lstm_single_stock

September 21, 2023

[52]:
```
import numpy as np
import pandas as pd
from lstm_functions import *
from lost_functions import *
from sklearn.preprocessing import MinMaxScaler
import matplotlib.pyplot as plt
from sklearn.metrics import mean_absolute_error, mean_squared_error
import yfinance as yf
```

1 This to try to tune and try to get a good prediction for Apple Stock

If i can get a good prediction for Apple Stock, then i can use the same model for other stocks
This notebook is mainly to tune the model and get a good prediction for Apple Stock

2 Reading and storing the Data

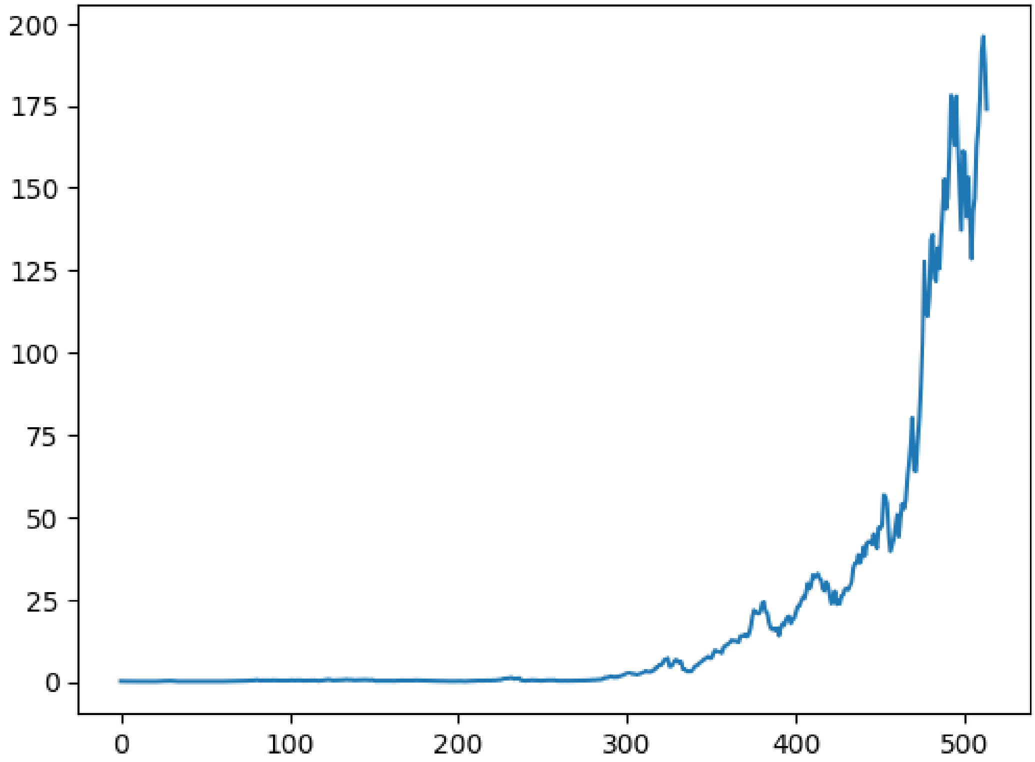
[53]:
```
xls = pd.ExcelFile('data/data_for_testing.xlsx')
all_data = {}
# This is too much data to load into memory at once
# for sheet in xls.sheet_names:
#     all_data[sheet] = pd.read_excel(xls, sheet_name=sheet)
for sheet in ["AAPL"]:
    data = pd.read_excel(xls, sheet_name=sheet).set_index('Date')
    # Resample to monthly data as a simple way to reduce the number of data␣
↪points
    # Daily data is too much and take too long to train
    new_data = data.resample('M').last().reset_index()
    # new_data = new_data[new_data['Date'] < '2019-12-01']
    all_data[sheet] = new_data
```

[54]:
```
all_data["AAPL"].columns
```

[54]:
```
Index(['Date', 'Open', 'High', 'Low', 'Close', 'Adj Close', 'Volume', 'Sector',
       'Ticker'],
      dtype='object')
```

