

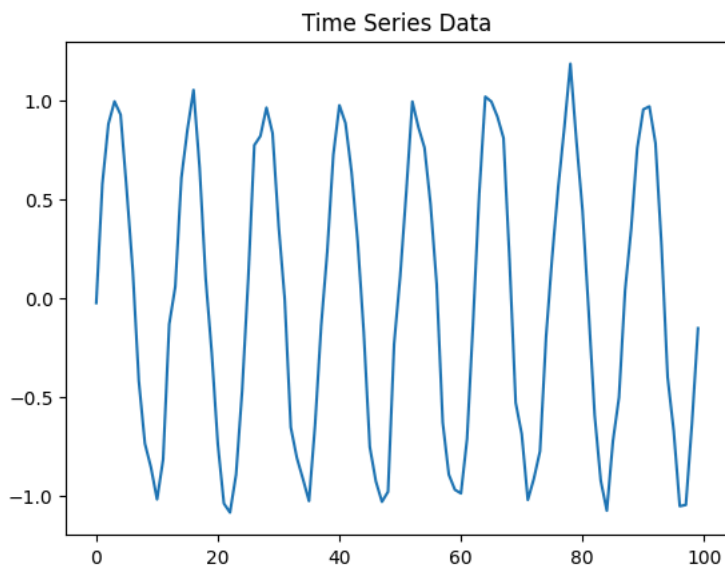
```
pip install tensorflow numpy pandas matplotlib
```

```
Requirement already satisfied: tensorflow in /usr/local/lib/python3.10/dist-packages (2.17.1)
Requirement already satisfied: numpy in /usr/local/lib/python3.10/dist-packages (1.26.4)
Requirement already satisfied: pandas in /usr/local/lib/python3.10/dist-packages (2.2.2)
Requirement already satisfied: matplotlib in /usr/local/lib/python3.10/dist-packages (3.8.0)
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Requirement already satisfied: libclang>=13.0.0 in /usr/local/lib/python3.10/dist-packages (from tensorflow) (18.1.1)
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Requirement already satisfied: opt-einsum>=2.3.2 in /usr/local/lib/python3.10/dist-packages (from tensorflow) (3.4.0)
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Requirement already satisfied: protobuf!=4.21.0,!4.21.1,!4.21.2,!4.21.3,!4.21.4,!4.21.5,<5.0.0dev,>=3.20.3 in /usr/local/lib/python3.10/dist-packages (from tensorflow) (4.21.3)
Requirement already satisfied: requests<3,>=2.21.0 in /usr/local/lib/python3.10/dist-packages (from tensorflow) (2.32.3)
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Requirement already satisfied: wrapt>=1.11.0 in /usr/local/lib/python3.10/dist-packages (from tensorflow) (1.17.0)
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Requirement already satisfied: tensorboard<2.18,>=2.17 in /usr/local/lib/python3.10/dist-packages (from tensorflow) (2.17.1)
Requirement already satisfied: keras>=3.2.0 in /usr/local/lib/python3.10/dist-packages (from tensorflow) (3.5.0)
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Requirement already satisfied: markdown>=2.6.8 in /usr/local/lib/python3.10/dist-packages (from tensorboard<2.18,>=2.17->tensorflow) (3.7)
Requirement already satisfied: tensorboard-data-server<0.8.0,>=0.7.0 in /usr/local/lib/python3.10/dist-packages (from tensorboard<2.18,>=2.17->tensorflow) (0.7.0)
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```

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

```
data = pd.DataFrame({'value': np.sin(np.linspace(0, 50, 100)) + np.random.normal(0, 0.1, 100)})
```

```
plt.plot(data['value'])
plt.title("Time Series Data")
plt.show()
```




```
scaler = MinMaxScaler(feature_range=(0, 1))
scaled_data = scaler.fit_transform(data[['value']])
```

```
def create_sequences(data, sequence_length):
    # Indent the lines within the function body
    sequences, labels = [], []
    for i in range(len(data) - sequence_length):
        sequences.append(data[i:i + sequence_length])
        labels.append(data[i + sequence_length])
    return np.array(sequences), np.array(labels)
```

```
sequence_length = 10
X, y = create_sequences(scaled_data, sequence_length)
```

```
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=42)
```

```
model = Sequential()
model.add(LSTM(50, activation='relu', input_shape=(X_train.shape[1], X_train.shape[2])))
model.add(Dense(1))
```

 /usr/local/lib/python3.10/dist-packages/keras/src/layers/rnn/rnn.py:204: UserWarning: Do not pass an `input_shape`/`input_dim` argument
super().__init__(**kwargs)

