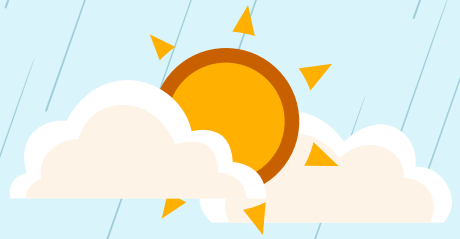

Weather Data Analysis and Visualization

2204063, 2204074, 2204076 CSE (B)

Dhaka University of Engineering & Technology

Department of Computer Science and Engineering

Course Code: ***CSE 2110***
Course Title: ***Advanced Programming Sessional***

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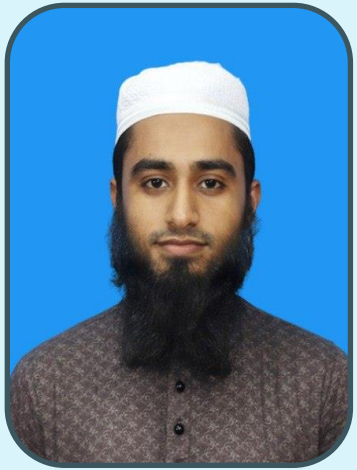

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Presentation Outlines

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01

Project Objectives

Objective of this project

The project “Weather Data Analysis and Visualization” is designed and developed to analyze and visualize the real time weather of different cities. We have collected real time weather data for different cities from kaggle.com website. We processed the data using Pandas and visualized weather trends (temperature, humidity, wind speed etc.) over time using Matplotlib.

02

Skills and Tools used

- Python
- Panda
- Matplotlib
- Numpy
- Notebook

03

Data Collection

How we collect data?

To complete this project we collected our data from Kaggle.com. We have downloaded a .csv file of weather data sets. Which data set is used to analyze and visualize.

04

Work flow

Summary of data set

Year : 2012
Total months: 12
Total rows : 8784
Total columns : 8

Total data set

	Date/Time	Temp_C	Dew Point Temp_C	Rel Hum_%	Wind Speed_km/h	Visibility_km	Press_kPa	Weather
0	1/1/2012 0:00	-1.8	-3.9	86	4	8.0	101.24	Fog
1	1/1/2012 1:00	-1.8	-3.7	87	4	8.0	101.24	Fog
2	1/1/2012 2:00	-1.8	-3.4	89	7	4.0	101.26	Freezing Drizzle,Fog
3	1/1/2012 3:00	-1.5	-3.2	88	6	4.0	101.27	Freezing Drizzle,Fog
4	1/1/2012 4:00	-1.5	-3.3	88	7	4.8	101.23	Fog
...	...	...	...	...	...	...	...	...
8779	12/31/2012 19:00	0.1	-2.7	81	30	9.7	100.13	Snow
8780	12/31/2012 20:00	0.2	-2.4	83	24	9.7	100.03	Snow
8781	12/31/2012 21:00	-0.5	-1.5	93	28	4.8	99.95	Snow
8782	12/31/2012 22:00	-0.2	-1.8	89	28	9.7	99.91	Snow
8783	12/31/2012 23:00	0.0	-2.1	86	30	11.3	99.89	Snow

8784 rows × 8 columns

Frequency count

	Weather	Frequency
0	Mainly Clear	2106
1	Mostly Cloudy	2069
2	Cloudy	1728
3	Clear	1326
4	Snow	390
5	Rain	306
6	Rain Showers	188
7	Fog	150
8	Rain,Fog	116
9	Drizzle,Fog	80
10	Snow Showers	60
11	Drizzle	41
12	Snow,Fog	37
13	Snow,Blowing Snow	19
14	Rain,Snow	18
15	Thunderstorms,Rain Showers	16
16	Haze	16
17	Drizzle,Snow,Fog	15
18	Freezing Rain	14
19	Freezing Drizzle,Snow	11
20	Freezing Drizzle	7
21	Freezing Drizzle,Fog	6
22	Snow,Ice Pellets	6
23	Snow,Haze	5
24	Freezing Rain,Fog	4
25	Moderate Snow	4
26	Rain,Snow,Ice Pellets	4
27	Freezing Fog	4
28	Snow Showers,Fog	4
29	Thunderstorms,Rain Showers,Fog	3
30	Thunderstorms,Rain	3
31	Freezing Drizzle,Haze	3
32	Rain,Haze	3
33	Drizzle,Snow	2
34	Moderate Snow,Blowing Snow	2

