Data Acquisition and Preparation

Task 1.1: Importing Weather Data

- Using the 'readmatrix' function to import data

```
% importing the weather data
data = readmatrix('Weather_Data.csv');

%Inspecting the data by displaying first few rows
head(data)
```

```
       NaN   -1.8000   -3.9000   86.0000    4.0000    8.0000  101.2400       NaN
       NaN   -1.8000   -3.7000   87.0000    4.0000    8.0000  101.2400       NaN
       NaN   -1.8000   -3.4000   89.0000    7.0000    4.0000  101.2600       NaN
       NaN   -1.5000   -3.2000   88.0000    6.0000    4.0000  101.2700       NaN
       NaN   -1.5000   -3.3000   88.0000    7.0000    4.8000  101.2300       NaN
       NaN   -1.4000   -3.3000   87.0000    9.0000    6.4000  101.2700       NaN
       NaN   -1.5000   -3.1000   89.0000    7.0000    6.4000  101.2900       NaN
       NaN   -1.4000   -3.6000   85.0000    7.0000    8.0000  101.2600       NaN
```

```
% Checking for missing values
miss_val = sum(ismissing(data));
disp(miss_val)
```

```
        8784           0           0           0           0           0           0        8784
```

```
% Data seems to contains datetime and
% categorical values,
% we would use use readtimetable
% instead of readmatrix
```

- Using the 'readtimetable' instead of 'readmatrix' function to import data

```
% Setting up the Import Options Object for importing delimited text files
opts = delimitedTextImportOptions("NumVariables", 8);
% 'NumVariables',8 argument indicates that the file contains 8 columns

% Specifying range of imported data and delimiter used in the file
opts.DataLines = [2, Inf];
% Range of imported data starts from 2nd line to the end
opts.Delimiter = ",";

% Specify column names and types
opts.VariableNames = ["Date_Time", "Temp_C", "DewPointTemp_C", "RelHum__",
"WindSpeed_km_h", "Visibility_km", "Press_kPa", "Weather"];
opts.VariableTypes = ["datetime", "double", "double", "double", "double", "double",
"double", "categorical"];
```

```
% Specify file level properties
opts.ExtraColumnsRule = "ignore";
% Ignoring any extra columns that are not specified
opts.EmptyLineRule = "read";
% Reading empty lines as they are

% Specify variable properties
opts = setvaropts(opts, "Weather", "EmptyFieldRule", "auto");
opts = setvaropts(opts, "Date_Time", "InputFormat", "MM/dd/yyyy HH:mm",
"DatetimeFormat", "preserveinput");
% Setting additional properties for specific variables

% Import the data
Weather_Data = readtimetable("C:\Users\Dell\Downloads\Weather_Data.csv", opts,
"RowTimes", "Date_Time");

% Clear temporary variables
clear opts

% Display results
Weather_Data
```

Weather_Data = 8784×7 timetable

...

	Date_Time	Temp_C	DewPointTemp_C	RelHum__	WindSpeed_km_h
1	01/01/2012 00:00	-1.8000	-3.9000	86	4
2	01/01/2012 01:00	-1.8000	-3.7000	87	4
3	01/01/2012 02:00	-1.8000	-3.4000	89	7
4	01/01/2012 03:00	-1.5000	-3.2000	88	6
5	01/01/2012 04:00	-1.5000	-3.3000	88	7
6	01/01/2012 05:00	-1.4000	-3.3000	87	9
7	01/01/2012 06:00	-1.5000	-3.1000	89	7
8	01/01/2012 07:00	-1.4000	-3.6000	85	7
9	01/01/2012 08:00	-1.4000	-3.6000	85	9
10	01/01/2012 09:00	-1.3000	-3.1000	88	15
11	01/01/2012 10:00	-1	-2.3000	91	9
12	01/01/2012 11:00	-0.5000	-2.1000	89	7
13	01/01/2012 12:00	-0.2000	-2	88	9
14	01/01/2012 13:00	0.2000	-1.7000	87	13
15	01/01/2012 14:00	0.8000	-1.1000	87	20
16	01/01/2012 15:00	1.8000	-0.4000	85	22

	Date_Time	Temp_C	DewPointTemp_C	RelHum__	WindSpeed_km_h
17	01/01/2012 16:00	2.6000	-0.2000	82	13
18	01/01/2012 17:00	3	0	81	13
19	01/01/2012 18:00	3.8000	1	82	15
20	01/01/2012 19:00	3.1000	1.3000	88	15
21	01/01/2012 20:00	3.2000	1.3000	87	19
22	01/01/2012 21:00	4	1.7000	85	20
23	01/01/2012 22:00	4.4000	1.9000	84	24
24	01/01/2012 23:00	5.3000	2	79	30
25	01/02/2012 00:00	5.2000	1.5000	77	35
26	01/02/2012 01:00	4.6000	0	72	39
27	01/02/2012 02:00	3.9000	-0.9000	71	32
28	01/02/2012 03:00	3.7000	-1.5000	69	33
29	01/02/2012 04:00	2.9000	-2.3000	69	32
30	01/02/2012 05:00	2.6000	-2.3000	70	32
31	01/02/2012 06:00	2.3000	-2.6000	70	26
32	01/02/2012 07:00	2	-2.9000	70	33
33	01/02/2012 08:00	1.9000	-3.3000	68	39
34	01/02/2012 09:00	1.8000	-3.7000	67	44
35	01/02/2012 10:00	1.5000	-4.1000	66	43
36	01/02/2012 11:00	2.2000	-3.5000	66	30
37	01/02/2012 12:00	1.7000	-6.2000	56	48
38	01/02/2012 13:00	1.1000	-6.5000	57	37
39	01/02/2012 14:00	1.1000	-6.8000	56	33
40	01/02/2012 15:00	0	-7	59	33
41	01/02/2012 16:00	-0.7000	-8.7000	55	24
42	01/02/2012 17:00	-2.1000	-9.5000	57	22
43	01/02/2012 18:00	-4.1000	-11.4000	57	28
44	01/02/2012 19:00	-4.8000	-12.1000	57	24
45	01/02/2012 20:00	-5.6000	-13.4000	54	24
46	01/02/2012 21:00	-5.8000	-12.8000	58	26
47	01/02/2012 22:00	-7	-14.7000	54	20
48	01/02/2012 23:00	-7.4000	-14.1000	59	17
49	01/03/2012 00:00	-9	-16	57	28

