

Exploratory Analysis of Rainfall Data in India for Agriculture

Prepared for Agricultural Data Analysis Study

Introduction

- Rainfall plays a vital role in Indian agriculture.
- India depends heavily on monsoon rainfall for crop production.
- Exploratory Data Analysis (EDA) helps understand rainfall patterns.
- Aim: Identify trends and patterns for agricultural planning.

Importance of Rainfall in India

- Nearly 50% of agriculture is rain-fed.
- Monsoon contributes around 70–80% of annual rainfall.
- Affects crop yield, irrigation, and food security.
- Variability impacts farmer income and economy.

Dataset Description

- Historical rainfall data across Indian states.
- Features: Year, Month, State, Seasonal Rainfall, Annual Rainfall.
- Time span: Multiple decades.
- Data source: Indian Meteorological Department (IMD).

Data Preprocessing

- Handling missing values.
- Checking for outliers.
- Converting seasonal data into structured format.
- Aggregating yearly and state-wise rainfall.

Rainfall Trends

- Increasing variability in recent years.
- Some states show declining rainfall trends.
- Extreme rainfall events becoming more frequent.
- Monsoon onset and withdrawal fluctuations observed.

Seasonal Rainfall Analysis

- South-West Monsoon (June–September) dominates rainfall.
- North-East Monsoon important for Tamil Nadu region.
- Pre-monsoon and winter rainfall comparatively low.
- Kharif crops depend heavily on monsoon season.

State-wise Rainfall Variations

- High rainfall: Kerala, Assam, Meghalaya.
- Low rainfall: Rajasthan, Gujarat (arid regions).
- Central India shows moderate rainfall.
- Spatial variation impacts crop selection.

Correlation with Agriculture

- Positive correlation between rainfall and crop yield.
- Deficient rainfall leads to drought conditions.
- Excess rainfall causes floods and crop damage.
- Rainfall prediction helps improve planning.

Agricultural Implications

- Need for irrigation infrastructure in low rainfall areas.
- Promote drought-resistant crop varieties.
- Adoption of rainwater harvesting.
- Use rainfall forecasting models in ML systems.

Conclusion

- Rainfall variability significantly affects Indian agriculture.
- EDA helps identify patterns and anomalies.
- Data-driven decisions improve crop productivity.
- Future work: ML-based rainfall forecasting models.