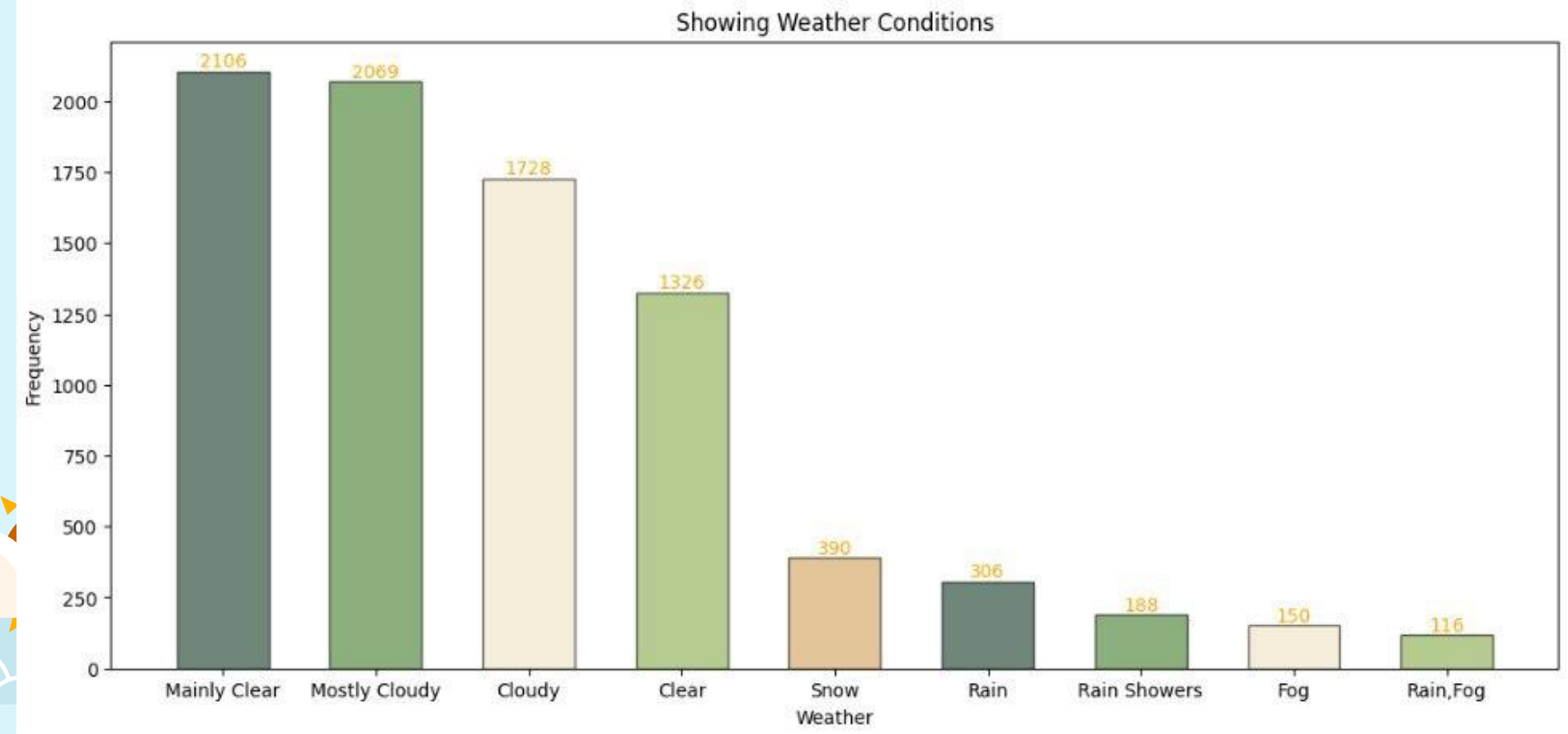
Frequency count

35	Thunderstorms	2
36	Freezing Rain,Haze	2
37	Rain Showers,Snow Showers	2
38	Freezing Rain,Snow Grains	1
39	Thunderstorms,Heavy Rain Showers	1
40	Thunderstorms,Moderate Rain Showers,Fog	1
41	Thunderstorms,Rain,Fog	1
42	Freezing Rain,Ice Pellets,Fog	1
43	Moderate Rain,Fog	1
44	Rain,Snow,Fog	1
45	Snow Pellets	1
46	Rain Showers,Fog	1
47	Drizzle,Ice Pellets,Fog	1
48	Rain,Ice Pellets	1
49	Rain,Snow Grains	1

Frequency count summary:

Total types of different weather: ***50***
Max weather: ***Most Clear*** *(2106)*

Graph of Frequency count



Unique value count in all column

```
Date/Time                8784
Temp_C                    533
Dew Point Temp_C          489
Rel Hum_%                  83
Wind Speed_km/h            34
Visibility_km              24
Press_kPa                 518
Weather                    50
dtype: int64
```

Where weather is exactly “clear”

	Date/Time	Temp_C	Dew Point Temp_C	Rel Hum_%	Wind Speed_km/h	Visibility_km	Press_kPa	Weather
67	1/3/2012 19:00	-16.9	-24.8	50	24	25.0	101.74	Clear
114	1/5/2012 18:00	-7.1	-14.4	56	11	25.0	100.71	Clear
115	1/5/2012 19:00	-9.2	-15.4	61	7	25.0	100.80	Clear
116	1/5/2012 20:00	-9.8	-15.7	62	9	25.0	100.83	Clear
117	1/5/2012 21:00	-9.0	-14.8	63	13	25.0	100.83	Clear
...	...	...	...	...	...	...	...	...
8646	12/26/2012 6:00	-13.4	-14.8	89	4	25.0	102.47	Clear
8698	12/28/2012 10:00	-6.1	-8.6	82	19	24.1	101.27	Clear
8713	12/29/2012 1:00	-11.9	-13.6	87	11	25.0	101.31	Clear
8714	12/29/2012 2:00	-11.8	-13.1	90	13	25.0	101.33	Clear
8756	12/30/2012 20:00	-13.8	-16.5	80	24	25.0	101.52	Clear