	Date_Time	Temp_C	DewPointTemp_C	RelHum__	WindSpeed_km_h
50	01/03/2012 01:00	-9.7000	-17.2000	54	20
51	01/03/2012 02:00	-10.5000	-15.8000	65	22
52	01/03/2012 03:00	-11.3000	-18.7000	54	33
53	01/03/2012 04:00	-12.6000	-20.1000	53	24
54	01/03/2012 05:00	-12.9000	-19.1000	60	22
55	01/03/2012 06:00	-13.3000	-19.3000	61	19
56	01/03/2012 07:00	-14	-19.5000	63	19
57	01/03/2012 08:00	-14.8000	-21.3000	58	26
58	01/03/2012 09:00	-15	-21.9000	56	19
59	01/03/2012 10:00	-15.3000	-22.2000	56	24
60	01/03/2012 11:00	-14.9000	-22.2000	54	22
61	01/03/2012 12:00	-14.9000	-22.6000	52	20
62	01/03/2012 13:00	-15.1000	-22.4000	54	22
63	01/03/2012 14:00	-14.9000	-22.9000	50	22
64	01/03/2012 15:00	-14.8000	-22.2000	53	19
65	01/03/2012 16:00	-15.3000	-22.9000	52	22
66	01/03/2012 17:00	-15.8000	-23.2000	53	22
67	01/03/2012 18:00	-16.3000	-23.8000	52	24
68	01/03/2012 19:00	-16.9000	-24.8000	50	24
69	01/03/2012 20:00	-17.3000	-25.4000	49	24
70	01/03/2012 21:00	-17	-24.6000	52	15
71	01/03/2012 22:00	-17.1000	-24.6000	52	20
72	01/03/2012 23:00	-17.3000	-24.2000	55	17
73	01/04/2012 00:00	-17.5000	-24.2000	56	13
74	01/04/2012 01:00	-17.9000	-24.1000	58	11
75	01/04/2012 02:00	-18.1000	-23.8000	61	15
76	01/04/2012 03:00	-18.5000	-24.6000	59	13
77	01/04/2012 04:00	-18.5000	-24.6000	59	13
78	01/04/2012 05:00	-18.6000	-24	62	9
79	01/04/2012 06:00	-18.5000	-24.1000	61	11
80	01/04/2012 07:00	-18.2000	-24.1000	60	11
81	01/04/2012 08:00	-17.8000	-24.2000	57	17
82	01/04/2012 09:00	-16.8000	-22.5000	61	9

	Date_Time	Temp_C	DewPointTemp_C	RelHum__	WindSpeed_km_h
83	01/04/2012 10:00	-15.2000	-20.6000	63	7
84	01/04/2012 11:00	-14.2000	-21.1000	56	13
85	01/04/2012 12:00	-13.7000	-21.7000	51	11
86	01/04/2012 13:00	-12.4000	-20.1000	53	11
87	01/04/2012 14:00	-11.3000	-19	53	7
88	01/04/2012 15:00	-10.2000	-16.3000	61	11
89	01/04/2012 16:00	-9.4000	-15.5000	61	13
90	01/04/2012 17:00	-8.9000	-13.2000	71	9
91	01/04/2012 18:00	-8.9000	-12.6000	75	11
92	01/04/2012 19:00	-8.4000	-12.7000	71	9
93	01/04/2012 20:00	-7.8000	-12.1000	71	9
94	01/04/2012 21:00	-7.6000	-11.6000	73	7
95	01/04/2012 22:00	-9.5000	-12.7000	77	6
96	01/04/2012 23:00	-9.6000	-12.6000	79	6
97	01/05/2012 00:00	-8.8000	-11.7000	79	4
98	01/05/2012 01:00	-7.5000	-10.2000	81	0
99	01/05/2012 02:00	-5.4000	-8.3000	80	9
100	01/05/2012 03:00	-5	-7.7000	81	11

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- Inspecting Data

```
% Displaying the first few rows of the data
head(Weather_Data)
```

Date_Time	Temp_C	DewPointTemp_C	RelHum__	WindSpeed_km_h	Visibility_km	Press_kPa	
01/01/2012 00:00	-1.8	-3.9	86	4	8	101.24	Fog
01/01/2012 01:00	-1.8	-3.7	87	4	8	101.24	Fog
01/01/2012 02:00	-1.8	-3.4	89	7	4	101.26	Free
01/01/2012 03:00	-1.5	-3.2	88	6	4	101.27	Free
01/01/2012 04:00	-1.5	-3.3	88	7	4.8	101.23	Fog
01/01/2012 05:00	-1.4	-3.3	87	9	6.4	101.27	Fog
01/01/2012 06:00	-1.5	-3.1	89	7	6.4	101.29	Fog
01/01/2012 07:00	-1.4	-3.6	85	7	8	101.26	Fog

```
% Checking for missing values
missing_values = sum(ismissing(Weather_Data));
disp('Missing Values in Each Column: ')
```

```
Missing Values in Each Column:
```

```
disp(missing_values)
```

```
     0     0     0     0     0     0     0
```

Task 1.2: Organizing the data into appropriate MATLAB data structures

- Using tables or matrices to store and manipulate the data.

```
% Converting to table for easier manipulation
weather_data = timetable2table(Weather_Data)
```

weather_data = 8784×8 table

...

	Date_Time	Temp_C	DewPointTemp_C	RelHum__	WindSpeed_km_h
1	01/01/2012 00:00	-1.8000	-3.9000	86	4
2	01/01/2012 01:00	-1.8000	-3.7000	87	4
3	01/01/2012 02:00	-1.8000	-3.4000	89	7
4	01/01/2012 03:00	-1.5000	-3.2000	88	6
5	01/01/2012 04:00	-1.5000	-3.3000	88	7
6	01/01/2012 05:00	-1.4000	-3.3000	87	9
7	01/01/2012 06:00	-1.5000	-3.1000	89	7
8	01/01/2012 07:00	-1.4000	-3.6000	85	7
9	01/01/2012 08:00	-1.4000	-3.6000	85	9
10	01/01/2012 09:00	-1.3000	-3.1000	88	15
11	01/01/2012 10:00	-1	-2.3000	91	9
12	01/01/2012 11:00	-0.5000	-2.1000	89	7
13	01/01/2012 12:00	-0.2000	-2	88	9
14	01/01/2012 13:00	0.2000	-1.7000	87	13
15	01/01/2012 14:00	0.8000	-1.1000	87	20
16	01/01/2012 15:00	1.8000	-0.4000	85	22
17	01/01/2012 16:00	2.6000	-0.2000	82	13
18	01/01/2012 17:00	3	0	81	13
19	01/01/2012 18:00	3.8000	1	82	15
20	01/01/2012 19:00	3.1000	1.3000	88	15
21	01/01/2012 20:00	3.2000	1.3000	87	19
22	01/01/2012 21:00	4	1.7000	85	20
23	01/01/2012 22:00	4.4000	1.9000	84	24
24	01/01/2012 23:00	5.3000	2	79	30
25	01/02/2012 00:00	5.2000	1.5000	77	35