[55]:
```python
all_data["AAPL"]["Open"].plot()
```

[55]: <Axes: >



[56]:
```python
final_importance_values = {}
final_predictions = {}
# 30 is not a good number of batches, but it's a start for testing
# 60 is a good number of batches, but it takes a long time to train
time_steps = 12
features = 6
```

[57]:
```python
def evaluate_model(y_train, train_predictions, y_test, test_predictions, ticker, feature):
    train_mae = mean_absolute_error(y_train, train_predictions)
    test_mae = mean_absolute_error(y_test, test_predictions)

    train_rmse = mean_squared_error(y_train, train_predictions, squared=False)
    test_rmse = mean_squared_error(y_test, test_predictions, squared=False)

    print(f"\nEvaluation for {ticker} on {feature}:")
    print(f"Training MAE: {train_mae}, Testing MAE: {test_mae}")
    print(f"Training RMSE: {train_rmse}, Testing RMSE: {test_rmse}\n")
```

```
    return train_mae, test_mae, train_rmse, test_rmse
```

[58]:
```
def plot_predictions(y_train, train_predictions, y_test, test_predictions,␣
↪ticker, feature):
    plt.figure(figsize=(14,7))
    plt.plot(y_train, label="Actual Train Values", color='blue')
    plt.plot(train_predictions, label="Predicted Train Values", color='blue',␣
↪linestyle='dashed')
    plt.plot(np.arange(len(y_train), len(y_train) + len(y_test)), y_test,␣
↪label="Actual Test Values", color='red')
    plt.plot(np.arange(len(y_train), len(y_train) + len(y_test)),␣
↪test_predictions, label="Predicted Test Values", color='red',␣
↪linestyle='dashed')
    plt.title(f"{ticker} {feature} - Actual vs Predicted Values")
    plt.legend()
    plt.show()
```