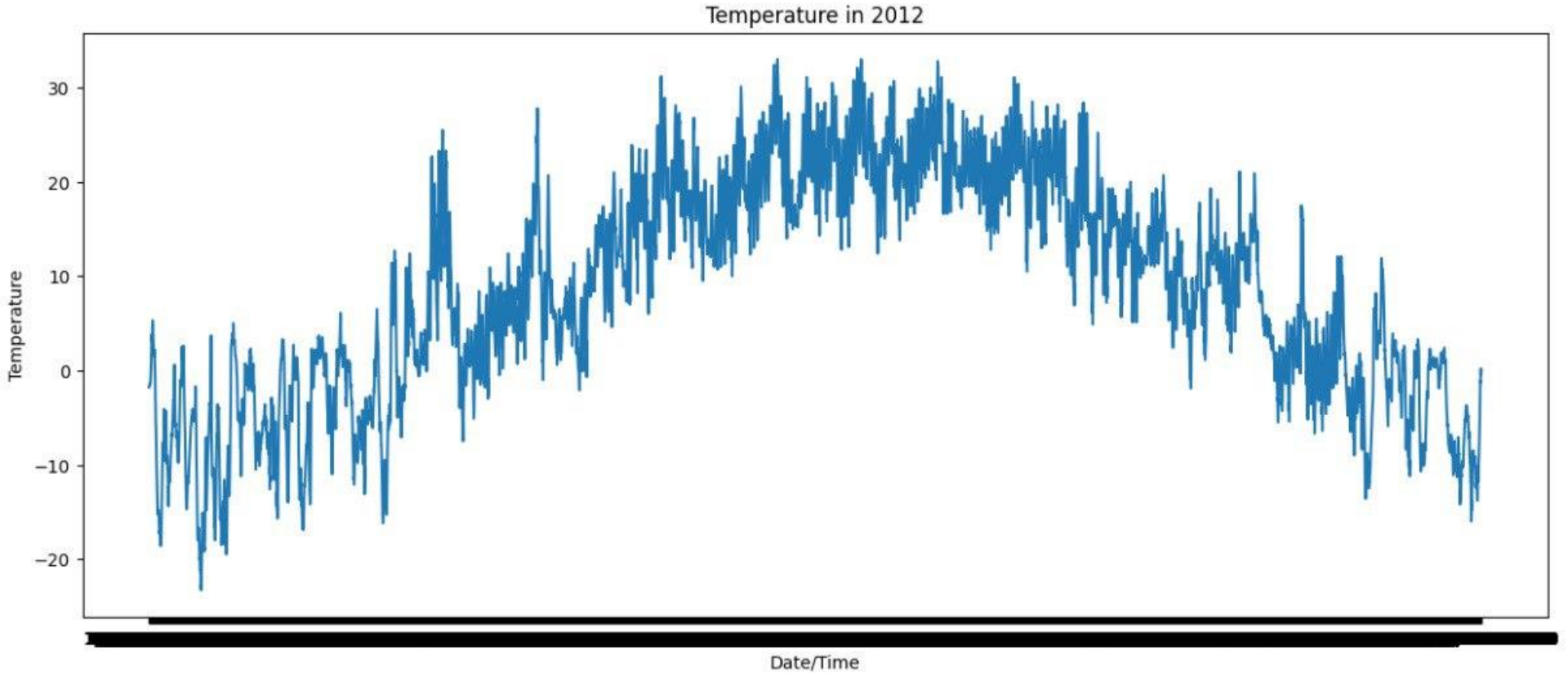
1326 rows × 8 columns

Where weather is exactly “fog”

	Date/Time	Temp_C	Dew Point Temp_C	Rel Hum_%	Wind Speed_km/h	Visibility_km	Press_kPa	Weather
0	1/1/2012 0:00	-1.8	-3.9	86	4	8.0	101.24	Fog
1	1/1/2012 1:00	-1.8	-3.7	87	4	8.0	101.24	Fog
4	1/1/2012 4:00	-1.5	-3.3	88	7	4.8	101.23	Fog
5	1/1/2012 5:00	-1.4	-3.3	87	9	6.4	101.27	Fog
6	1/1/2012 6:00	-1.5	-3.1	89	7	6.4	101.29	Fog
...	...	...	...	...	...	...	...	...
8716	12/29/2012 4:00	-16.0	-17.2	90	6	9.7	101.25	Fog
8717	12/29/2012 5:00	-14.8	-15.9	91	4	6.4	101.25	Fog
8718	12/29/2012 6:00	-13.8	-15.3	88	4	9.7	101.25	Fog
8719	12/29/2012 7:00	-14.8	-16.4	88	7	8.0	101.22	Fog
8722	12/29/2012 10:00	-12.0	-13.3	90	7	6.4	101.15	Fog

150 rows × 8 columns

Temperature and Date/Time Chart



Minimum, Maximum and average value of “Wind speed”

```
——— Wind Speed km/h ———

Minimum =  0
Maximum =  83
Average =  14.945469034608 38
```

Minimum, Maximum and average value of “Visibility”

```
——— Visibility km ———

Minimum =  0.2
Maximum =  48.3
Average =  27.664446721311478
```

