Weather Data Analysis Report

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This report analyzes and visualizes historical weather data, including basic statistical measures, trends, correlations, and advanced visualizations. The goal is to uncover insights into temperature, humidity, precipitation, and wind speed.

Section 1: Data Import and Preparation

Import weather data from a CSV file and clean it.

```
% The data contains the following columns:
% - Date
% - Temperature
% - Humidity
% - Precipitation
% - WindSpeed
```

Section 2: Basic Statistical Analysis

Compute basic statistics such as mean, median, and standard deviation for key weather parameters.

```
% Example code for statistical calculations
meanTemp = mean(weatherData.Temperature, 'omitnan');
disp(['Mean Temperature: ', num2str(meanTemp), ' °C']);
stdTemp = std(weatherData.Temperature, 'omitnan');
disp(['Standard Deviation of Temperature: ', num2str(stdTemp), ' °C']);
```

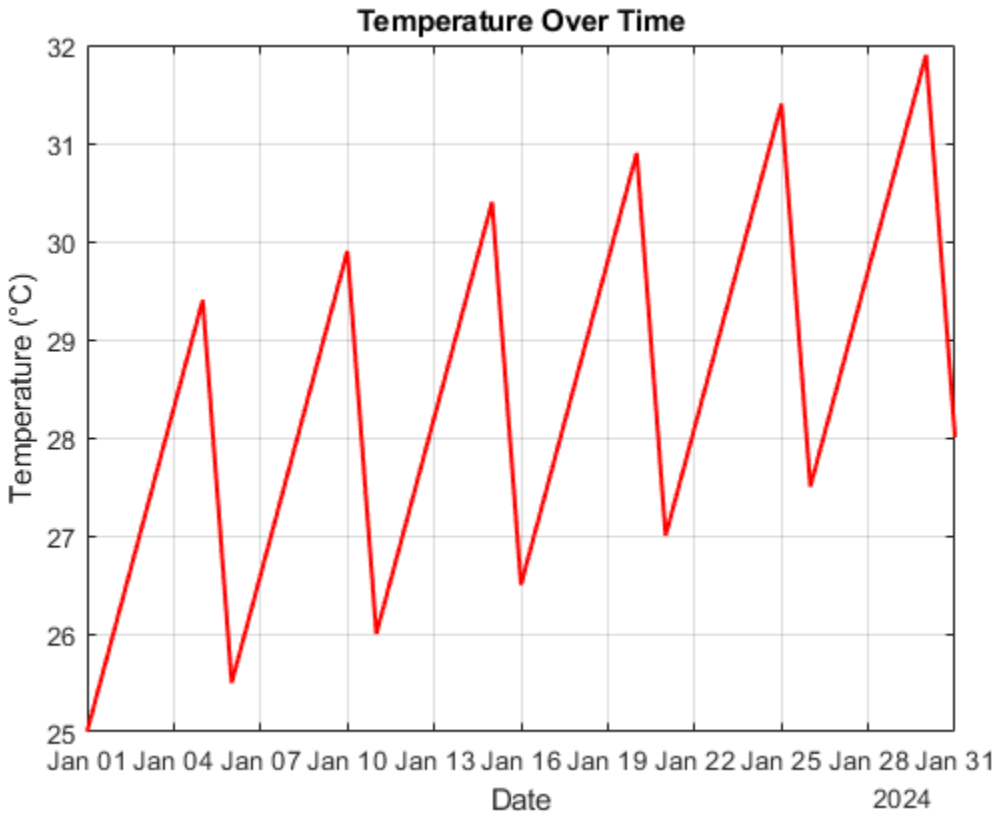
```
Mean Temperature: 28.4355 °C
Standard Deviation of Temperature: 1.7764 °C
```