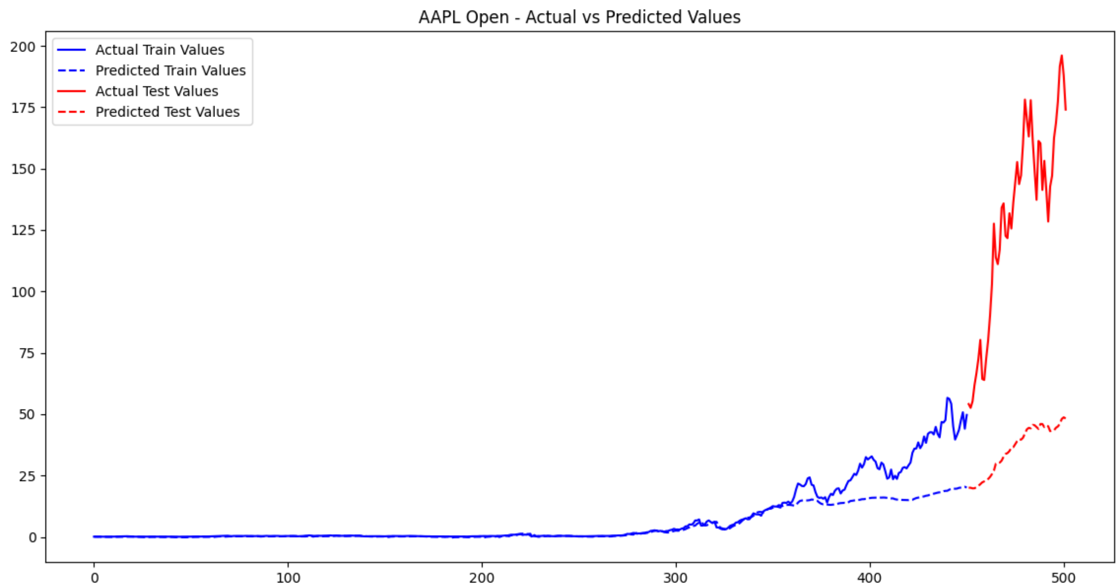
[63]:
```
ticker = "AAPL"
data = all_data[ticker]

# Drop non-numeric columns
data = data.drop(columns=['Sector', 'Ticker', 'Date'])  # Assuming 'Date' is␣
↪the index
lstm_model = LstmBuilder(time_step=time_steps, loss=huber_loss)
model = lstm_model.create_model(features=features)
scaler = MinMaxScaler()
normalized_data = scaler.fit_transform(data)
X, y = lstm_model.create_sequences(normalized_data)
X_train, X_test, y_train, y_test = lstm_model.split_data(X,y, size=0.9)
print(len(X_train), len(X_test))
print()

print("Working on: " + ticker)
model.fit(X_train, y_train, epochs=200, batch_size=16, validation_split=0.2,␣
↪verbose=0)

# Predict the next day value
last_days = normalized_data[-time_steps:].reshape(1, time_steps, features)
prediction_next_day = model.predict(last_days)
prediction_next_day_actual = scaler.inverse_transform(prediction_next_day)
final_predictions[ticker] = prediction_next_day_actual.flatten()
print(f"Predicted value for {ticker}: {prediction_next_day_actual.flatten()}")


# Extracting importance
dense_weights = model.layers[-1].get_weights()[0]
```

```python
# Think about to use sum or mean and to use abs() or not
feature_weights = dense_weights.sum(axis=0)
weighted_importance = prediction_next_day.flatten() * feature_weights
final_importance_value = np.sum(weighted_importance)  # Final importance as a␣
↪single value
print(f"Importance value for {ticker}: {final_importance_value}")

# Store the importance value in the dictionary
final_importance_values[ticker] = final_importance_value

# Predict for both training and testing data
train_predictions = scaler.inverse_transform(model.predict(X_train))
test_predictions = scaler.inverse_transform(model.predict(X_test))
y_train = scaler.inverse_transform(y_train)
y_test = scaler.inverse_transform(y_test)
features_list = ['Open', 'High', 'Low', 'Close', 'Adj Close', 'Volume']
for feature_index, feature_name in enumerate(features_list):
    # Extracting data for the specific feature
    y_train_feature = y_train[:, feature_index]
    y_test_feature = y_test[:, feature_index]
    train_predictions_feature = train_predictions[:, feature_index]
    test_predictions_feature = test_predictions[:, feature_index]

    # Evaluating the model for this feature
    evaluate_model(y_train_feature, train_predictions_feature, y_test_feature,␣
↪test_predictions_feature, ticker, feature_name)

    # Plotting the results for this feature
    plot_predictions(y_train_feature, train_predictions_feature,␣
↪y_test_feature, test_predictions_feature, ticker, feature_name)
```