Visibility greater than average value of visibility

Visibility greater than average value

	Date/Time	Temp_C	Dew Point Temp_C	Rel Hum_%	Wind Speed_km/h	Visibility_km	Press_kPa	Weather
106	1/5/2012 10:00	-6.0	-10.0	73	17	48.3	100.45	Mainly Clear
107	1/5/2012 11:00	-5.6	-10.2	70	22	48.3	100.41	Mainly Clear
108	1/5/2012 12:00	-4.7	-9.6	69	20	48.3	100.38	Mainly Clear
109	1/5/2012 13:00	-4.4	-9.7	66	26	48.3	100.40	Mainly Clear
110	1/5/2012 14:00	-5.1	-10.7	65	22	48.3	100.46	Mainly Clear
...	...	...	...	...	...	...	...	...
8748	12/30/2012 12:00	-12.2	-15.7	75	26	48.3	100.91	Mostly Cloudy
8749	12/30/2012 13:00	-12.4	-16.2	73	37	48.3	100.92	Mostly Cloudy
8750	12/30/2012 14:00	-11.8	-16.1	70	37	48.3	100.96	Mainly Clear
8751	12/30/2012 15:00	-11.3	-15.6	70	32	48.3	101.05	Mainly Clear
8752	12/30/2012 16:00	-11.4	-15.5	72	26	48.3	101.15	Mainly Clear