	Date_Time	Temp_C	DewPointTemp_C	RelHum__	WindSpeed_km_h
26	01/02/2012 01:00	4.6000	0	72	39
27	01/02/2012 02:00	3.9000	-0.9000	71	32
28	01/02/2012 03:00	3.7000	-1.5000	69	33
29	01/02/2012 04:00	2.9000	-2.3000	69	32
30	01/02/2012 05:00	2.6000	-2.3000	70	32
31	01/02/2012 06:00	2.3000	-2.6000	70	26
32	01/02/2012 07:00	2	-2.9000	70	33
33	01/02/2012 08:00	1.9000	-3.3000	68	39
34	01/02/2012 09:00	1.8000	-3.7000	67	44
35	01/02/2012 10:00	1.5000	-4.1000	66	43
36	01/02/2012 11:00	2.2000	-3.5000	66	30
37	01/02/2012 12:00	1.7000	-6.2000	56	48
38	01/02/2012 13:00	1.1000	-6.5000	57	37
39	01/02/2012 14:00	1.1000	-6.8000	56	33
40	01/02/2012 15:00	0	-7	59	33
41	01/02/2012 16:00	-0.7000	-8.7000	55	24
42	01/02/2012 17:00	-2.1000	-9.5000	57	22
43	01/02/2012 18:00	-4.1000	-11.4000	57	28
44	01/02/2012 19:00	-4.8000	-12.1000	57	24
45	01/02/2012 20:00	-5.6000	-13.4000	54	24
46	01/02/2012 21:00	-5.8000	-12.8000	58	26
47	01/02/2012 22:00	-7	-14.7000	54	20
48	01/02/2012 23:00	-7.4000	-14.1000	59	17
49	01/03/2012 00:00	-9	-16	57	28
50	01/03/2012 01:00	-9.7000	-17.2000	54	20
51	01/03/2012 02:00	-10.5000	-15.8000	65	22
52	01/03/2012 03:00	-11.3000	-18.7000	54	33
53	01/03/2012 04:00	-12.6000	-20.1000	53	24
54	01/03/2012 05:00	-12.9000	-19.1000	60	22
55	01/03/2012 06:00	-13.3000	-19.3000	61	19
56	01/03/2012 07:00	-14	-19.5000	63	19
57	01/03/2012 08:00	-14.8000	-21.3000	58	26
58	01/03/2012 09:00	-15	-21.9000	56	19

	Date_Time	Temp_C	DewPointTemp_C	RelHum__	WindSpeed_km_h
59	01/03/2012 10:00	-15.3000	-22.2000	56	24
60	01/03/2012 11:00	-14.9000	-22.2000	54	22
61	01/03/2012 12:00	-14.9000	-22.6000	52	20
62	01/03/2012 13:00	-15.1000	-22.4000	54	22
63	01/03/2012 14:00	-14.9000	-22.9000	50	22
64	01/03/2012 15:00	-14.8000	-22.2000	53	19
65	01/03/2012 16:00	-15.3000	-22.9000	52	22
66	01/03/2012 17:00	-15.8000	-23.2000	53	22
67	01/03/2012 18:00	-16.3000	-23.8000	52	24
68	01/03/2012 19:00	-16.9000	-24.8000	50	24
69	01/03/2012 20:00	-17.3000	-25.4000	49	24
70	01/03/2012 21:00	-17	-24.6000	52	15
71	01/03/2012 22:00	-17.1000	-24.6000	52	20
72	01/03/2012 23:00	-17.3000	-24.2000	55	17
73	01/04/2012 00:00	-17.5000	-24.2000	56	13
74	01/04/2012 01:00	-17.9000	-24.1000	58	11
75	01/04/2012 02:00	-18.1000	-23.8000	61	15
76	01/04/2012 03:00	-18.5000	-24.6000	59	13
77	01/04/2012 04:00	-18.5000	-24.6000	59	13
78	01/04/2012 05:00	-18.6000	-24	62	9
79	01/04/2012 06:00	-18.5000	-24.1000	61	11
80	01/04/2012 07:00	-18.2000	-24.1000	60	11
81	01/04/2012 08:00	-17.8000	-24.2000	57	17
82	01/04/2012 09:00	-16.8000	-22.5000	61	9
83	01/04/2012 10:00	-15.2000	-20.6000	63	7
84	01/04/2012 11:00	-14.2000	-21.1000	56	13
85	01/04/2012 12:00	-13.7000	-21.7000	51	11
86	01/04/2012 13:00	-12.4000	-20.1000	53	11
87	01/04/2012 14:00	-11.3000	-19	53	7
88	01/04/2012 15:00	-10.2000	-16.3000	61	11
89	01/04/2012 16:00	-9.4000	-15.5000	61	13
90	01/04/2012 17:00	-8.9000	-13.2000	71	9
91	01/04/2012 18:00	-8.9000	-12.6000	75	11

	Date_Time	Temp_C	DewPointTemp_C	RelHum__	WindSpeed_km_h
92	01/04/2012 19:00	-8.4000	-12.7000	71	9
93	01/04/2012 20:00	-7.8000	-12.1000	71	9
94	01/04/2012 21:00	-7.6000	-11.6000	73	7
95	01/04/2012 22:00	-9.5000	-12.7000	77	6
96	01/04/2012 23:00	-9.6000	-12.6000	79	6
97	01/05/2012 00:00	-8.8000	-11.7000	79	4
98	01/05/2012 01:00	-7.5000	-10.2000	81	0
99	01/05/2012 02:00	-5.4000	-8.3000	80	9
100	01/05/2012 03:00	-5	-7.7000	81	11

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- Extracting relevant columns for analysis.

```
temperature = weather_data.Temp_C;
humidity = weather_data.RelHum__;
wind_speed = weather_data.WindSpeed_km_h;
visibility = weather_data.Visibility_km;
```

Basic Data Analysis:

Task 2.1: Calculating the basic statistical measures for each weather parameter (mean, median, standard deviation).

