melbourne-dt

June 21, 2024

[9]:
```
pip install tensorflow pandas matplotlib seaborn
```

Requirement already satisfied: tensorflow in /usr/local/lib/python3.10/dist-
packages (2.15.0)
Requirement already satisfied: pandas in /usr/local/lib/python3.10/dist-packages
(2.0.3)
Requirement already satisfied: matplotlib in /usr/local/lib/python3.10/dist-
packages (3.7.1)
Requirement already satisfied: seaborn in /usr/local/lib/python3.10/dist-
packages (0.13.1)
Requirement already satisfied: absl-py>=1.0.0 in /usr/local/lib/python3.10/dist-
packages (from tensorflow) (1.4.0)
Requirement already satisfied: astunparse>=1.6.0 in
/usr/local/lib/python3.10/dist-packages (from tensorflow) (1.6.3)
Requirement already satisfied: flatbuffers>=23.5.26 in
/usr/local/lib/python3.10/dist-packages (from tensorflow) (24.3.25)
Requirement already satisfied: gast!=0.5.0,!=0.5.1,!=0.5.2,>=0.2.1 in
/usr/local/lib/python3.10/dist-packages (from tensorflow) (0.5.4)
Requirement already satisfied: google-pasta>=0.1.1 in
/usr/local/lib/python3.10/dist-packages (from tensorflow) (0.2.0)
Requirement already satisfied: h5py>=2.9.0 in /usr/local/lib/python3.10/dist-
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Requirement already satisfied: libclang>=13.0.0 in
/usr/local/lib/python3.10/dist-packages (from tensorflow) (18.1.1)
Requirement already satisfied: ml-dtypes~=0.2.0 in
/usr/local/lib/python3.10/dist-packages (from tensorflow) (0.2.0)
Requirement already satisfied: numpy<2.0.0,>=1.23.5 in
/usr/local/lib/python3.10/dist-packages (from tensorflow) (1.25.2)
Requirement already satisfied: opt-einsum>=2.3.2 in
/usr/local/lib/python3.10/dist-packages (from tensorflow) (3.3.0)
Requirement already satisfied: packaging in /usr/local/lib/python3.10/dist-
packages (from tensorflow) (24.1)
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) (3.20.3)
Requirement already satisfied: setuptools in /usr/local/lib/python3.10/dist-
packages (from tensorflow) (67.7.2)
Requirement already satisfied: six>=1.12.0 in /usr/local/lib/python3.10/dist-

packages (from tensorflow) (1.16.0)
Requirement already satisfied: termcolor>=1.1.0 in
/usr/local/lib/python3.10/dist-packages (from tensorflow) (2.4.0)
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/usr/local/lib/python3.10/dist-packages (from tensorflow) (4.12.2)
Requirement already satisfied: wrapt<1.15,>=1.11.0 in
/usr/local/lib/python3.10/dist-packages (from tensorflow) (1.14.1)
Requirement already satisfied: tensorflow-io-gcs-filesystem>=0.23.1 in
/usr/local/lib/python3.10/dist-packages (from tensorflow) (0.37.0)
Requirement already satisfied: grpcio<2.0,>=1.24.3 in
/usr/local/lib/python3.10/dist-packages (from tensorflow) (1.64.1)
Requirement already satisfied: tensorboard<2.16,>=2.15 in
/usr/local/lib/python3.10/dist-packages (from tensorflow) (2.15.2)
Requirement already satisfied: tensorflow-estimator<2.16,>=2.15.0 in
/usr/local/lib/python3.10/dist-packages (from tensorflow) (2.15.0)
Requirement already satisfied: keras<2.16,>=2.15.0 in
/usr/local/lib/python3.10/dist-packages (from tensorflow) (2.15.0)
Requirement already satisfied: python-dateutil>=2.8.2 in
/usr/local/lib/python3.10/dist-packages (from pandas) (2.8.2)
Requirement already satisfied: pytz>=2020.1 in /usr/local/lib/python3.10/dist-
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Requirement already satisfied: tzdata>=2022.1 in /usr/local/lib/python3.10/dist-
packages (from pandas) (2024.1)
Requirement already satisfied: contourpy>=1.0.1 in
/usr/local/lib/python3.10/dist-packages (from matplotlib) (1.2.1)
Requirement already satisfied: cycler>=0.10 in /usr/local/lib/python3.10/dist-