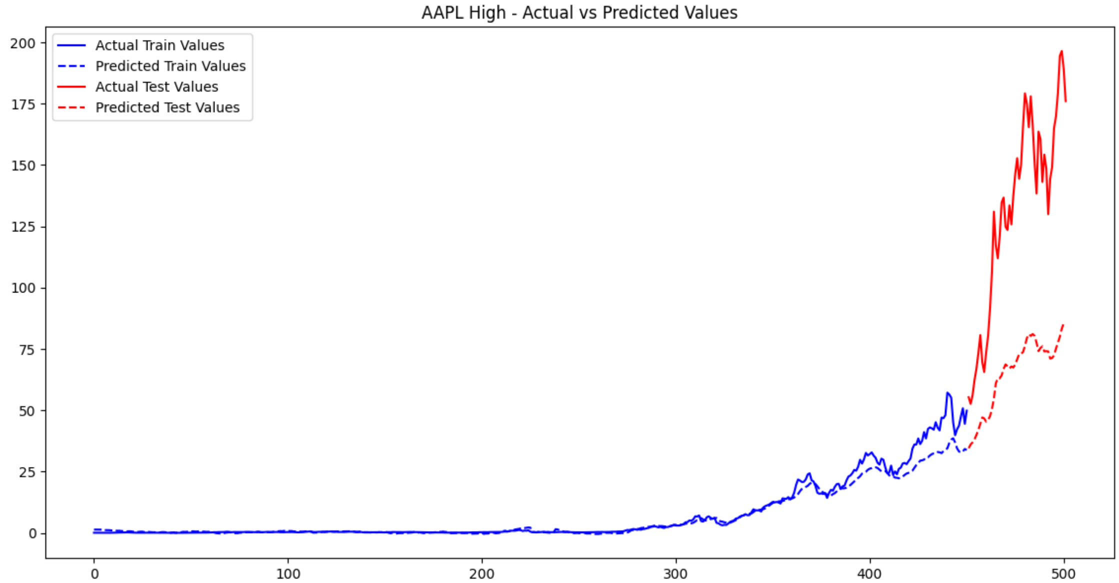
```
WARNING:tensorflow:Layer lstm_11 will not use cuDNN kernels since it doesn't
meet the criteria. It will use a generic GPU kernel as fallback when running on
GPU.
451 51

Working on: AAPL

2023-09-21 11:03:02.300188: I
tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:114]
Plugin optimizer for device_type GPU is enabled.
2023-09-21 11:03:07.084677: I
tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:114]
Plugin optimizer for device_type GPU is enabled.

1/1 [==============================] - 0s 151ms/step

2023-09-21 11:13:55.145492: I
```

```
tensorflow/core/grappler/optimizers/custom_graph_optimizer_registry.cc:114]
Plugin optimizer for device_type GPU is enabled.
```

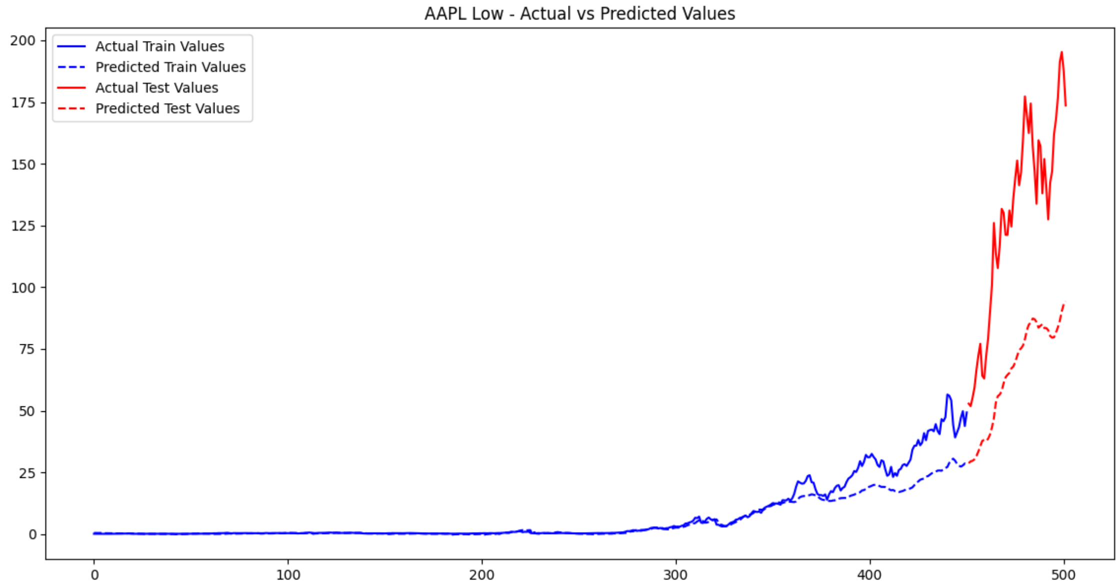
```
Predicted value for AAPL: [ 4.7710800e+01  8.4251534e+01  9.3983772e+01
1.3554959e+02
  1.4138560e+02 -3.8817344e+09]
Importance value for AAPL: -0.6789854764938354
15/15 [==============================] - 0s 23ms/step
2/2 [==============================] - 0s 60ms/step

Evaluation for AAPL on Open:
Training MAE: 3.065912569682021, Testing MAE: 93.79841823203891
Training RMSE: 7.534499144172082, Testing RMSE: 98.83895807107251
```




```
Evaluation for AAPL on High:
Training MAE: 1.4921901893178353, Testing MAE: 66.18082704731063
Training RMSE: 3.424351994024248, Testing RMSE: 71.33353901417269
```

