Weather Data Analysis Report

1. Introduction

This report presents an analytical study of weather conditions using a meteorological dataset. The dataset includes parameters such as temperature, rainfall, humidity, cloud cover and wind information. The purpose of this analysis is to understand temperature trends, seasonal variations, rainfall distribution, and indicators of extreme weather conditions.

2. Objectives

The main objectives of this analysis are:

- To study temperature trends using minimum and maximum temperature data
- To observe seasonal temperature patterns
- To analyze rainfall distribution
- To identify extreme weather events using statistical indicators
- To explore relationships between weather parameters

3. Dataset Description

The dataset contains daily weather observations with key attributes such as:

- MinTemp
- MaxTemp
- Rainfall
- Sunshine
- Humidity
- Pressure
- Cloud Conditions
- Wind Direction
- Wind Speed
- Rain Today / Rain Tomorrow

These features allow us to analyze weather conditions and climatic behavior over time.

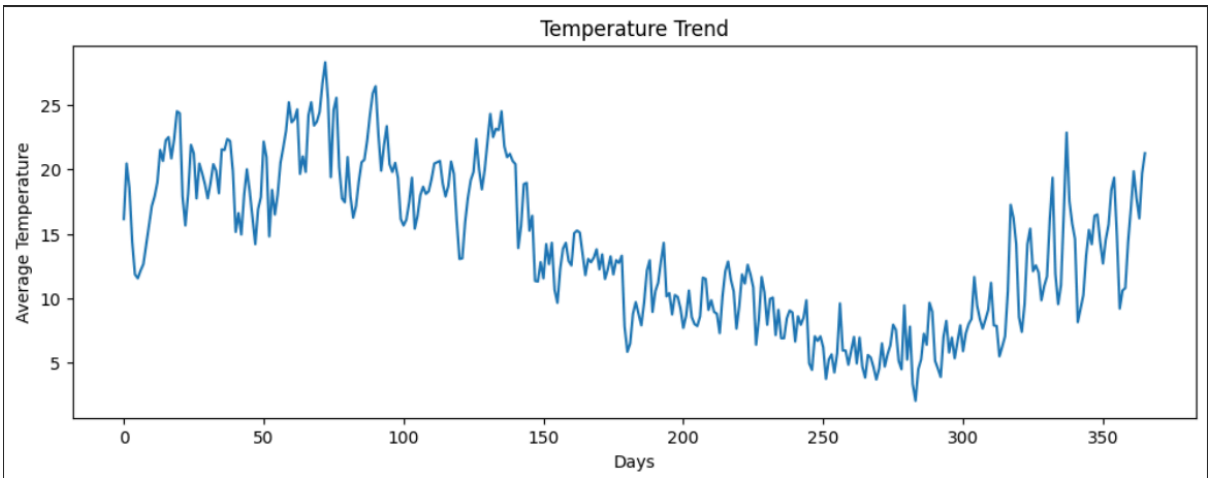
4. Temperature Trend Analysis

Daily minimum and maximum temperatures were analyzed to understand the variation in temperature over time. An average temperature column was generated from MinTemp and MaxTemp.

Observations:

- Temperature fluctuates across days and seasons
- Warmer and cooler phases can be visually identified
- Long-term trends may reflect climatic changes

Graphing average temperature helps visualize warming and cooling periods.



