Project Design Phase
Solution Architecture

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Team ID	LTVIP2026TMIDS90283
Project Name	rising waters: a machine learning approach to flood prediction

Solution Architecture:

The Flood Prediction System is designed using a layered architecture that integrates Machine Learning with a web-based application. The objective of this architecture is to convert environmental data into meaningful flood prediction results in an automated and user-friendly manner.

The system consists of five major components: User Interface, Flask Backend, Data Processing Layer, Machine Learning Model, and Model Storage.

Architecture Components

1. User Interface Layer

The frontend is developed using HTML and CSS. It provides a simple form where users enter environmental parameters such as Cloud Cover, Annual Rainfall, Jan–Feb Rainfall, March–May Rainfall, and June–September Rainfall. The data entered by the user is sent to the backend using the POST method.

2. Application Layer (Flask Backend)

The backend is implemented using Flask. It handles routing, receives input data from the form, processes it, and sends it to the trained machine learning model. After prediction, it returns the result to the result page.

3. Data Processing Layer

Before prediction, input data is processed using StandardScaler to ensure that values are scaled consistently. This ensures that the model receives data in the same format as used during training.

4. Machine Learning Layer

Multiple supervised learning algorithms such as Decision Tree, Random Forest, KNN, and XGBoost were trained and evaluated. Based on performance comparison, the best-performing model was selected and deployed for prediction.

The model predicts:

1 → Possibility of Severe Flood

0 → No Possibility of Severe Flood

5. Model Storage Layer

The trained model and scaler are saved using Joblib as:

floods.save

transform.save

These files are loaded into the Flask application at runtime for efficient prediction without retraining.

Example - Solution Architecture Diagram:

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