2347126-nndl-lab6

November 8, 2024

[14]:
```python
import pandas as pd
import numpy as np
from sklearn.preprocessing import MinMaxScaler
import matplotlib.pyplot as plt

# Load the dataset
data = pd.read_csv('/content/HistoricalQuotes.csv')

# Remove leading or trailing whitespace from column names
data.columns = data.columns.str.strip()

# Remove the dollar sign ('$') and convert to numeric
data['Close/Last'] = data['Close/Last'].replace({'\$': '', ',': ''}, regex=True)
data['Close'] = pd.to_numeric(data['Close/Last'], errors='coerce')

# Drop rows with NaN values in 'Close'
data.dropna(subset=['Close'], inplace=True)

# Check if data is empty after cleaning
if not data.empty:
    # Keep only the 'Close' column
    data = data[['Close']]

    # Normalize data using Min-Max Scaling
    scaler = MinMaxScaler(feature_range=(0, 1))
    data_scaled = scaler.fit_transform(data)

    # Split data into training and testing sets (80% training, 20% testing)
    train_size = int(len(data_scaled) * 0.8)
    train_data, test_data = data_scaled[:train_size], data_scaled[train_size:]

    # Confirm successful preprocessing
    print("Data preprocessing complete. Training and testing sets prepared.")
else:
    print("Error: DataFrame is empty after cleaning. Check the CSV file or␣
 ↪conversion process.")
```

```
Data preprocessing complete. Training and testing sets prepared.
```

[15]:
```python
def create_sequences(data, sequence_length=60):
    x, y = [], []
    for i in range(sequence_length, len(data)):
        x.append(data[i-sequence_length:i, 0])
        y.append(data[i, 0])
    return np.array(x), np.array(y)

sequence_length = 60
x_train, y_train = create_sequences(train_data, sequence_length)
x_test, y_test = create_sequences(test_data, sequence_length)

# Reshape for RNN input
x_train = np.reshape(x_train, (x_train.shape[0], x_train.shape[1], 1))
x_test = np.reshape(x_test, (x_test.shape[0], x_test.shape[1], 1))
```

[16]:
```python
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import SimpleRNN, Dense

# Build the RNN model
model = Sequential()
model.add(SimpleRNN(50, input_shape=(x_train.shape[1], 1),␣
 ↪return_sequences=False))
model.add(Dense(1))

# Compile the model
model.compile(optimizer='adam', loss='mean_squared_error')
```

```
/usr/local/lib/python3.10/dist-packages/keras/src/layers/rnn/rnn.py:204:
UserWarning: Do not pass an `input_shape`/`input_dim` argument to a layer. When
using Sequential models, prefer using an `Input(shape)` object as the first
layer in the model instead.
  super().__init__(**kwargs)
```

