tosh-kumar-jha-12340390-dav-lab-11

March 24, 2025

[38]:
```
from google.colab import drive
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
```

[39]:
```
drive.mount("/content/drive")
```

```
Drive already mounted at /content/drive; to attempt to forcibly remount, call
drive.mount("/content/drive", force_remount=True).
```

[40]:
```
test = pd.read_csv("/content/drive/MyDrive/Course Work/Sem 4/Data Analysis and␣
↪Visualization/Homework 6/DailyDelhiClimateTest.csv")
```

[41]:
```
train = pd.read_csv("/content/drive/MyDrive/Course Work/Sem 4/Data Analysis and␣
↪Visualization/Homework 6/DailyDelhiClimateTrain.csv")
```

[42]:
```
train
```

[42]:

	date	meantemp	humidity	wind_speed	meanpressure
0	2013-01-01	10.000000	84.500000	0.000000	1015.666667
1	2013-01-02	7.400000	92.000000	2.980000	1017.800000
2	2013-01-03	7.166667	87.000000	4.633333	1018.666667
3	2013-01-04	8.666667	71.333333	1.233333	1017.166667
4	2013-01-05	6.000000	86.833333	3.700000	1016.500000
…	…	…	…	…	…
1457	2016-12-28	17.217391	68.043478	3.547826	1015.565217
1458	2016-12-29	15.238095	87.857143	6.000000	1016.904762
1459	2016-12-30	14.095238	89.666667	6.266667	1017.904762
1460	2016-12-31	15.052632	87.000000	7.325000	1016.100000
1461	2017-01-01	10.000000	100.000000	0.000000	1016.000000

```
[1462 rows x 5 columns]
```

[43]:
```
test
```

[43]:

	date	meantemp	humidity	wind_speed	meanpressure
0	2017-01-01	15.913043	85.869565	2.743478	59.000000
1	2017-01-02	18.500000	77.222222	2.894444	1018.277778

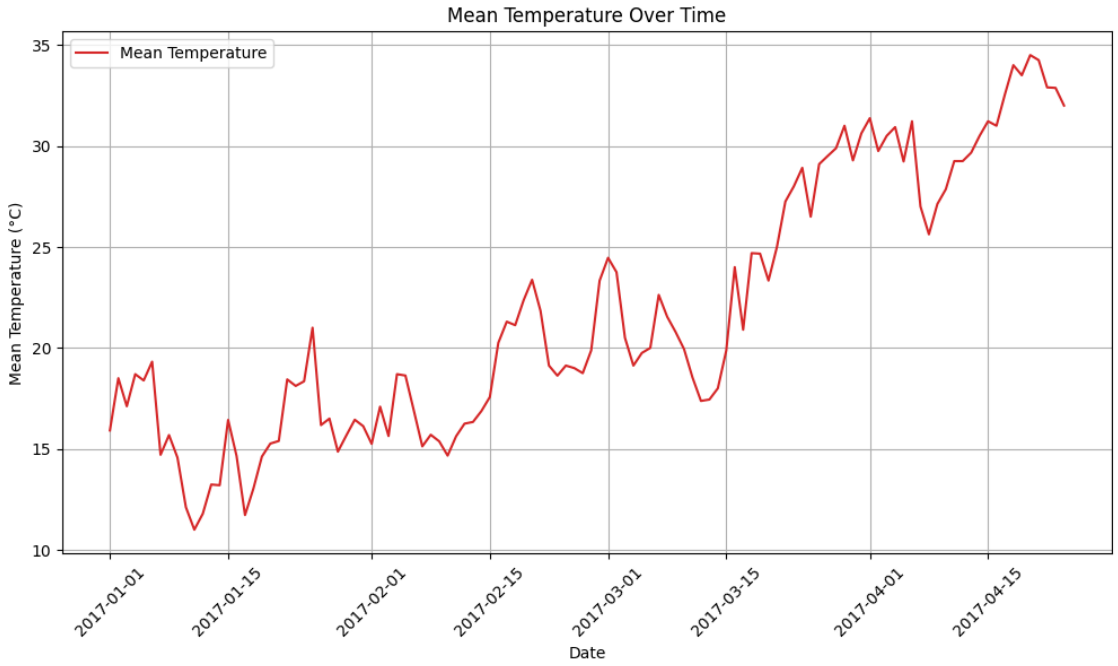
```
2    2017-01-03  17.111111  81.888889    4.016667   1018.333333
3    2017-01-04  18.700000  70.050000    4.545000   1015.700000
4    2017-01-05  18.388889  74.944444    3.300000   1014.333333
..          …         …         …          …           …
109  2017-04-20  34.500000  27.500000    5.562500    998.625000
110  2017-04-21  34.250000  39.375000    6.962500    999.875000
111  2017-04-22  32.900000  40.900000    8.890000   1001.600000
112  2017-04-23  32.875000  27.500000    9.962500   1002.125000
113  2017-04-24  32.000000  27.142857   12.157143   1004.142857

[114 rows x 5 columns]
```