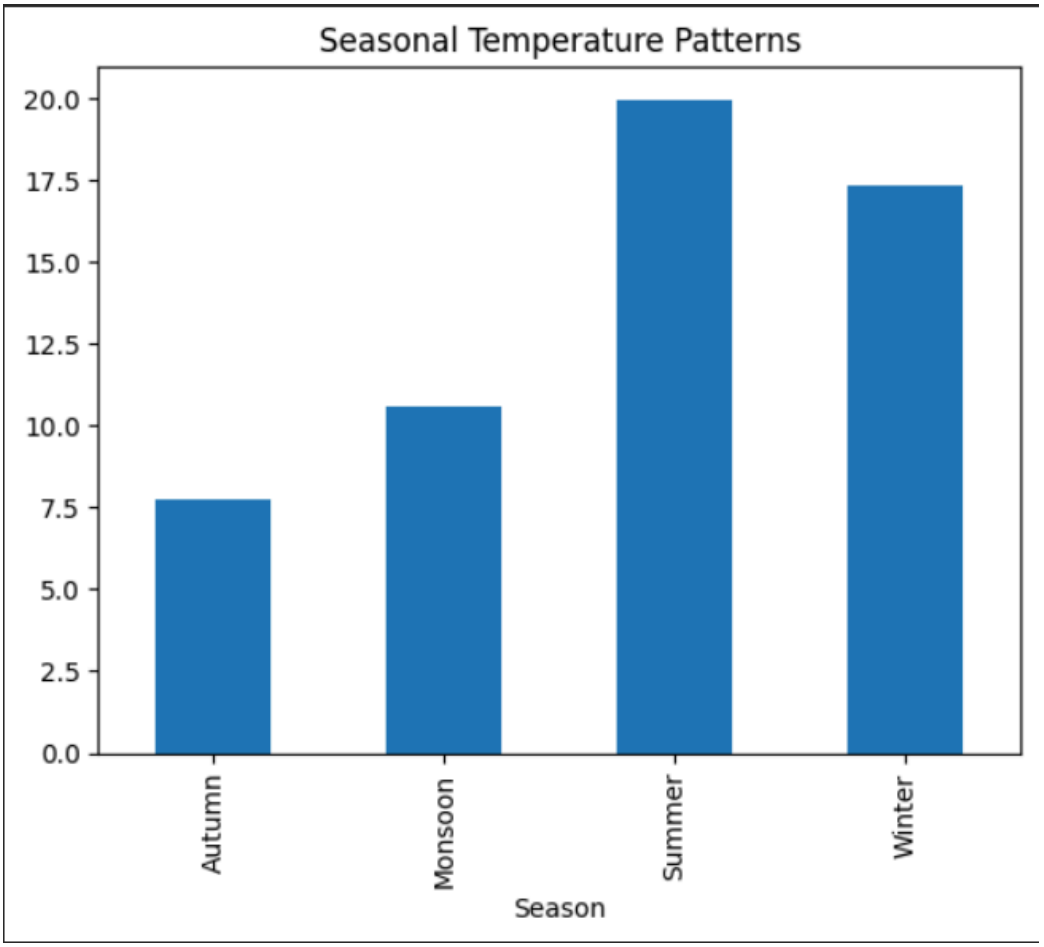
5. Seasonal Temperature Patterns

Using the month field, temperature values were grouped into seasons. This reveals:

- Higher temperatures in summer months
- Lower temperatures during winter

- Transition patterns between seasons

Seasonal grouping helps identify climate characteristics and seasonal extremes.



6. Rainfall Distribution

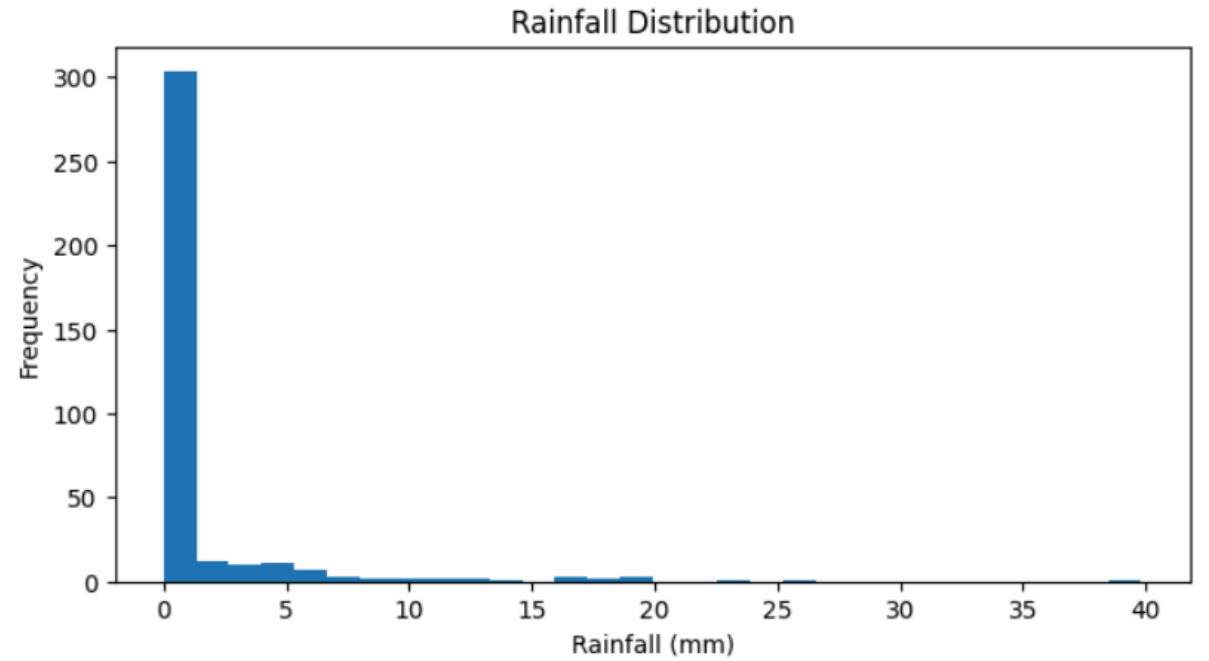
Rainfall data was analyzed using histograms to study its distribution.