[17]:
```python
# Train the model
history = model.fit(x_train, y_train, epochs=50, batch_size=32,␣
 ↪validation_data=(x_test, y_test))
```

```
Epoch 1/50
62/62                 3s 26ms/step -
loss: 0.0228 - val_loss: 2.3402e-04
Epoch 2/50
62/62                 2s 11ms/step -
loss: 4.4779e-04 - val_loss: 1.9020e-04
Epoch 3/50
62/62                 1s 11ms/step -
loss: 4.0582e-04 - val_loss: 7.2563e-05
Epoch 4/50
```

```
62/62            1s 11ms/step -
loss: 3.2702e-04 - val_loss: 6.3433e-05
Epoch 5/50
62/62            1s 11ms/step -
loss: 2.6307e-04 - val_loss: 1.1201e-04
Epoch 6/50
62/62            1s 11ms/step -
loss: 2.6136e-04 - val_loss: 5.6937e-05
Epoch 7/50
62/62            1s 11ms/step -
loss: 1.9751e-04 - val_loss: 3.8609e-05
Epoch 8/50
62/62            1s 11ms/step -
loss: 2.1429e-04 - val_loss: 7.2016e-05
Epoch 9/50
62/62            1s 11ms/step -
loss: 1.9730e-04 - val_loss: 6.2465e-05
Epoch 10/50
62/62            1s 11ms/step -
loss: 1.6318e-04 - val_loss: 3.5161e-05
Epoch 11/50
62/62            1s 11ms/step -
loss: 1.7433e-04 - val_loss: 6.2136e-05
Epoch 12/50
62/62            1s 19ms/step -
loss: 1.6702e-04 - val_loss: 2.8318e-05
Epoch 13/50
62/62            1s 19ms/step -
loss: 1.4836e-04 - val_loss: 2.9308e-05
Epoch 14/50
62/62            1s 18ms/step -
loss: 1.4636e-04 - val_loss: 2.2397e-05
Epoch 15/50
62/62            1s 11ms/step -
loss: 1.5472e-04 - val_loss: 5.9515e-05
Epoch 16/50
62/62            1s 11ms/step -
loss: 1.6192e-04 - val_loss: 2.1049e-05
Epoch 17/50
62/62            1s 11ms/step -
loss: 1.4223e-04 - val_loss: 2.8665e-05
Epoch 18/50
62/62            1s 11ms/step -
loss: 1.1607e-04 - val_loss: 5.0848e-05
Epoch 19/50
62/62            1s 12ms/step -
loss: 1.4477e-04 - val_loss: 3.8207e-05
Epoch 20/50
```

```
62/62            1s 11ms/step -
loss: 1.1458e-04 - val_loss: 2.8047e-05
Epoch 21/50
62/62            1s 11ms/step -
loss: 1.1103e-04 - val_loss: 6.0073e-05
Epoch 22/50
62/62            1s 11ms/step -
loss: 1.3258e-04 - val_loss: 1.6566e-05
Epoch 23/50
62/62            1s 11ms/step -
loss: 1.1418e-04 - val_loss: 2.2620e-05
Epoch 24/50
62/62            1s 11ms/step -
loss: 1.1458e-04 - val_loss: 1.5728e-05
Epoch 25/50
62/62            1s 12ms/step -
loss: 9.3263e-05 - val_loss: 1.7518e-05
Epoch 26/50
62/62            1s 16ms/step -
loss: 1.1962e-04 - val_loss: 1.4893e-05
Epoch 27/50
62/62            1s 18ms/step -
loss: 9.6039e-05 - val_loss: 1.4059e-05
Epoch 28/50
62/62            1s 20ms/step -
loss: 1.1811e-04 - val_loss: 1.8345e-05
Epoch 29/50
62/62            2s 11ms/step -
loss: 8.4541e-05 - val_loss: 2.2607e-05
Epoch 30/50
62/62            1s 12ms/step -
loss: 1.0239e-04 - val_loss: 2.0848e-05
Epoch 31/50
62/62            1s 11ms/step -
loss: 1.0280e-04 - val_loss: 1.3772e-05
Epoch 32/50
62/62            1s 11ms/step -
loss: 9.6618e-05 - val_loss: 1.5245e-05
Epoch 33/50
62/62            1s 12ms/step -
loss: 9.2178e-05 - val_loss: 3.8722e-05
Epoch 34/50
62/62            1s 12ms/step -
loss: 9.4680e-05 - val_loss: 1.2507e-05
Epoch 35/50
62/62            1s 12ms/step -
loss: 8.4135e-05 - val_loss: 1.3960e-05
Epoch 36/50
```

```
62/62              1s 11ms/step -
loss: 8.2080e-05 - val_loss: 1.1913e-05
Epoch 37/50
62/62              1s 15ms/step -
loss: 8.5707e-05 - val_loss: 1.1677e-05
Epoch 38/50
62/62              1s 18ms/step -
loss: 8.2080e-05 - val_loss: 1.4831e-05
Epoch 39/50
62/62              1s 19ms/step -
loss: 7.8692e-05 - val_loss: 1.4159e-05
Epoch 40/50
62/62              1s 13ms/step -
loss: 8.6287e-05 - val_loss: 1.6469e-05
Epoch 41/50
62/62              1s 11ms/step -
loss: 8.1763e-05 - val_loss: 1.1151e-05
Epoch 42/50
62/62              1s 12ms/step -
loss: 9.9679e-05 - val_loss: 1.1636e-05
Epoch 43/50
62/62              1s 12ms/step -
loss: 8.5460e-05 - val_loss: 1.0548e-05
Epoch 44/50
62/62              1s 11ms/step -
loss: 7.3481e-05 - val_loss: 1.0647e-05
Epoch 45/50
62/62              1s 11ms/step -
loss: 7.0585e-05 - val_loss: 1.1856e-05
Epoch 46/50
62/62              1s 12ms/step -
loss: 7.7251e-05 - val_loss: 2.0255e-05
Epoch 47/50
62/62              1s 11ms/step -
loss: 7.7211e-05 - val_loss: 1.0190e-05
Epoch 48/50
62/62              1s 12ms/step -
loss: 6.5198e-05 - val_loss: 2.6223e-05
Epoch 49/50
62/62              1s 11ms/step -
loss: 7.7584e-05 - val_loss: 1.0957e-05
Epoch 50/50
62/62              1s 12ms/step -
loss: 7.4310e-05 - val_loss: 1.0442e-05
```