[44]:
```
train["date"] = pd.to_datetime(train["date"])
```

[45]:
```
test["date"] = pd.to_datetime(test["date"])
```

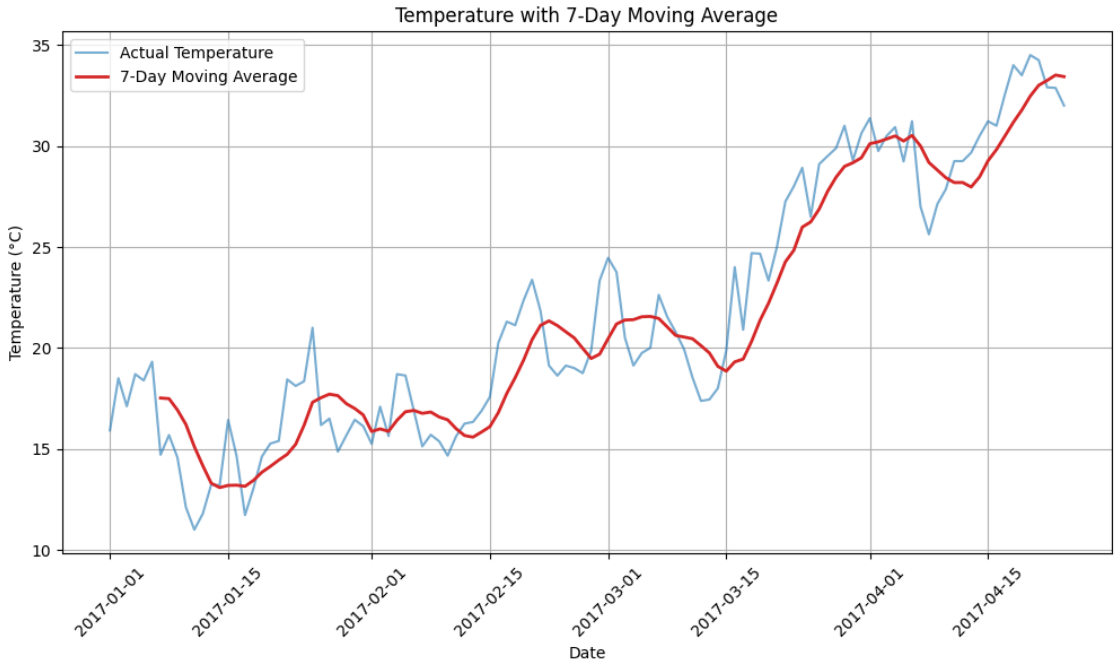
0.1 Basic Time Series Plot

[46]:
```
# Plot Mean Temperature Over Time
plt.figure(figsize=(12, 6))
plt.plot(test["date"], test["meantemp"], label="Mean Temperature", color="tab:
 ↪red")

# Formatting
plt.xlabel("Date")
plt.ylabel("Mean Temperature (°C)")
plt.title("Mean Temperature Over Time")
plt.legend()
plt.grid(True)
plt.xticks(rotation=45)

# Show plot
plt.show()
```