Key insights:

- Rainfall is unevenly distributed across days

- Certain days show significantly high rainfall
- Frequency of rainy days can be estimated
- Helps classify dry vs rainy periods

This information is useful for agriculture, water resource planning, and climate studies.



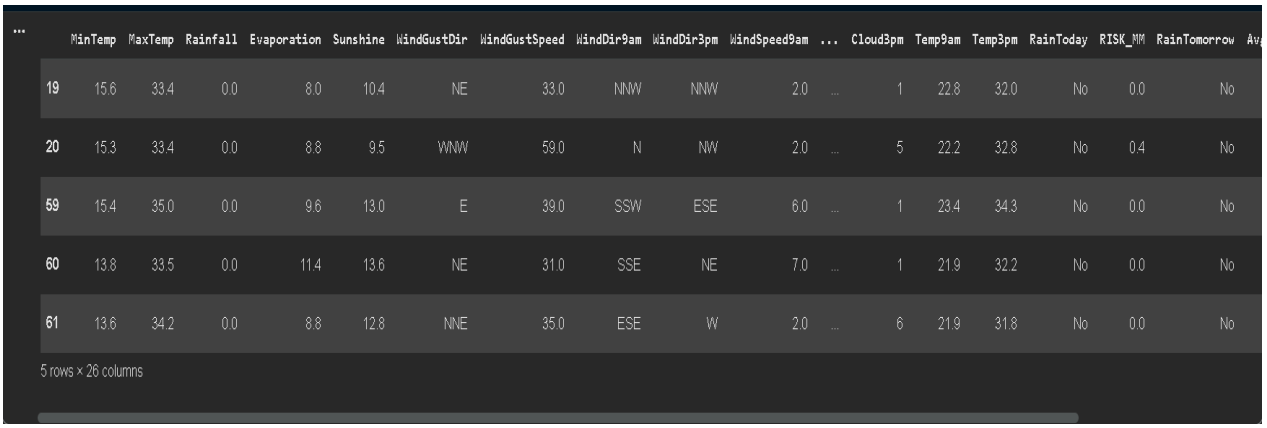
7. Extreme Weather Events

Extreme values were identified using statistical thresholds (e.g., 95th percentile).

Examples of extreme indicators:

- Extremely high maximum temperature
- Extremely high rainfall amount
- Intense wind gust speeds

These extreme values help identify unusual weather that may indicate storms, heatwaves or heavy rain events.



	MinTemp	MaxTemp	Rainfall	Evaporation	Sunshine	WindGustDir	WindGustSpeed	WindDir9am	WindDir3pm	WindSpeed9am	...	Cloud3pm	Temp9am	Temp3pm	RainToday	RISK_MM	RainTomorrow	Av
19	15.6	33.4	0.0	8.0	10.4	NE	33.0	NNW	NNW	2.0	...	1	22.8	32.0	No	0.0	No	
20	15.3	33.4	0.0	8.8	9.5	WNW	59.0	N	NW	2.0	...	5	22.2	32.8	No	0.4	No	
59	15.4	35.0	0.0	9.6	13.0	E	39.0	SSW	ESE	6.0	...	1	23.4	34.3	No	0.0	No	
60	13.8	33.5	0.0	11.4	13.6	NE	31.0	SSE	NE	7.0	...	1	21.9	32.2	No	0.0	No	
61	13.6	34.2	0.0	8.8	12.8	NNE	35.0	ESE	W	2.0	...	6	21.9	31.8	No	0.0	No	

5 rows × 26 columns

8. Findings

From the analysis:

- Weather patterns change significantly across seasons
- Daily temperature fluctuates strongly
- Rainfall events vary widely in intensity
- Extreme conditions can be detected using numerical thresholds

Data also indicates potential prediction possibilities such as rainfall forecasting (RainToday and RainTomorrow).

9. Conclusions

The weather dataset provides valuable insights into regional climate patterns, seasonal behavior, and daily atmospheric conditions. Temperature trends and seasonal cycles are clearly visible, and rainfall distribution highlights varying precipitation levels. Extreme weather events can also be identified using statistical analysis of temperature and rainfall.

10. Future Scope

The dataset can be used for:

- Predicting rainfall using machine learning
- Climate pattern classification
- Trend forecasting
- Weather anomaly detection
- Agricultural support analytics
- Seasonal climate prediction

Further analysis using more years of data would strengthen long-term climate observations.