```
model.compile(optimizer='adam', loss='mse')
```

```
history = model.fit(X_train, y_train, validation_data=(X_test, y_test), epochs=20, batch_size=16)
```



```
Epoch 1/20
5/5 ————— 3s 109ms/step - loss: 0.2987 - val_loss: 0.2729
Epoch 2/20
5/5 ————— 0s 21ms/step - loss: 0.2171 - val_loss: 0.2355
Epoch 3/20
5/5 ————— 0s 17ms/step - loss: 0.2049 - val_loss: 0.1982
Epoch 4/20
5/5 ————— 0s 24ms/step - loss: 0.1611 - val_loss: 0.1649
Epoch 5/20
5/5 ————— 0s 21ms/step - loss: 0.1185 - val_loss: 0.1394
Epoch 6/20
5/5 ————— 0s 18ms/step - loss: 0.1122 - val_loss: 0.1289
Epoch 7/20
5/5 ————— 0s 22ms/step - loss: 0.1095 - val_loss: 0.1238
Epoch 8/20
5/5 ————— 0s 23ms/step - loss: 0.1115 - val_loss: 0.1160
Epoch 9/20
5/5 ————— 0s 24ms/step - loss: 0.0991 - val_loss: 0.1113
Epoch 10/20
5/5 ————— 0s 19ms/step - loss: 0.1007 - val_loss: 0.1051
Epoch 11/20
5/5 ————— 0s 19ms/step - loss: 0.0932 - val_loss: 0.0968
Epoch 12/20
```

```

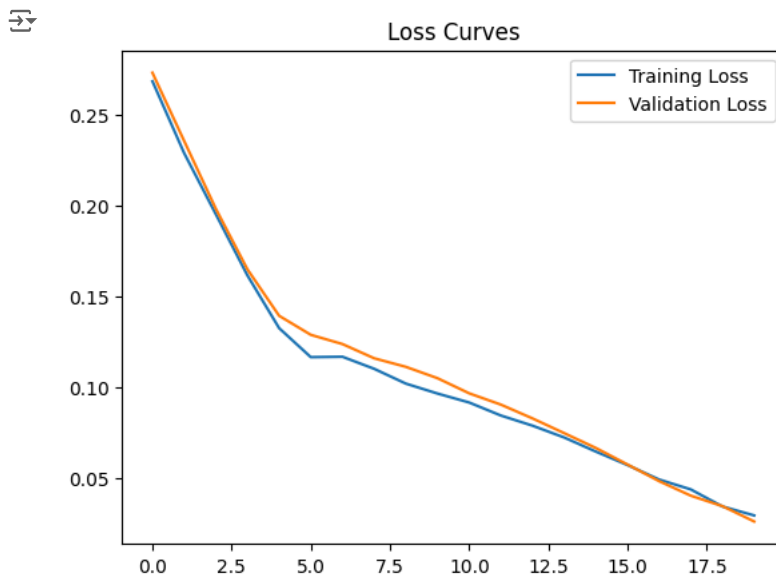
5/5 ————— 0s 24ms/step - loss: 0.0820 - val_loss: 0.0906
Epoch 13/20
5/5 ————— 0s 16ms/step - loss: 0.0806 - val_loss: 0.0830
Epoch 14/20
5/5 ————— 0s 18ms/step - loss: 0.0786 - val_loss: 0.0749
Epoch 15/20
5/5 ————— 0s 12ms/step - loss: 0.0572 - val_loss: 0.0667
Epoch 16/20
5/5 ————— 0s 16ms/step - loss: 0.0592 - val_loss: 0.0577
Epoch 17/20
5/5 ————— 0s 12ms/step - loss: 0.0498 - val_loss: 0.0485
Epoch 18/20
5/5 ————— 0s 16ms/step - loss: 0.0440 - val_loss: 0.0405
Epoch 19/20
5/5 ————— 0s 12ms/step - loss: 0.0342 - val_loss: 0.0347
Epoch 20/20
5/5 ————— 0s 13ms/step - loss: 0.0295 - val_loss: 0.0263

```

```

plt.plot(history.history['loss'], label='Training Loss')
plt.plot(history.history['val_loss'], label='Validation Loss')
plt.legend()
plt.title("Loss Curves")
plt.show()

```



```

y_pred = model.predict(X_test)
y_pred = scaler.inverse_transform(y_pred)
y_test_original = scaler.inverse_transform(y_test.reshape(-1, 1))

```

```

1/1 ————— 0s 153ms/step

```

```

plt.plot(y_test_original, label='True Values')
plt.plot(y_pred, label='Predicted Values') # Removed the extra space at the beginning of this line
plt.legend()
plt.title("True vs Predicted")
plt.show()

```