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Requirement already satisfied: fonttools>=4.22.0 in
/usr/local/lib/python3.10/dist-packages (from matplotlib) (4.53.0)
Requirement already satisfied: kiwisolver>=1.0.1 in
/usr/local/lib/python3.10/dist-packages (from matplotlib) (1.4.5)
Requirement already satisfied: pillow>=6.2.0 in /usr/local/lib/python3.10/dist-
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Requirement already satisfied: pyparsing>=2.3.1 in
/usr/local/lib/python3.10/dist-packages (from matplotlib) (3.1.2)
Requirement already satisfied: wheel<1.0,>=0.23.0 in
/usr/local/lib/python3.10/dist-packages (from astunparse>=1.6.0->tensorflow)
(0.43.0)
Requirement already satisfied: google-auth<3,>=1.6.3 in
/usr/local/lib/python3.10/dist-packages (from
tensorboard<2.16,>=2.15->tensorflow) (2.27.0)
Requirement already satisfied: google-auth-oauthlib<2,>=0.5 in
/usr/local/lib/python3.10/dist-packages (from
tensorboard<2.16,>=2.15->tensorflow) (1.2.0)
Requirement already satisfied: markdown>=2.6.8 in
/usr/local/lib/python3.10/dist-packages (from
tensorboard<2.16,>=2.15->tensorflow) (3.6)
Requirement already satisfied: requests<3,>=2.21.0 in

/usr/local/lib/python3.10/dist-packages (from
tensorboard<2.16,>=2.15->tensorflow) (2.31.0)
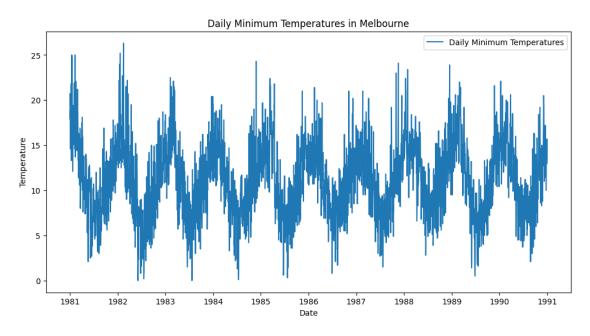Requirement already satisfied: tensorboard-data-server<0.8.0,>=0.7.0 in
/usr/local/lib/python3.10/dist-packages (from
tensorboard<2.16,>=2.15->tensorflow) (0.7.2)
Requirement already satisfied: werkzeug>=1.0.1 in
/usr/local/lib/python3.10/dist-packages (from
tensorboard<2.16,>=2.15->tensorflow) (3.0.3)
Requirement already satisfied: cachetools<6.0,>=2.0.0 in
/usr/local/lib/python3.10/dist-packages (from google-
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Requirement already satisfied: pyasn1-modules>=0.2.1 in
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Requirement already satisfied: rsa<5,>=3.1.4 in /usr/local/lib/python3.10/dist-
packages (from google-auth<3,>=1.6.3->tensorboard<2.16,>=2.15->tensorflow) (4.9)
Requirement already satisfied: requests-oauthlib>=0.7.0 in
/usr/local/lib/python3.10/dist-packages (from google-auth-
oauthlib<2,>=0.5->tensorboard<2.16,>=2.15->tensorflow) (1.3.1)
Requirement already satisfied: charset-normalizer<4,>=2 in
/usr/local/lib/python3.10/dist-packages (from
requests<3,>=2.21.0->tensorboard<2.16,>=2.15->tensorflow) (3.3.2)
Requirement already satisfied: idna<4,>=2.5 in /usr/local/lib/python3.10/dist-
packages (from requests<3,>=2.21.0->tensorboard<2.16,>=2.15->tensorflow) (3.7)
Requirement already satisfied: urllib3<3,>=1.21.1 in
/usr/local/lib/python3.10/dist-packages (from
requests<3,>=2.21.0->tensorboard<2.16,>=2.15->tensorflow) (2.0.7)
Requirement already satisfied: certifi>=2017.4.17 in
/usr/local/lib/python3.10/dist-packages (from
requests<3,>=2.21.0->tensorboard<2.16,>=2.15->tensorflow) (2024.6.2)
Requirement already satisfied: MarkupSafe>=2.1.1 in
/usr/local/lib/python3.10/dist-packages (from
werkzeug>=1.0.1->tensorboard<2.16,>=2.15->tensorflow) (2.1.5)
Requirement already satisfied: pyasn1<0.7.0,>=0.4.6 in
/usr/local/lib/python3.10/dist-packages (from pyasn1-modules>=0.2.1->google-
auth<3,>=1.6.3->tensorboard<2.16,>=2.15->tensorflow) (0.6.0)
Requirement already satisfied: oauthlib>=3.0.0 in
/usr/local/lib/python3.10/dist-packages (from requests-oauthlib>=0.7.0->google-
auth-oauthlib<2,>=0.5->tensorboard<2.16,>=2.15->tensorflow) (3.2.2)

```python
[10]: import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.preprocessing import MinMaxScaler
from sklearn.model_selection import train_test_split
import tensorflow as tf
```

```python
