



# BANGLADESH ARMY UNIVERSITY OF SCIENCE & TECHNOLOGY (BAUST)

## Department of Computer Science and Engineering (CSE)

# Rainfall Prediction Using Machine Learning

COURSE CODE : CSE 4140  
COURSE TITLE : Machine Learning Sessional  
COURSE TEACHER : Engr. Rohul Amin, Nadim Reza  
DESIGNATION : Lecturer

### Group Members:

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# Project Overview

- This project focuses on predicting whether rainfall will occur on a given day.
- The prediction uses daily weather features such as temperature, humidity, precipitation, wind speed, and sunshine duration.
- Machine learning models are trained using historical weather data from Rangpur.



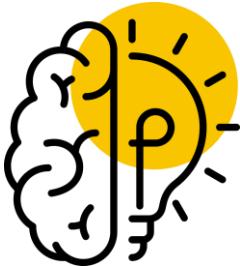
# Introduction

- Rainfall prediction is essential for agriculture, water management, and disaster preparedness.
- Machine learning improves rainfall forecasting compared to slow and less accurate manual methods.
- Weather features and past rainfall data are used to train regression and classification models.
- The project builds a full ML pipeline with analysis, preprocessing, model training, and performance evaluation.



# Objectives

- To develop a machine learning model that can accurately predict rainfall amount and rain occurrence.
- To analyze and preprocess weather data to identify key features influencing rainfall.
- To compare multiple regression and classification models to find the most effective prediction approach.
- To build a complete ML pipeline with visualization for better understanding and result interpretation.



# Scope and Limitations

## ● Scope:

- Useful for agriculture planning and irrigation scheduling.
- Helps in flood and drought early warnings.
- Supports smart city water management systems.
- Can be integrated with IoT weather stations for real-time forecasting.

## Limitations:

- Accuracy depends on the quality and amount of historical weather data.
- Sudden weather changes and extreme events are hard for models to predict.
- Models may not work well in regions with different climate patterns



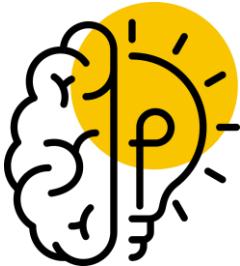
# Datasets

- Coverage and Location: Daily weather data for Rangpur, Bangladesh from January 1, 2022, to December 26, 2024.
- Key Metrics: Includes maximum/minimum temperature, precipitation, wind speed, and sunshine duration.
- Analytical Utility: Contains pre-calculated fields like “Season” and “Will Rain” for seasonal analysis and rainfall prediction.

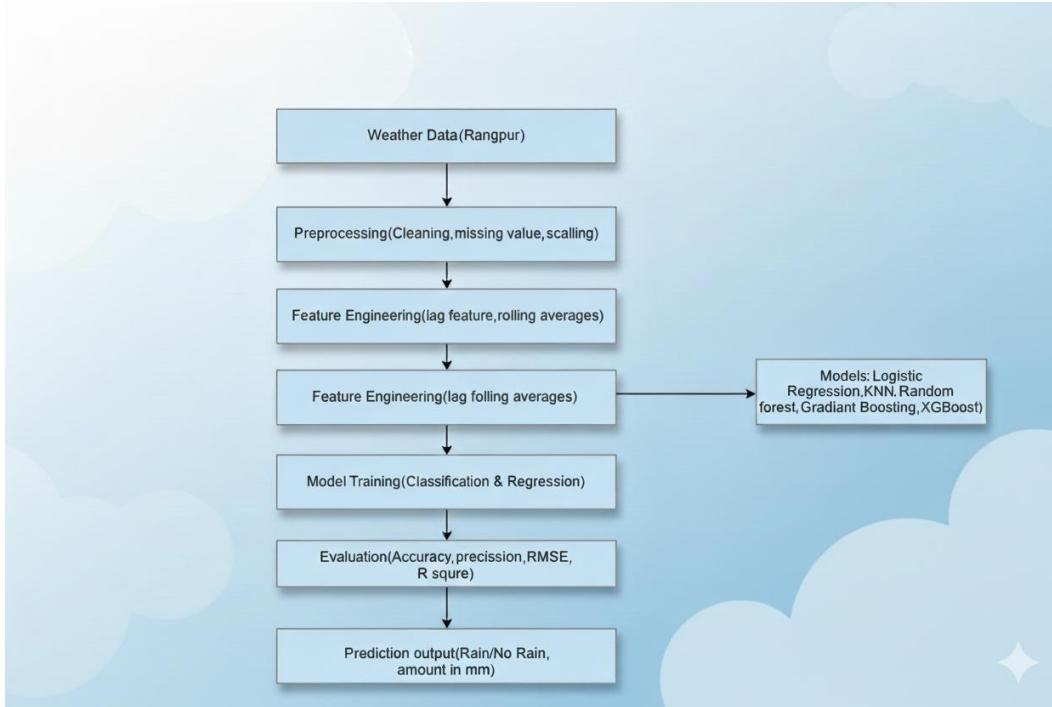


# Challenges

- Imbalanced labels: Days with “no rain” are usually higher, causing class imbalance.
- Weather variability: Sudden climatic changes can reduce model accuracy.
- Limited geographic scope: Data is only from Rangpur; model may not generalize to other regions.
- Model overfitting: Advanced models may fit training data too closely without proper regularization.



# Methodology

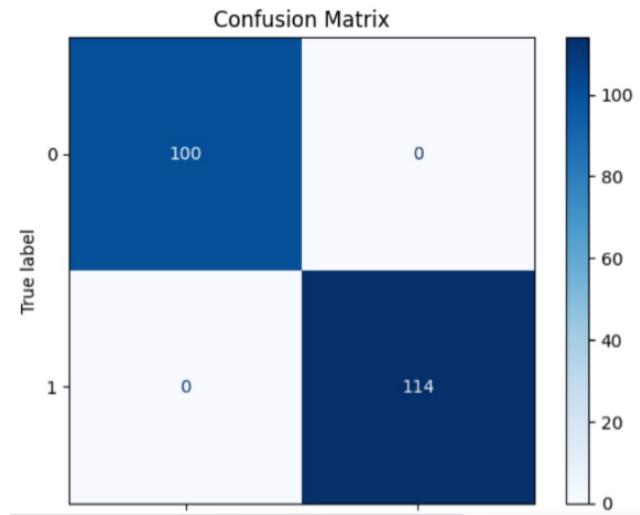


# Results

Model	Accuracy	F1 Score
Logistic Regression	~72%	Moderate
Decision Tree	~75%	High variance
Random Forest	<b>80–85%</b>	Strong
XGBoost	<b>82–88%</b>	Excellent



# Results



# Conclusion

- Rainfall prediction for Rangpur is **feasible with good accuracy**
- Using multiple weather parameters provides reliable predictions
- XGBoost or Random Forest are the most effective models



# References

- Bangladesh Meteorological Department (BMD), “Climate and Weather Data,” 2024.
- G. J. Huffman et al., “The Global Precipitation Climatology Project,” Bulletin of the American Meteorological Society, 1997.
- J. Han, M. Kamber, and J. Pei, Data Mining: Concepts and Techniques, Morgan Kaufmann, 2011.
- Scikit-Learn Documentation, “Machine Learning in Python,” 2024.
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- Kaggle Weather Datasets (for methodological reference).



**THANK YOU**