2014 rows × 8 columns

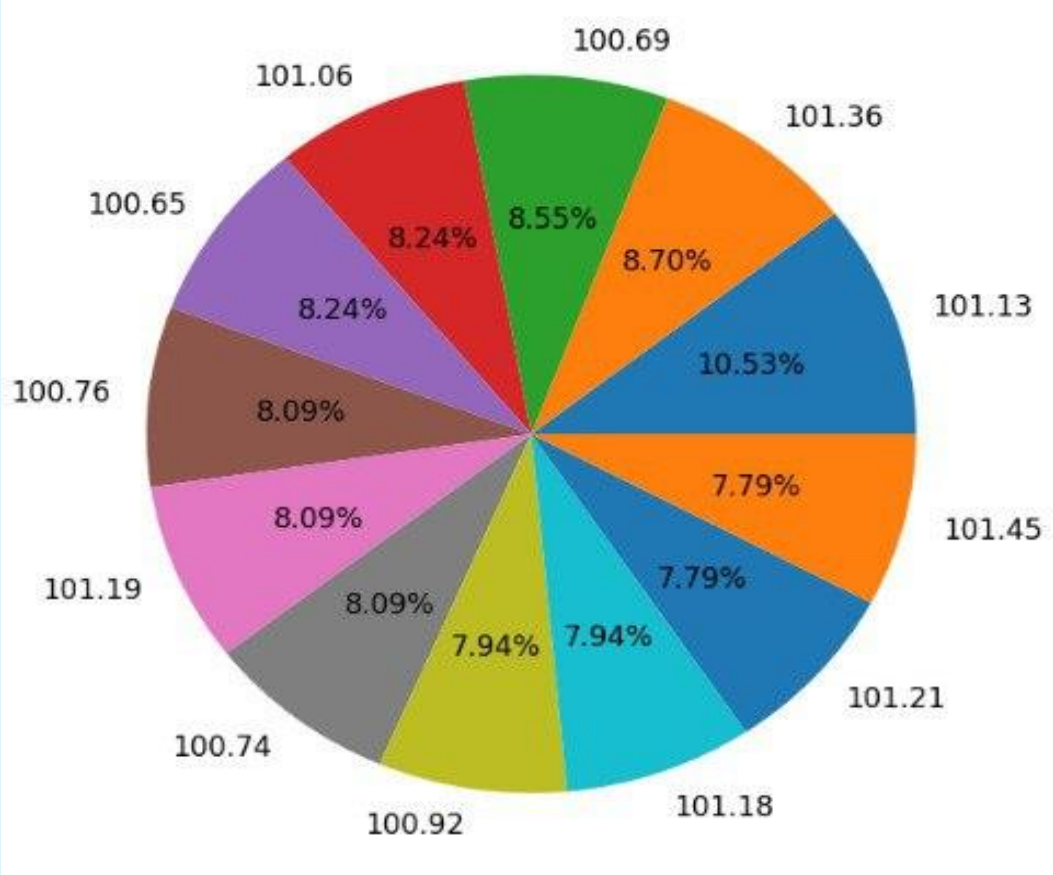
Where wind speed is exactly 4 km/h

	Date/Time	Temp_C	Dew Point Temp_C	Rel Hum_%	Wind Speed_km/h	Visibility_km	Press_kPa	Weather
0	1/1/2012 0:00	-1.8	-3.9	86	4	8.0	101.24	Fog
1	1/1/2012 1:00	-1.8	-3.7	87	4	8.0	101.24	Fog
96	1/5/2012 0:00	-8.8	-11.7	79	4	9.7	100.32	Snow
101	1/5/2012 5:00	-7.0	-9.5	82	4	4.0	100.19	Snow
146	1/7/2012 2:00	-8.1	-11.1	79	4	19.3	100.15	Cloudy
...	...	...	...	...	...	...	...	...
8768	12/31/2012 8:00	-8.6	-10.3	87	4	3.2	101.14	Snow Showers
8769	12/31/2012 9:00	-8.1	-9.6	89	4	2.4	101.09	Snow
8770	12/31/2012 10:00	-7.4	-8.9	89	4	6.4	101.05	Snow,Fog
8772	12/31/2012 12:00	-5.8	-7.5	88	4	12.9	100.78	Snow
8773	12/31/2012 13:00	-4.6	-6.6	86	4	12.9	100.63	Snow

474 rows × 8 columns

Where pressure is greater than 50 kPa

This is the pi chart where pressure is greater than 50 kPa



All the instances when:

"**Weather is Clear**" and "**Relative Humidity is greater than 50**“ or "**Visibility is above 40**"

	Date/Time	Temp_C	Dew Point Temp_C	Rel Hum_%	Wind Speed_km/h	Visibility_km	Press_kPa	Weather
106	1/5/2012 10:00	-6.0	-10.0	73	17	48.3	100.45	Mainly Clear
107	1/5/2012 11:00	-5.6	-10.2	70	22	48.3	100.41	Mainly Clear
108	1/5/2012 12:00	-4.7	-9.6	69	20	48.3	100.38	Mainly Clear
109	1/5/2012 13:00	-4.4	-9.7	66	26	48.3	100.40	Mainly Clear
110	1/5/2012 14:00	-5.1	-10.7	65	22	48.3	100.46	Mainly Clear
...	...	...	...	...	...	...	...	...
8749	12/30/2012 13:00	-12.4	-16.2	73	37	48.3	100.92	Mostly Cloudy
8750	12/30/2012 14:00	-11.8	-16.1	70	37	48.3	100.96	Mainly Clear
8751	12/30/2012 15:00	-11.3	-15.6	70	32	48.3	101.05	Mainly Clear
8752	12/30/2012 16:00	-11.4	-15.5	72	26	48.3	101.15	Mainly Clear
8756	12/30/2012 20:00	-13.8	-16.5	80	24	25.0	101.52	Clear

2921 rows × 8 columns

05

Future

- We want our project to analysis weather data more briefly (like monthly, daily or hourly basis).
- Integration with machine learning models for more sophisticated forecasting techniques.