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import SimpleRNN, Dense, Dropout

# Load dataset
url = "https://raw.githubusercontent.com/jbrownlee/Datasets/master/
 ↪daily-min-temperatures.csv"
df = pd.read_csv(url, parse_dates=['Date'], index_col='Date')

# Display the first few rows of the dataset
print(df.head())

# Plotting the time series
plt.figure(figsize=(12, 6))
plt.plot(df, label='Daily Minimum Temperatures')
plt.title('Daily Minimum Temperatures in Melbourne')
plt.xlabel('Date')
plt.ylabel('Temperature')
plt.legend()
plt.show()
```

```
            Temp
Date
1981-01-01  20.7
1981-01-02  17.9
1981-01-03  18.8
1981-01-04  14.6
1981-01-05  15.8
```

```python
[11]:  # Normalize the data
       scaler = MinMaxScaler(feature_range=(0, 1))
       df_scaled = scaler.fit_transform(df)

       # Convert to supervised learning
       def create_dataset(data, look_back=1):
           X, y = [], []
           for i in range(len(data) - look_back - 1):
               a = data[i:(i + look_back), 0]
               X.append(a)
               y.append(data[i + look_back, 0])
           return np.array(X), np.array(y)

       look_back = 10
       X, y = create_dataset(df_scaled, look_back)

       # Split the data into training and testing sets
       X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2,␣
        ↪random_state=42)

       # Reshape input to be [samples, time steps, features]
       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))
```

```python
[12]:  # Build the RNN model
       model = Sequential()
       model.add(SimpleRNN(units=50, return_sequences=True, input_shape=(look_back,␣
        ↪1)))
       model.add(Dropout(0.2))
       model.add(SimpleRNN(units=50, return_sequences=False))
       model.add(Dropout(0.2))
       model.add(Dense(units=1))

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

       # Train the model
       history = model.fit(X_train, y_train, epochs=50, batch_size=32,␣
        ↪validation_data=(X_test, y_test), verbose=1)

       # Plot training & validation loss values
       plt.figure(figsize=(12, 6))
       plt.plot(history.history['loss'], label='Train Loss')
       plt.plot(history.history['val_loss'], label='Validation Loss')
       plt.title('Model Loss')
       plt.ylabel('Loss')
       plt.xlabel('Epoch')
       plt.legend()
```

```
plt.show()
```

```
Epoch 1/50
91/91 [==============================] - 3s 11ms/step - loss: 0.0753 - val_loss:
0.0149
Epoch 2/50
91/91 [==============================] - 1s 8ms/step - loss: 0.0239 - val_loss:
0.0083
Epoch 3/50
91/91 [==============================] - 1s 7ms/step - loss: 0.0192 - val_loss:
0.0090
Epoch 4/50
91/91 [==============================] - 1s 7ms/step - loss: 0.0169 - val_loss:
0.0079
Epoch 5/50
91/91 [==============================] - 1s 8ms/step - loss: 0.0149 - val_loss:
0.0078
Epoch 6/50
91/91 [==============================] - 1s 8ms/step - loss: 0.0138 - val_loss:
0.0079
Epoch 7/50
91/91 [==============================] - 1s 7ms/step - loss: 0.0133 - val_loss:
0.0079
Epoch 8/50
91/91 [==============================] - 1s 7ms/step - loss: 0.0125 - val_loss:
0.0079
Epoch 9/50
91/91 [==============================] - 1s 8ms/step - loss: 0.0125 - val_loss:
0.0078
Epoch 10/50
91/91 [==============================] - 1s 8ms/step - loss: 0.0118 - val_loss:
0.0081
Epoch 11/50
91/91 [==============================] - 1s 12ms/step - loss: 0.0119 - val_loss:
0.0078
Epoch 12/50
91/91 [==============================] - 1s 13ms/step - loss: 0.0115 - val_loss:
0.0078
Epoch 13/50
91/91 [==============================] - 1s 12ms/step - loss: 0.0117 - val_loss:
0.0078
Epoch 14/50