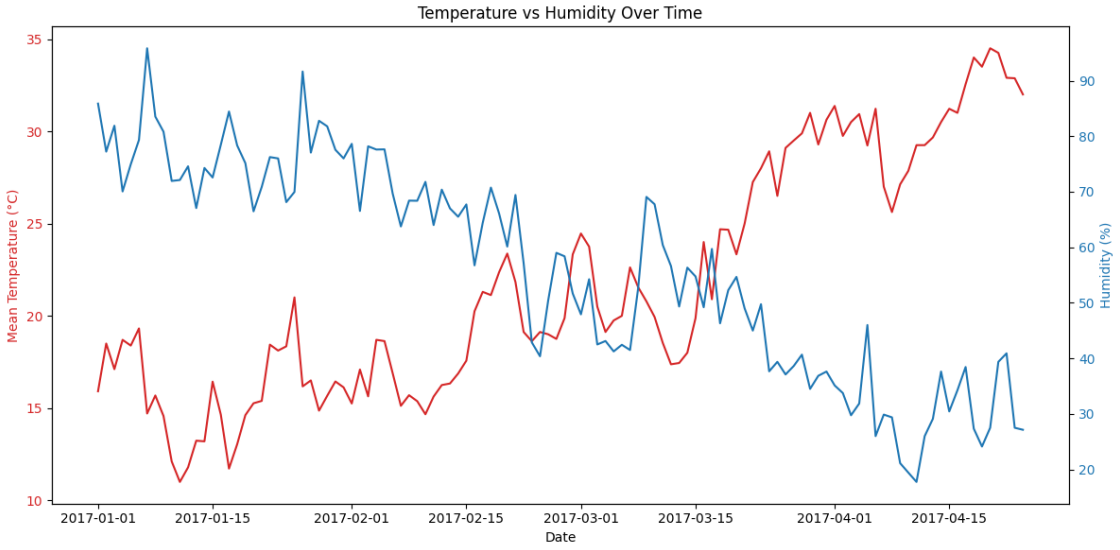
0.2 Rolling Average for Smoothing

[47]:
```
# Compute 7-day Moving Average
test["temp_rolling_avg"] = test["meantemp"].rolling(window=7).mean()

# Plot original vs smoothed data
plt.figure(figsize=(12, 6))
plt.plot(test["date"], test["meantemp"], label="Actual Temperature", color="tab:
 ↪blue", alpha=0.6)
plt.plot(test["date"], test["temp_rolling_avg"], label="7-Day Moving Average",␣
 ↪color="tab:red", linewidth=2)

# Formatting
plt.xlabel("Date")
plt.ylabel("Temperature (°C)")
plt.title("Temperature with 7-Day Moving Average")
plt.legend()
plt.grid(True)
plt.xticks(rotation=45)

plt.show()
```



0.3 Comparing Two Climate Variables

[48]:
```
fig, ax1 = plt.subplots(figsize=(12, 6))

# Plot Temperature on the left axis
ax1.set_xlabel("Date")
ax1.set_ylabel("Mean Temperature (°C)", color="tab:red")
ax1.plot(test["date"], test["meantemp"], label="Temperature", color="tab:red")
ax1.tick_params(axis="y", labelcolor="tab:red")

# Create second y-axis for Humidity
ax2 = ax1.twinx()
ax2.set_ylabel("Humidity (%)", color="tab:blue")
ax2.plot(test["date"], test["humidity"], label="Humidity", color="tab:blue")
ax2.tick_params(axis="y", labelcolor="tab:blue")

plt.title("Temperature vs Humidity Over Time")
fig.tight_layout()
plt.show()
```