[18]:

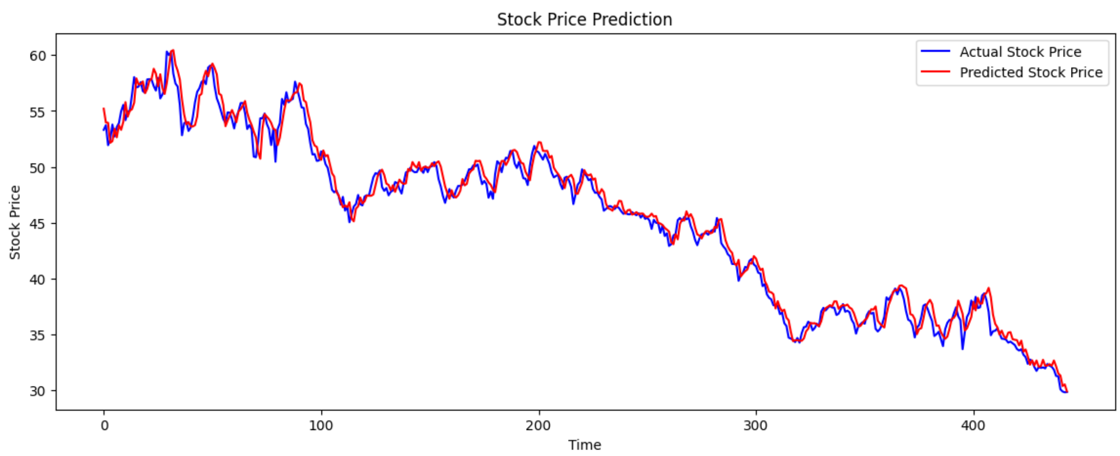
```python
# Make predictions
predicted_prices = model.predict(x_test)
```

```
predicted_prices = scaler.inverse_transform(predicted_prices)  # Convert back␣
 ↪to original scale

# Convert test data back to original scale for comparison
y_test = scaler.inverse_transform([y_test])

# Plot the predicted vs. actual stock prices
plt.figure(figsize=(14,5))
plt.plot(y_test[0], color='blue', label='Actual Stock Price')
plt.plot(predicted_prices, color='red', label='Predicted Stock Price')
plt.title('Stock Price Prediction')
plt.xlabel('Time')
plt.ylabel('Stock Price')
plt.legend()
plt.show()
```

```
14/14            0s 20ms/step
```



[19]:
```
from sklearn.metrics import mean_absolute_error, mean_squared_error

mae = mean_absolute_error(y_test[0], predicted_prices)
rmse = np.sqrt(mean_squared_error(y_test[0], predicted_prices))

print(f'Mean Absolute Error: {mae}')
print(f'Root Mean Squared Error: {rmse}')
```

```
Mean Absolute Error: 0.7329211939837482
Root Mean Squared Error: 0.9609202186488014
```