91/91 [==============================] - 1s 10ms/step - loss: 0.0108 - val_loss:
0.0078
Epoch 15/50
91/91 [==============================] - 1s 8ms/step - loss: 0.0109 - val_loss:
0.0083
```

```
Epoch 16/50
91/91 [==============================] - 1s 7ms/step - loss: 0.0107 - val_loss:
0.0078
Epoch 17/50
91/91 [==============================] - 1s 8ms/step - loss: 0.0107 - val_loss:
0.0077
Epoch 18/50
91/91 [==============================] - 1s 7ms/step - loss: 0.0104 - val_loss:
0.0086
Epoch 19/50
91/91 [==============================] - 1s 8ms/step - loss: 0.0106 - val_loss:
0.0081
Epoch 20/50
91/91 [==============================] - 1s 8ms/step - loss: 0.0104 - val_loss:
0.0079
Epoch 21/50
91/91 [==============================] - 1s 8ms/step - loss: 0.0102 - val_loss:
0.0079
Epoch 22/50
91/91 [==============================] - 1s 7ms/step - loss: 0.0100 - val_loss:
0.0079
Epoch 23/50
91/91 [==============================] - 1s 8ms/step - loss: 0.0102 - val_loss:
0.0081
Epoch 24/50
91/91 [==============================] - 1s 9ms/step - loss: 0.0100 - val_loss:
0.0078
Epoch 25/50
91/91 [==============================] - 1s 7ms/step - loss: 0.0103 - val_loss:
0.0081
Epoch 26/50
91/91 [==============================] - 1s 8ms/step - loss: 0.0102 - val_loss:
0.0079
Epoch 27/50
91/91 [==============================] - 1s 8ms/step - loss: 0.0100 - val_loss:
0.0083
Epoch 28/50
91/91 [==============================] - 1s 9ms/step - loss: 0.0098 - val_loss:
0.0078
Epoch 29/50
91/91 [==============================] - 1s 13ms/step - loss: 0.0101 - val_loss:
0.0078
Epoch 30/50
91/91 [==============================] - 1s 13ms/step - loss: 0.0102 - val_loss:
0.0083
Epoch 31/50
91/91 [==============================] - 1s 10ms/step - loss: 0.0099 - val_loss:
0.0079
```

```
Epoch 32/50
91/91 [==============================] - 1s 7ms/step - loss: 0.0097 - val_loss:
0.0081
Epoch 33/50
91/91 [==============================] - 1s 8ms/step - loss: 0.0097 - val_loss:
0.0077
Epoch 34/50
91/91 [==============================] - 1s 9ms/step - loss: 0.0096 - val_loss:
0.0077
Epoch 35/50
91/91 [==============================] - 1s 7ms/step - loss: 0.0096 - val_loss:
0.0078
Epoch 36/50
91/91 [==============================] - 1s 7ms/step - loss: 0.0095 - val_loss:
0.0087
Epoch 37/50
91/91 [==============================] - 1s 8ms/step - loss: 0.0097 - val_loss:
0.0082
Epoch 38/50
91/91 [==============================] - 1s 9ms/step - loss: 0.0097 - val_loss:
0.0078
Epoch 39/50
91/91 [==============================] - 1s 9ms/step - loss: 0.0095 - val_loss:
0.0079
Epoch 40/50
91/91 [==============================] - 1s 8ms/step - loss: 0.0095 - val_loss:
0.0079
Epoch 41/50
91/91 [==============================] - 1s 8ms/step - loss: 0.0095 - val_loss:
0.0079
Epoch 42/50
91/91 [==============================] - 1s 7ms/step - loss: 0.0095 - val_loss:
0.0078
Epoch 43/50
91/91 [==============================] - 1s 8ms/step - loss: 0.0095 - val_loss:
0.0080
Epoch 44/50
91/91 [==============================] - 1s 7ms/step - loss: 0.0094 - val_loss:
0.0077
Epoch 45/50
91/91 [==============================] - 1s 11ms/step - loss: 0.0094 - val_loss:
0.0082
Epoch 46/50
91/91 [==============================] - 1s 13ms/step - loss: 0.0095 - val_loss:
0.0077
Epoch 47/50
91/91 [==============================] - 1s 12ms/step - loss: 0.0093 - val_loss:
0.0079
```

```
Epoch 48/50
91/91 [==============================] - 1s 9ms/step - loss: 0.0093 - val_loss:
0.0078
Epoch 49/50
91/91 [==============================] - 1s 7ms/step - loss: 0.0093 - val_loss:
0.0078
Epoch 50/50
91/91 [==============================] - 1s 7ms/step - loss: 0.0093 - val_loss:
0.0080
```