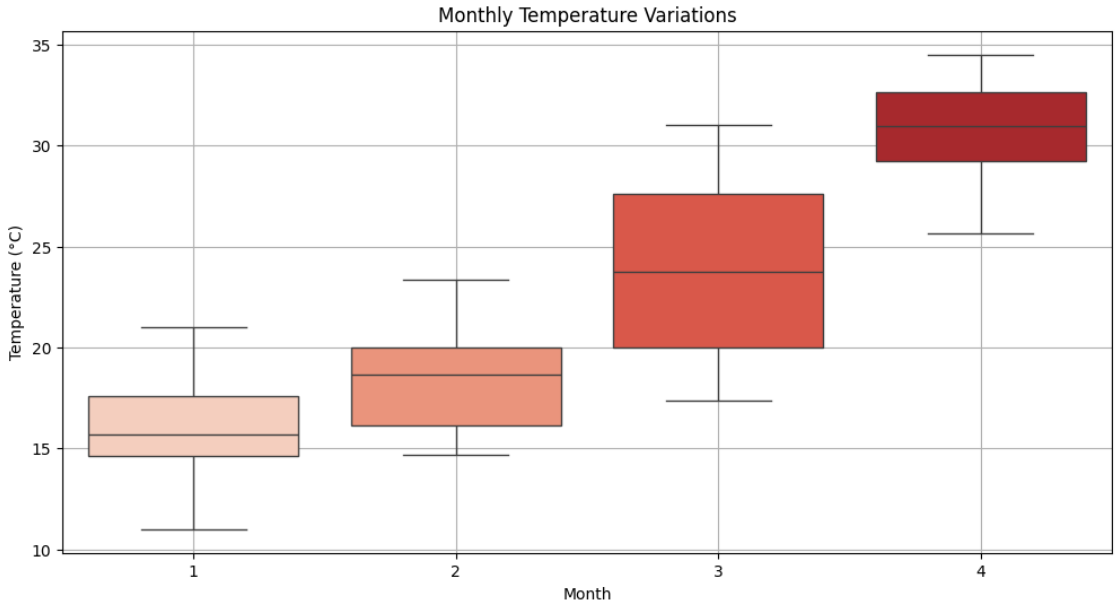


0.4 Seasonal Trend Analysis

[49]:
```
# Extract month from date
test["month"] = test["date"].dt.month

# Boxplot for Temperature
plt.figure(figsize=(12, 6))
sns.boxplot(x="month", y="meantemp", data=test, palette="Reds")
plt.xlabel("Month")
plt.ylabel("Temperature (°C)")
plt.title("Monthly Temperature Variations")
plt.grid()
plt.show()

# Boxplot for Humidity
plt.figure(figsize=(12, 6))
sns.boxplot(x="month", y="humidity", data=test, palette="Blues")
plt.xlabel("Month")
plt.ylabel("Humidity (%)")
plt.title("Monthly Humidity Variations")
plt.grid()
plt.show()
```

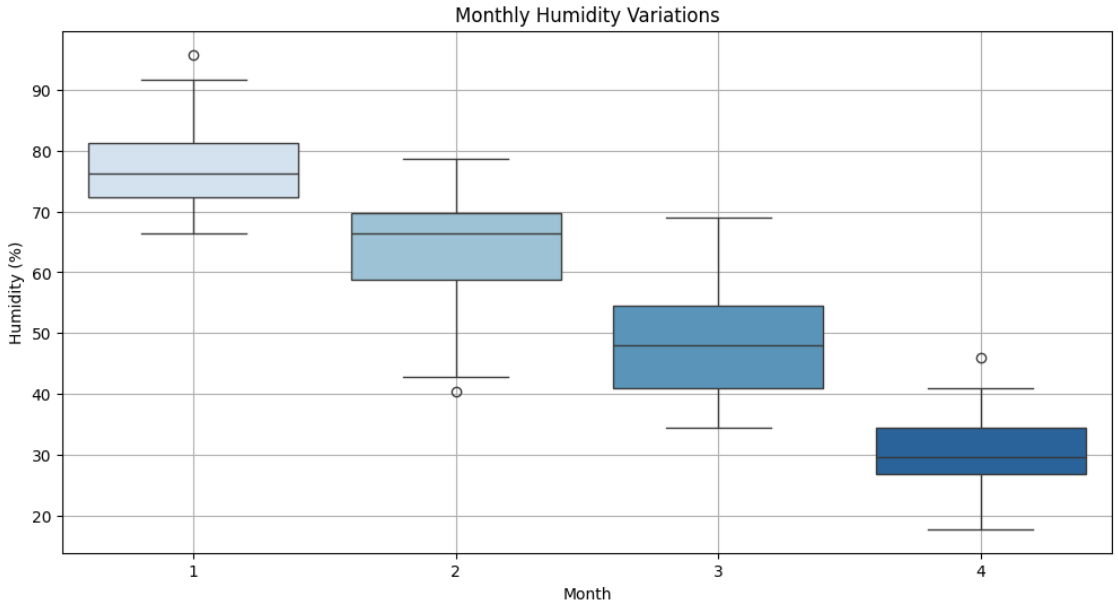
```
<ipython-input-49-ef0baba5e9c2>:6: FutureWarning:

Passing `palette` without assigning `hue` is deprecated and will be removed in
v0.14.0. Assign the `x` variable to `hue` and set `legend=False` for the same
effect.
```

```
sns.boxplot(x="month", y="meantemp", data=test, palette="Reds")
```




```
<ipython-input-49-ef0baba5e9c2>:15: FutureWarning:

Passing `palette` without assigning `hue` is deprecated and will be removed in
v0.14.0. Assign the `x` variable to `hue` and set `legend=False` for the same
effect.
```

```
sns.boxplot(x="month", y="humidity", data=test, palette="Blues")
```