- Adding more granular data sources (e.g., wind direction, UV index) for a comprehensive view of weather conditions.
- Extending the system to provide automated alerts based on certain weather conditions (e.g., extreme temperatures, storms).
- Hosting the project as a web application for public access, allowing users to visualize weather data globally.

06

Project outcomes

- The outcome of the "Weather Data Analysis and Visualization" project is a comprehensive analysis of weather data that provides valuable insights through visualizations, and trend analysis.

- It demonstrates the brief idea about the ongoing weather condition. Using this project we can be informed about various types of weather.

- It shows us the graphical representation of previous weather. Graphical representation help us to compare among various weather.

- In future we want our project to serve as a foundation for more advanced weather-related applications or further exploration of machine learning techniques for accurate forecasting.

07

Key Learnings

- Through the **Weather Data Analysis and Visualization** project, we learned how to collect real time weather data.
- We also learned how to analyze and visualize real time weather data using Python.
- We learned Pandas, Numpy, Matplotlib and Notebook.
- Team wise working experiences.
- Short time project creation experience.
- Additionally, we developed a strong understanding about the real-world weather.

08

Conclusion

The **"Weather Data Analysis and Visualization"** project has successfully achieved it’s goal of collecting, analyzing, and visualizing weather data to uncover meaningful insights and patterns that can be valuable for various applications. We have learn so many new things throughout the project. This knowledge will help us in future to create more real world projects. Overall, the project has provided a valuable platform for exploring and understanding weather data.

Thank You!