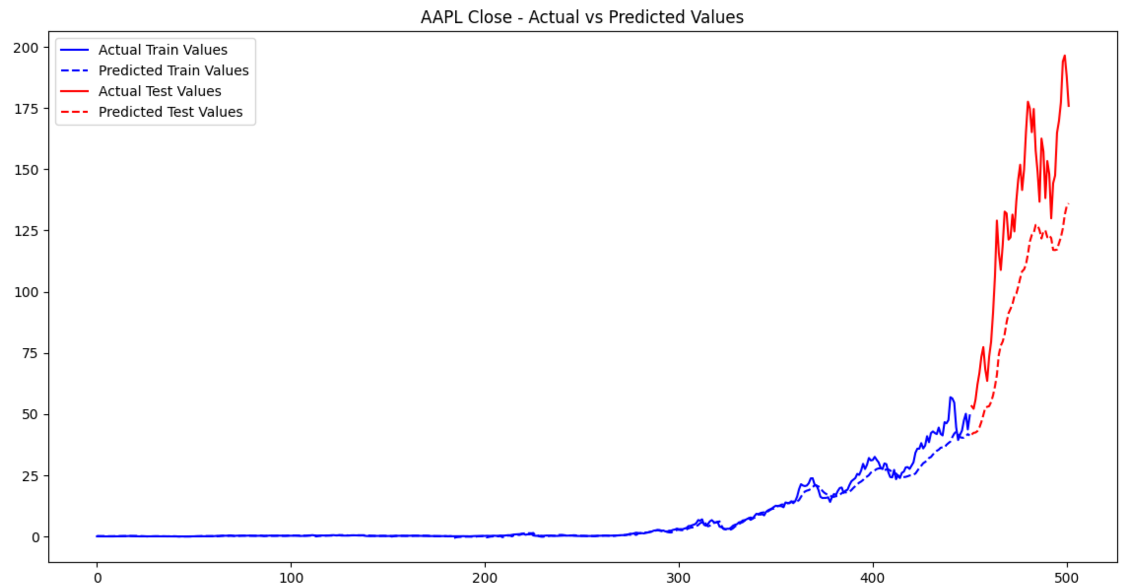



```
Evaluation for AAPL on Low:
Training MAE: 2.3192626777245198, Testing MAE: 62.7744847091974
Training RMSE: 5.474968672548447, Testing RMSE: 66.38838468999661
```

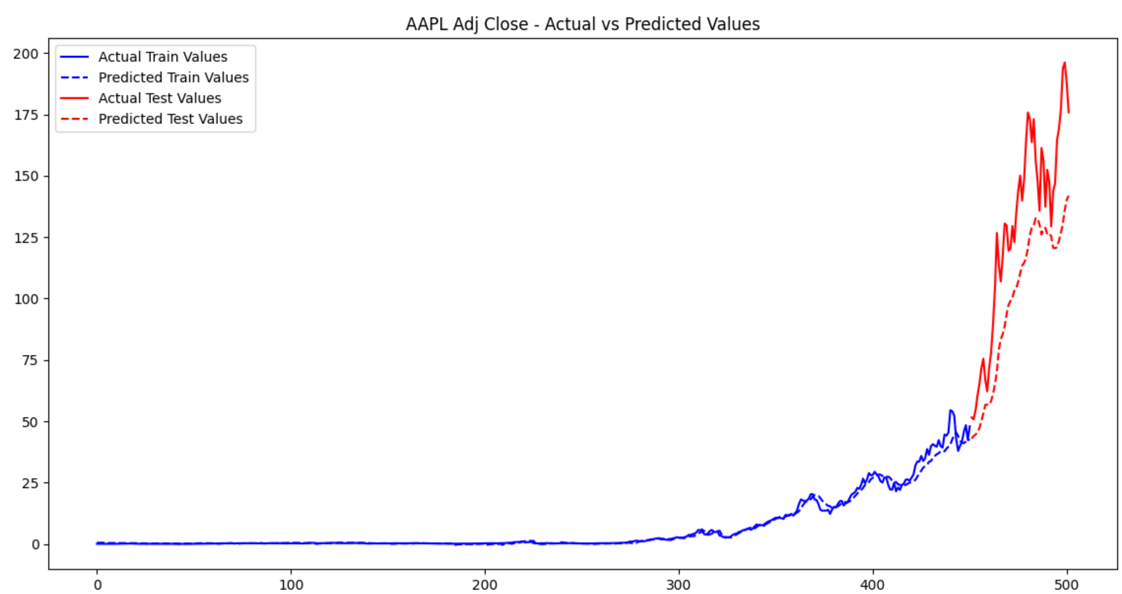



```
Evaluation for AAPL on Close:
```