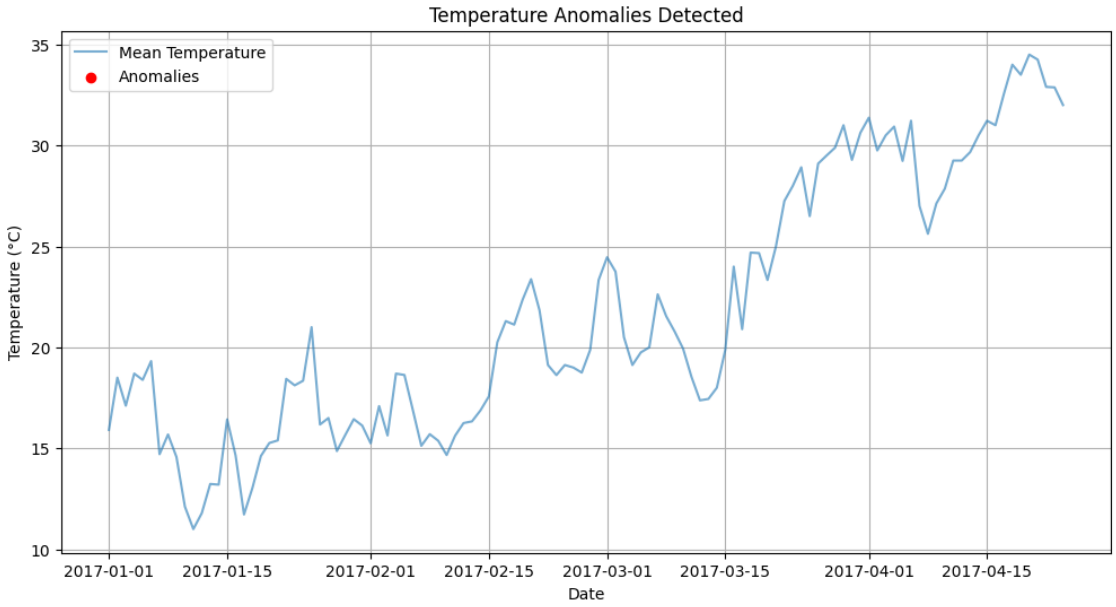


0.5 Detecting Weather Anomalies

[50]:
```
# Function to detect anomalies using IQR
def detect_outliers_iqr(data, column):
    Q1 = data[column].quantile(0.25)
    Q3 = data[column].quantile(0.75)
    IQR = Q3 - Q1
    lower_bound = Q1 - 1.5 * IQR
    upper_bound = Q3 + 1.5 * IQR

    return data[(data[column] < lower_bound) | (data[column] > upper_bound)]
```

[51]:
```
# Detect outliers for temperature and humidity
temp_anomalies = detect_outliers_iqr(test, "meantemp")
humidity_anomalies = detect_outliers_iqr(test, "humidity")
```

[52]:
```
# Plot anomalies on temperature chart
plt.figure(figsize=(12, 6))
plt.plot(test["date"], test["meantemp"], label="Mean Temperature", color="tab:
 ↪blue", alpha=0.6)
plt.scatter(temp_anomalies["date"], temp_anomalies["meantemp"], color="red",␣
 ↪label="Anomalies", zorder=3)
plt.xlabel("Date")
plt.ylabel("Temperature (°C)")
plt.title("Temperature Anomalies Detected")
plt.legend()
plt.grid(True)
plt.show()
```


Temperature Anomalies Detected
Mean Temperature
Anomalies
Temperature (°C)
35
30
25
20
15
10
2017-01-01
2017-01-15
2017-02-01
2017-02-15
2017-03-01
2017-03-15
2017-04-01
2017-04-15
Date