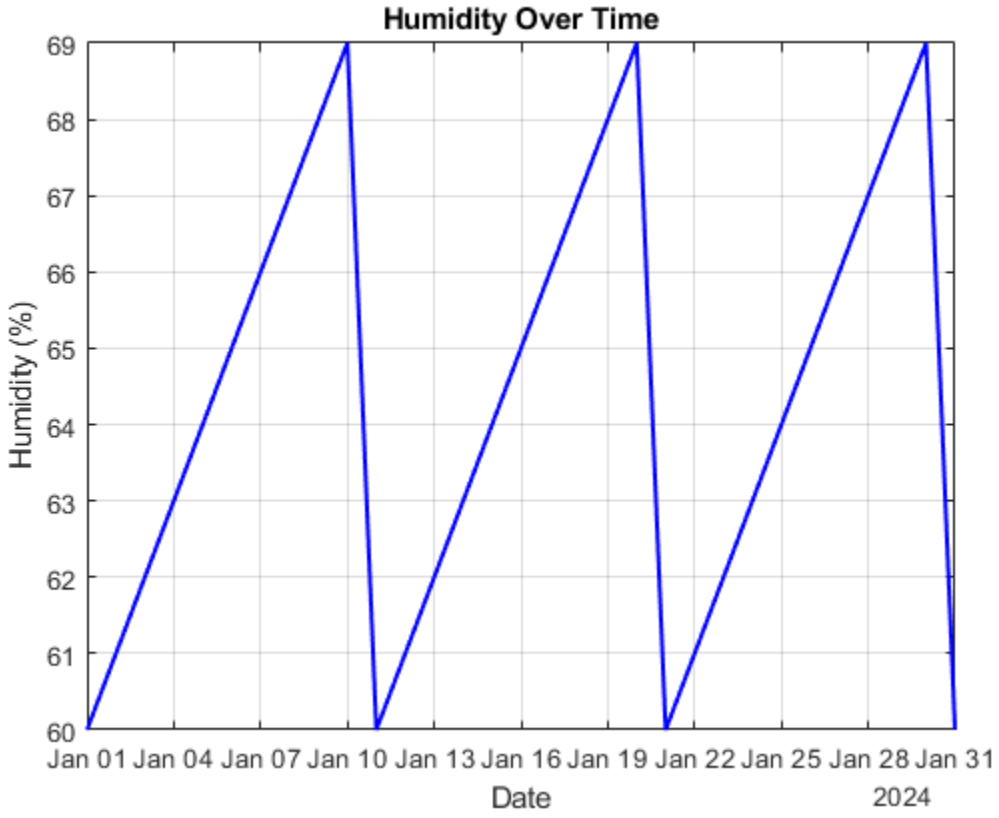
Section 3: Data Visualization

Plot time series and create 3D surface plots to visualize trends.

```
% Code for a time series plot
figure;
plot(weatherData.Date, weatherData.Temperature, 'r-', 'LineWidth', 1.5);
xlabel('Date');
ylabel('Temperature (°C)');
title('Temperature Over Time');
grid on;
```

```
% Code for humidity plot
figure;
plot(weatherData.Date, weatherData.Humidity, 'b-', 'LineWidth', 1.5);
xlabel('Date');
ylabel('Humidity (%)');
title('Humidity Over Time');
grid on;
```