- Using built-in MATLAB functions for statistical analysis

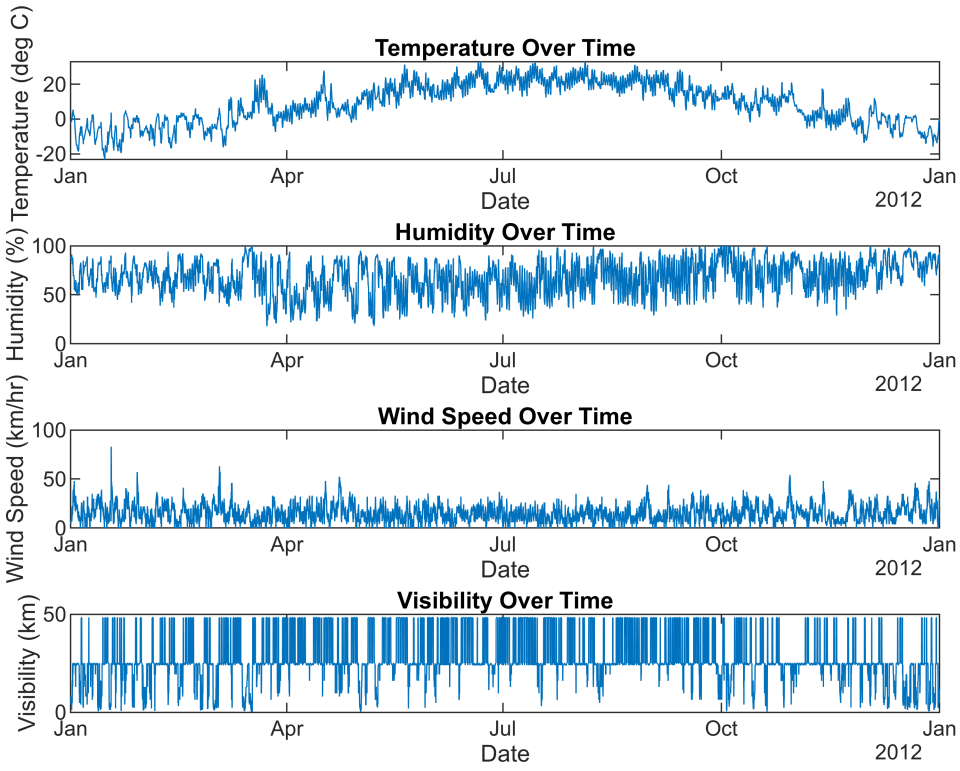
```
% For Temperature
mean_temp = mean(temperature);
median_temp = median(temperature);
std_temp = std(temperature);

% For Humidity
mean_humidity = mean(humidity);
median_humidity = median(humidity);
std_humidity = std(humidity);

% For Windspeed
mean_windspeed = mean(wind_speed);
median_windspeed = median(wind_speed);
std_windspeed = std(wind_speed);

% For Visibility
mean_visibility = mean(visibility);
median_visibility = median(visibility);
```

```
std_visibility = std(visibility);
```

Task 2.2: Identify trends and patterns in the data.

- Plotting time series graphs

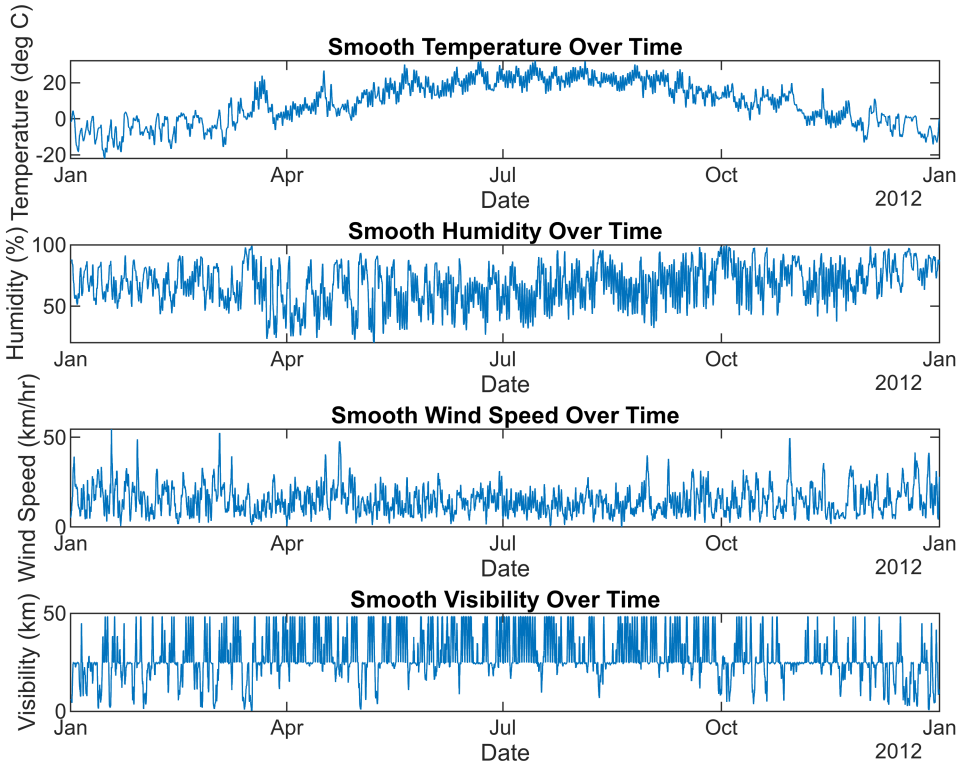
```
dates = weather_data.Date_Time;

% for Temperature
figure;
subplot(4,1,1);
plot(dates,temperature);
title('Temperature Over Time');
xlabel('Date');
ylabel('Temperature (deg C) ');

% for Humidity
subplot(4,1,2);
plot(dates,humidity);
title('Humidity Over Time');
xlabel('Date');
ylabel('Humidity (%)');

% for Wind Speed
subplot(4,1,3);
plot(dates,wind_speed);
title('Wind Speed Over Time');
xlabel('Date');
ylabel('Wind Speed (km/hr)');

% for Visibility
subplot(4,1,4);
plot(dates,visibility);
title('Visibility Over Time');
xlabel('Date');
ylabel('Visibility (km)');
```



