE

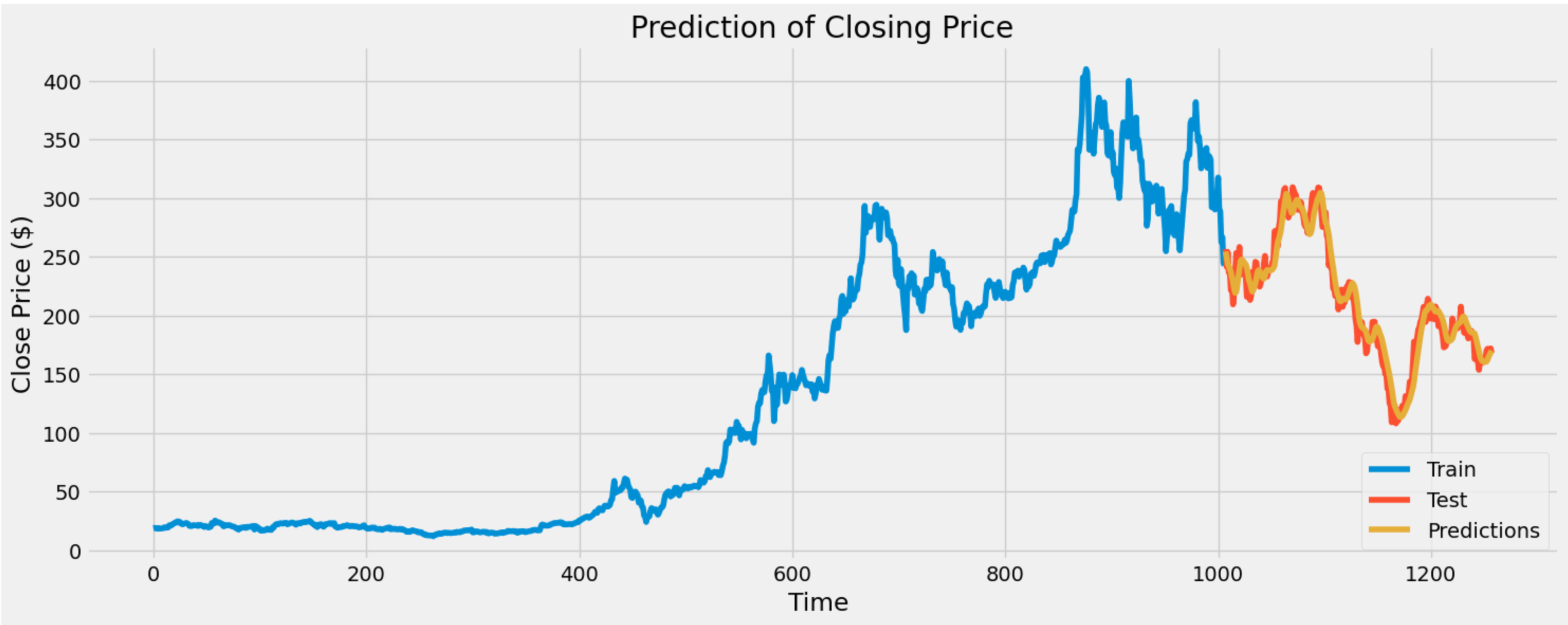
In [26]:
```
rmse = np.sqrt(np.mean(((predictions - y_test) ** 2)))
rmse
```

Out[26]: 12.016207234461927

Plot the data

In [27]:
```
train = data[:training_data_len]
valid = data[training_data_len:]
valid['Predictions'] = predictions
```

In [28]:
```
plt.figure(figsize=(16,6))
plt.title('Prediction of Closing Price')
plt.xlabel('Time ')
plt.ylabel('Close Price ($)')
plt.plot(train['Close'])
plt.plot(valid[['Close', 'Predictions']])
plt.legend(['Train', 'Test', 'Predictions'], loc='lower right')
plt.show()
```



Show the valid and predicted prices

In [29]:
```
valid
```

Out[29]:

	Close	Predictions
1007	256.529999	254.450226
1008	241.456665	249.151672
1009	253.869995	243.889145
1010	236.603333	242.330399
1011	236.473328	239.477356
...	...	...
1253	171.789993	162.366913
1254	169.149994	164.703659
1255	168.539993	166.800720
1256	172.080002	168.441315

1257	167.979996	170.140335

251 rows × 2 columns