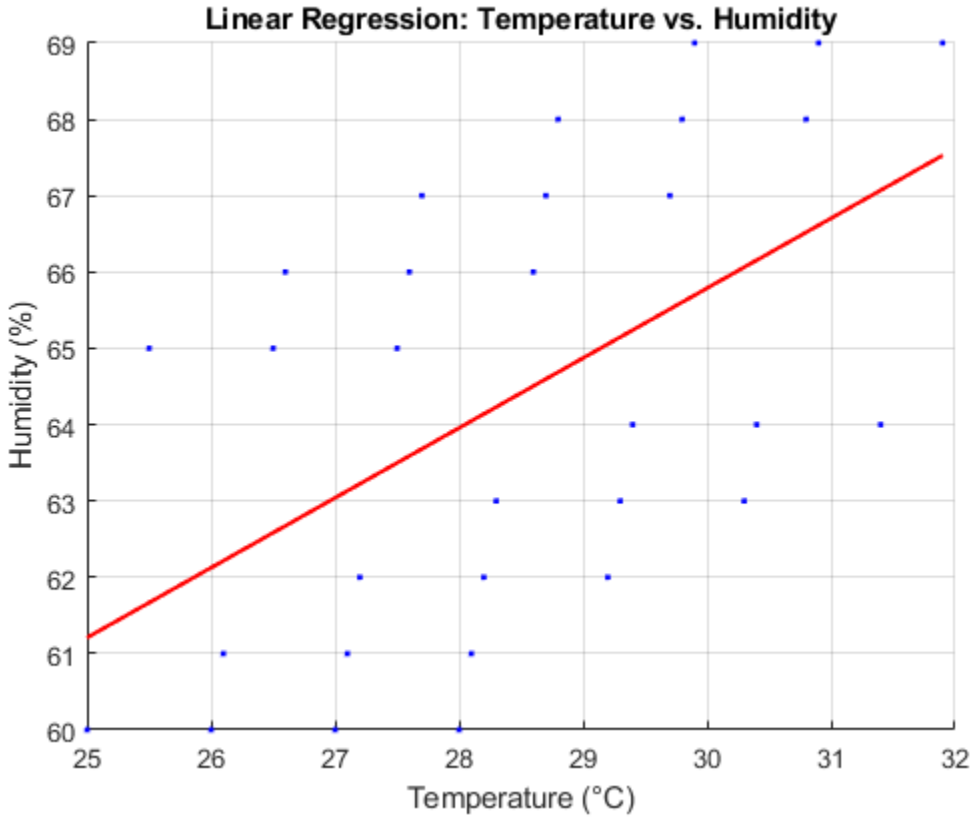




Section 4: Correlation and Regression Analysis

Perform correlation analysis and fit linear regression models.

```
% Regression plot
figure;
scatter(weatherData.Temperature, weatherData.Humidity, 'b.');
hold on;
p = polyfit(weatherData.Temperature, weatherData.Humidity, 1);
fitted = polyval(p, weatherData.Temperature);
plot(weatherData.Temperature, fitted, 'r-', 'LineWidth', 1.5);
xlabel('Temperature (°C)');
ylabel('Humidity (%)');
title('Linear Regression: Temperature vs. Humidity');
grid on;
hold off;
```



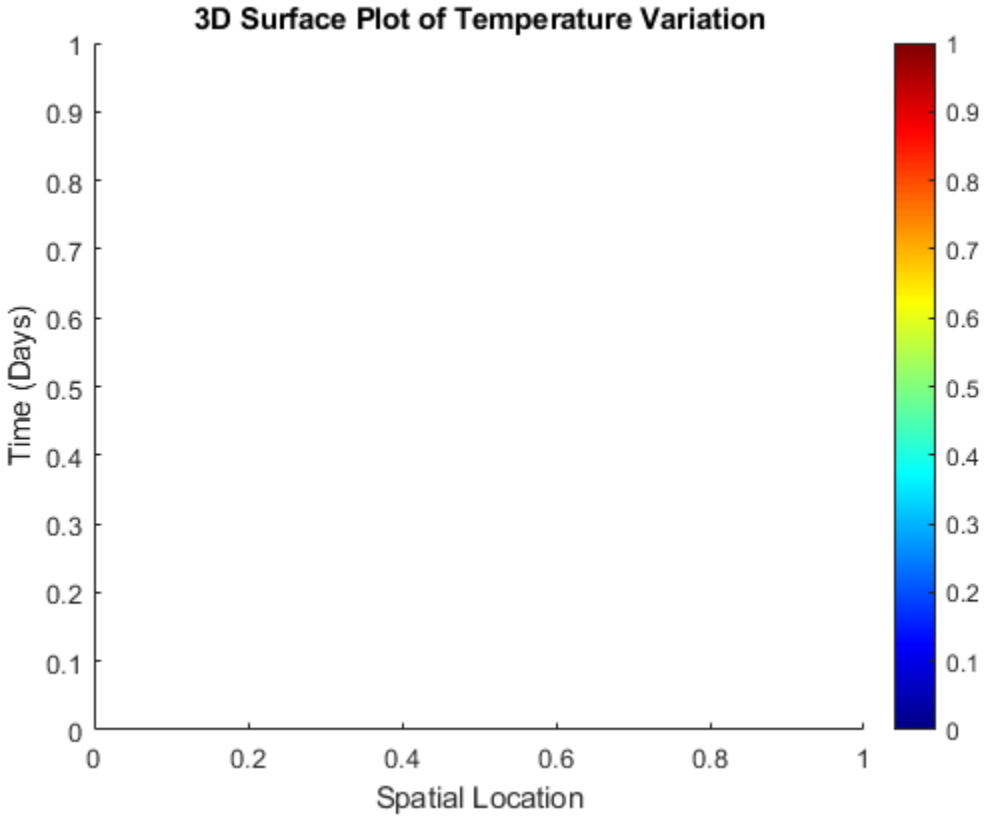
Section 5: 3D Surface Visualization

Visualize temperature variation over time and space.

```
% Convert Date to numeric values for plotting
time = datenum(weatherData.Date);  % Convert datetime to serial date numbers
x = 1:length(weatherData.Temperature);  % Spatial data (this can be your
locations if available)

% Create a 3D surface plot
figure;

xlabel('Spatial Location');
ylabel('Time (Days)');
zlabel('Temperature (°C)');
title('3D Surface Plot of Temperature Variation');
shading interp;
colorbar;
colormap jet;
```



Section 6: Conclusion

The analysis reveals key trends and insights into the weather data. The linear regression model shows a strong relationship between temperature and humidity. Temperature variations can be observed over time, providing a clear picture of temperature behavior.

Published with MATLAB® R2024b