- Use moving averages to smooth the data and highlight trends.

```
% Considering 7-day moving average
% For each point in the data, the average of the surrounding
% 7 days (including the current days) will be calculated.

window_size = 7;

% Calculating the moving average using specified window size.
temp_smooth = movmean(temperature, window_size);
% where each element is the average of the surrounding
% 7 elements in the original data
hum_smooth = movmean(humidity, window_size);
wind_smooth = movmean(wind_speed, window_size);
vis_smooth = movmean(visibility, window_size);

% Plotting the graph with smoothed data
% for Temperature
figure;
subplot(4,1,1);
plot(dates,temp_smooth);
title('Smooth Temperature Over Time');
xlabel('Date');
```

```
ylabel('Temperature (deg C) ');

% for Humidity
subplot(4,1,2);
plot(dates,hum_smooth);
title('Smooth Humidity Over Time');
xlabel('Date');
ylabel('Humidity (%)');

% for Wind Speed
subplot(4,1,3);
plot(dates,wind_smooth);
title('Smooth Wind Speed Over Time');
xlabel('Date');
ylabel('Wind Speed (km/hr)');

% for Visibility
subplot(4,1,4);
plot(dates,vis_smooth);
title('Smooth Visibility Over Time');
xlabel('Date');
ylabel('Visibility (km)');
```



Advanced Data Analysis:

Task 3.1: Perform correlation analysis between differentweather parameters.

- Calculate correlation coefficients and create scatterplots to visualize relationships.

```
% Calculating Correlation Coefficients
corr_temp_humidity = corr(temperature,humidity)
```

```
corr_temp_humidity =
-0.2202
```

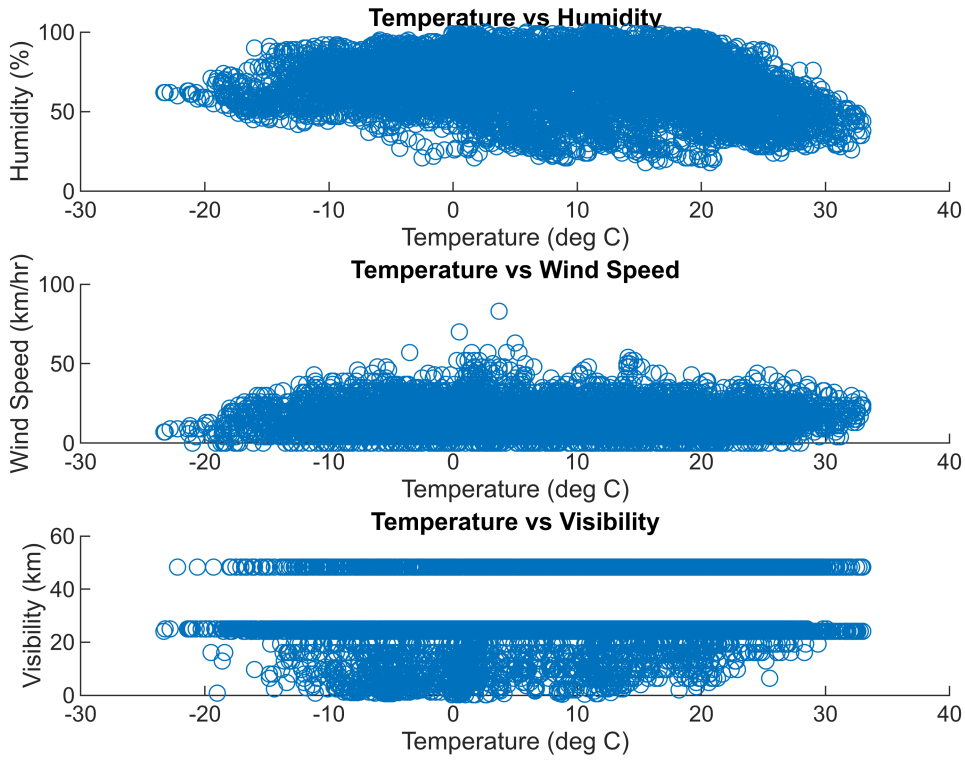
```
corr_temp_windspeed = corr(temperature,wind_speed)
```

```
corr_temp_windspeed =
-0.0619
```

```
corr_temp_visibility = corr(temperature,visibility)
```

```
corr_temp_visibility =
0.2735
```

```
% Creating Scatterplots to visualize relationships
figure;
subplot(3,1,1);
scatter(temperature,humidity);
title('Temperature vs Humidity');
xlabel('Temperature (deg C)');
ylabel('Humidity (%)');

subplot(3,1,2);
scatter(temperature,wind_speed);
title('Temperature vs Wind Speed');
xlabel('Temperature (deg C)');
ylabel('Wind Speed (km/hr)');

subplot(3,1,3);
scatter(temperature,visibility);
title('Temperature vs Visibility');
xlabel('Temperature (deg C)');
ylabel('Visibility (km)');
```



Task 3.2: Implement linearregression to modelthe relationship between temperature and other weather parameters.