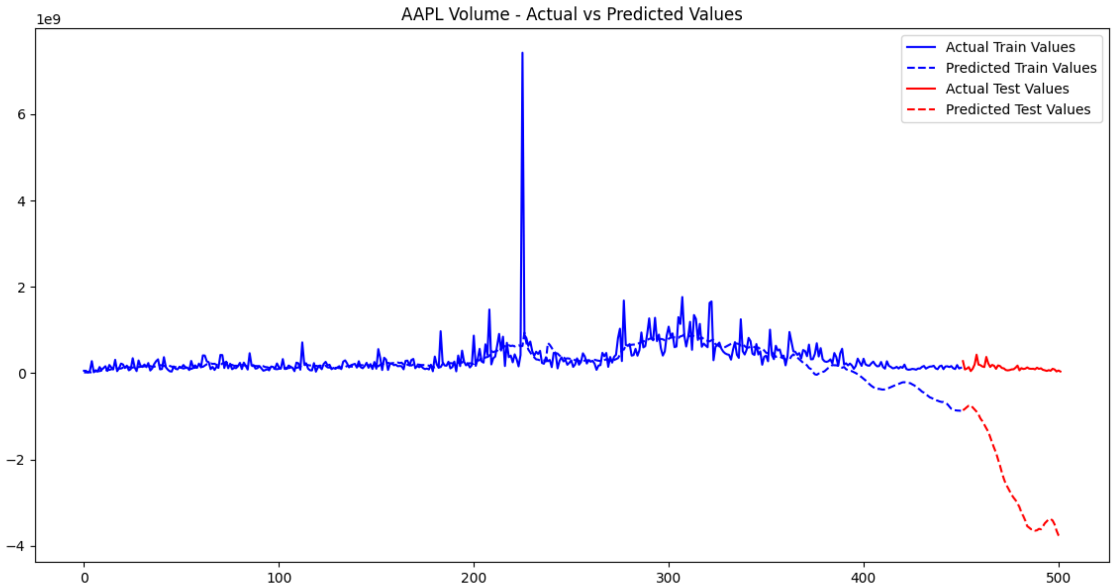
```
Training MAE: 1.0459353596471794, Testing MAE: 35.04864314958161
Training RMSE: 2.5116907449119723, Testing RMSE: 38.31483580944411
```




```
Evaluation for AAPL on Adj Close:
Training MAE: 0.7506652387783671, Testing MAE: 29.296613506242338
Training RMSE: 1.7014377047259055, Testing RMSE: 32.90011570807091
```



```
Evaluation for AAPL on Volume:
Training MAE: 213002241.0044346, Testing MAE: 2595003273.529412
Training RMSE: 437655889.3112838, Testing RMSE: 2800395044.09263
```



[60]:
```
final_importance_values
```

[60]:
```
{'AAPL': -1.2869408}
```