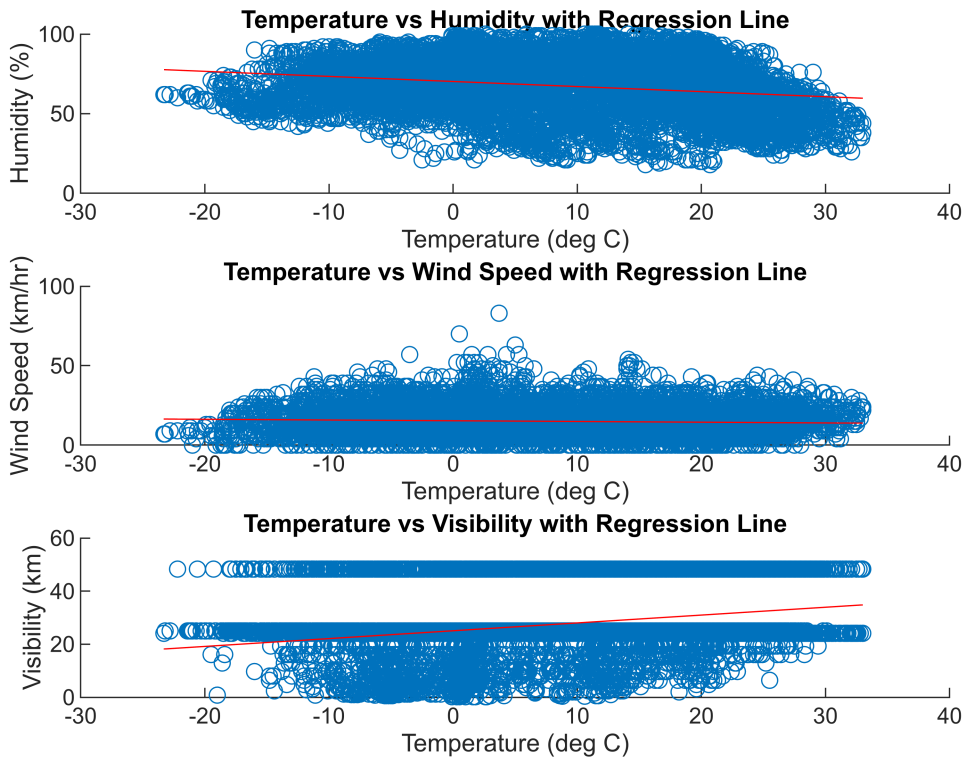
- Use the polyfitand polyval functionsto fit and evaluate the regression model.

```
% fitting and evaluating the regression model
p_temp_humidity = polyfit(temperature,humidity,1);
% where 1 is the degree of polynomial fit
p_temp_windspeed = polyfit(temperature,wind_speed,1);
p_temp_visibility = polyfit(temperature,visibility,1);

humidity_fit = polyval(p_temp_humidity,temperature);
windspeed_fit = polyval(p_temp_windspeed,temperature);
visibility_fit = polyval(p_temp_visibility,temperature);
```

- Plot the regression line and analyze the results.

```
figure;
% For Temp and Humidity
subplot(3,1,1);
scatter(temperature,humidity);
hold on;
plot(temperature,humidity_fit,'r');
title('Temperature vs Humidity with Regression Line');
xlabel('Temperature (deg C)');
```

```
ylabel ('Humidity (%)');

% For Temp and Wind Speed
subplot(3,1,2);
scatter(temperature,wind_speed);
hold on;
plot(temperature,windspeed_fit,'r');
title('Temperature vs Wind Speed with Regression Line');
xlabel('Temperature (deg C)');
ylabel ('Wind Speed (km/hr)');

% For Temp and Visibility
subplot(3,1,3);
scatter(temperature,visibility);
hold on;
plot(temperature,visibility_fit,'r');
title('Temperature vs Visibility with Regression Line');
xlabel('Temperature (deg C)');
ylabel ('Visibility (km)');

hold off
```

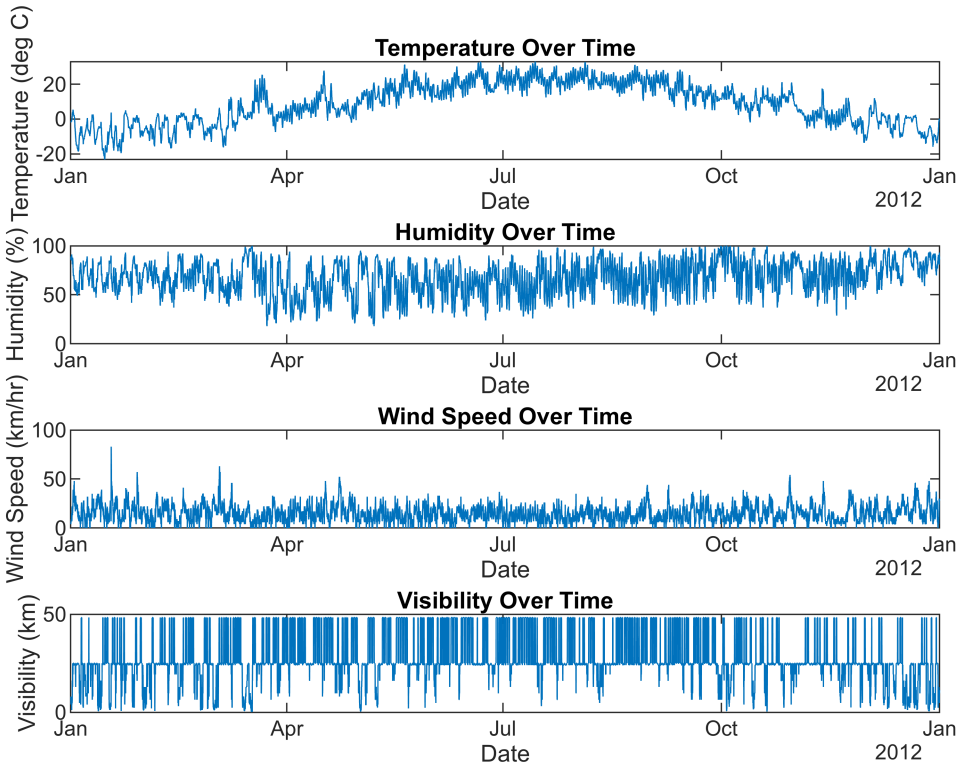


Data Visualization:

Task 4.1: Create comprehensive visualizations to present the analysis.

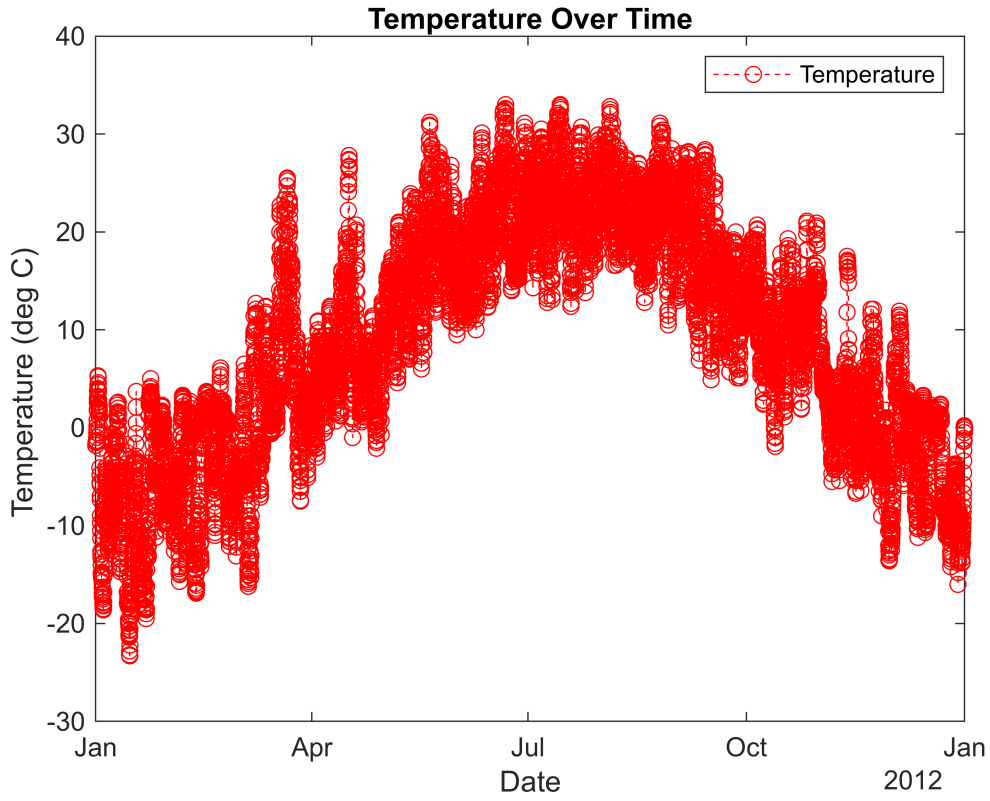
- Use subplot to create multipleplots in a single figure.

```
% for Temperature
figure;
subplot(4,1,1);
plot(dates,temperature);
title('Temperature Over Time');
xlabel('Date');
ylabel('Temperature (deg C) ');

% for Humidity
subplot(4,1,2);
plot(dates,humidity);
title('Humidity Over Time');
xlabel('Date');
ylabel('Humidity (%)');

% for Wind Speed
subplot(4,1,3);
plot(dates,wind_speed);
title('Wind Speed Over Time');
xlabel('Date');
ylabel('Wind Speed (km/hr)');

% for Visibility
subplot(4,1,4);
plot(dates,visibility);
title('Visibility Over Time');
xlabel('Date');
ylabel('Visibility (km)');
```

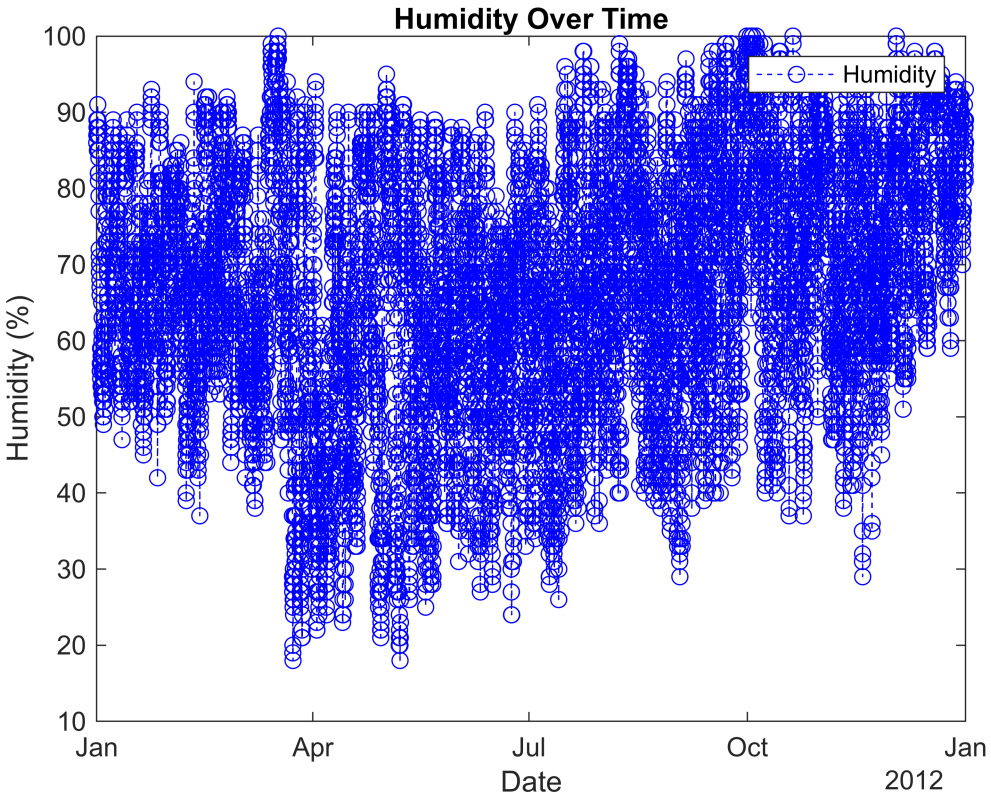


- Customize plots with titles, labels,legends, and annotations.

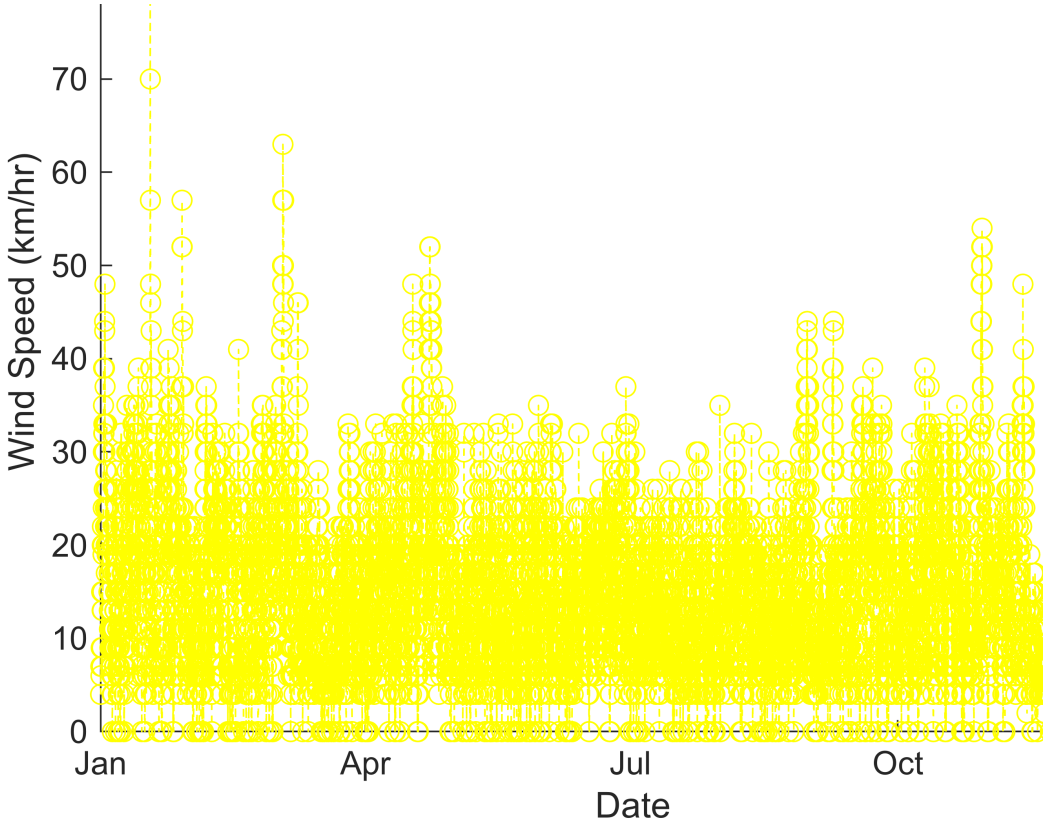
```
% for Temperature
figure;

plot(dates,temperature,'r--o');
title('Temperature Over Time');
xlabel('Date');
ylabel('Temperature (deg C) ');
legend('Temperature');
```



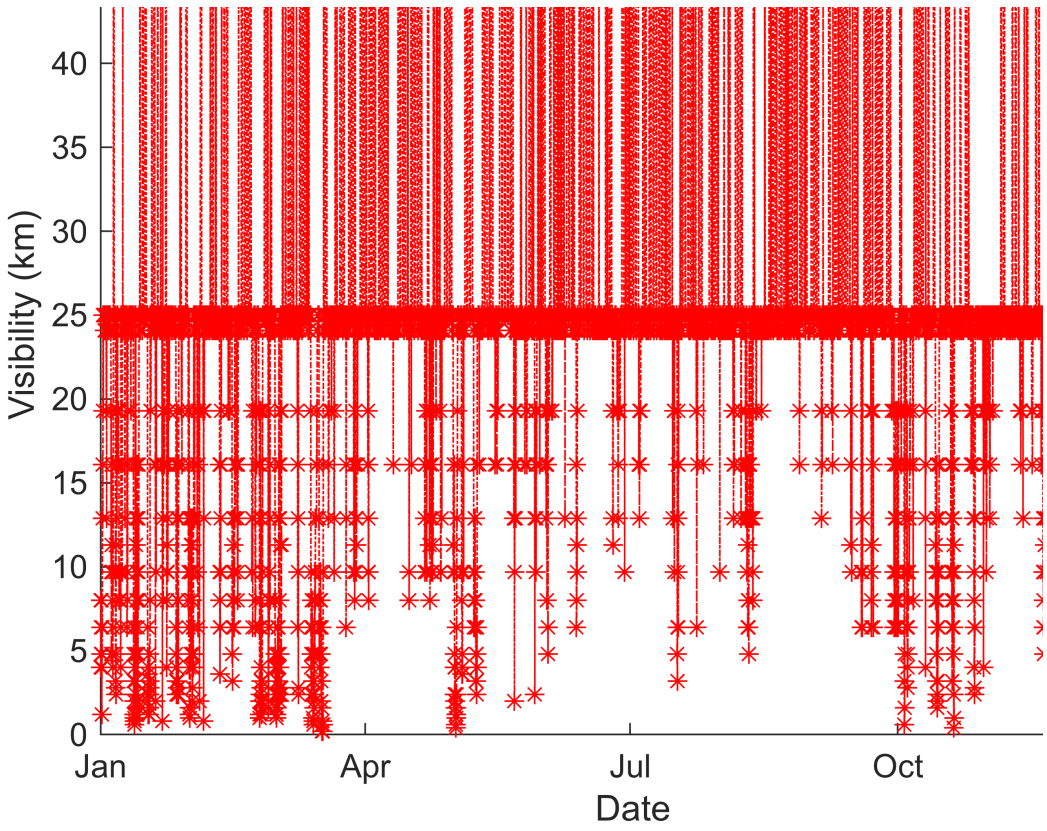

```
% for Humidity
plot(dates,humidity,'b--o');
title('Humidity Over Time');
xlabel('Date');
ylabel('Humidity (%)');
legend('Humidity');
```




```
% for Wind Speed
plot(dates,wind_speed,'y--o');
title('Wind Speed Over Time');
xlabel('Date');
ylabel('Wind Speed (km/hr)');
legend('Wind Speed');
```




```
% for Visibility
plot(dates,visibility,'r-.*');
title('Visibility Over Time');
xlabel('Date');
ylabel('Visibility (km)');
legend('Visibility');
```



Task 4.2: Develop 3D surface plots to visualize temperature variation over time and space.

- Use the surf and mesh functions to create 3D plots.

```
% Clearing memory
clear dates;
clear hum_smooth;
clear hum_smooth;
clear temp_smooth;
clear visibility_fit;
clear vis_smooth;
clear Weather_Data;
clear windspeed_fit;
clear wind_smooth;
```

```
% Assuming weatherTable.Date and temperature are vectors of the same length
% Converting DateTime to numeric values for plotting
time = datetime(weather_data.Date_Time);

% Creating an artificial index for the Y-axis
index = 1:length(temperature); % Create an index for each temperature value
```

```
% Creating the grid
[X, Y] = meshgrid(time, index);

% Reshaping temperature into a matrix
Z = repmat(temperature', length(index), 1);

% Creating the 3D surface plot
surf(X, Y, Z);
title('3D Surface Plot of Temperature');
xlabel('DateTime');
ylabel('Index');
zlabel('Temperature');

% Formatting  the DateTime axis
xtickformat('dd/MM/yyyy HH:mm');
% Adding this command to prevent serialization error
uicontrol('Visible', 'off');p
```