
A REVIEW ON FLOOD FORECASTING BY USING MACHINE LEARNING

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ABSTRACT

Flood forecasting plays a crucial role in mitigating the impact of floods on communities, economies, and the environment. Traditional methods of flood forecasting rely on hydrological models that consider rainfall, streamflow, and physical terrain characteristics. However, these methods can be limited by the complexity of real-time data and the unpredictability of extreme weather events. With advancements in machine learning (ML), flood forecasting has seen significant improvements by using algorithms to analyze large datasets and predict flood events with higher accuracy. This approach uses historical weather, river discharge, and land-use data to develop predictive models capable of forecasting floods in various geographic locations.

Machine learning techniques such as decision trees, random forests, support vector machines (SVM), and deep learning have shown promising results in flood forecasting applications. These models are trained using historical data to recognize patterns and correlations between environmental variables and flood occurrences. For example, artificial neural networks (ANN) can be used to model non-linear relationships, while SVM can classify flood-prone areas. Additionally, deep learning methods such as convolutional neural networks (CNN) can handle spatial data, making them effective in predicting flood risks based on satellite imagery or terrain maps. The ability of these models to process complex and high-dimensional data allows for more timely and accurate flood predictions.

Keywords: Flood Forecasting, Machine Learning, Predictive Modeling, Artificial Neural Networks (ANN), Convolutional Neural Networks (CNN)

INTRODUCTION

Flood forecasting is a critical tool for disaster management, aiming to predict and mitigate the impact of floods. Accurate and timely predictions can save lives, protect property, and ensure the safety of communities. Traditionally, flood forecasting relied heavily on hydrological models based on physical processes, such as rainfall, river flow, and soil moisture. While effective, these models often struggled with real-time data integration and could not handle the complexity of large, nonlinear systems that influence flooding events. Machine learning (ML) provides a promising alternative, leveraging data-driven approaches to improve flood prediction accuracy and forecasting timelines.

Machine learning models are well-suited for flood forecasting because they can learn from large datasets containing past flood events, weather patterns, and environmental conditions. These models can identify patterns and correlations that might be missed by traditional models, providing insights into the underlying causes of floods. Key machine learning techniques, such as decision trees, support vector machines, and deep learning, have been applied to predict flood occurrence and severity by analyzing historical weather data, river discharge data, and topographical information. Additionally,

machine learning models can adapt over time as more data becomes available, improving prediction accuracy and response times.

One of the key advantages of using machine learning in flood forecasting is its ability to integrate and process various types of data in real time. Unlike traditional models that rely on predefined assumptions, ML algorithms can continually refine their predictions based on new information, allowing for dynamic updates and early warnings. This adaptability is crucial in managing flood risks in regions prone to sudden weather changes or extreme events. As machine learning continues to evolve, its role in flood forecasting is expected to expand, offering more reliable, efficient, and scalable solutions for flood risk management worldwide.

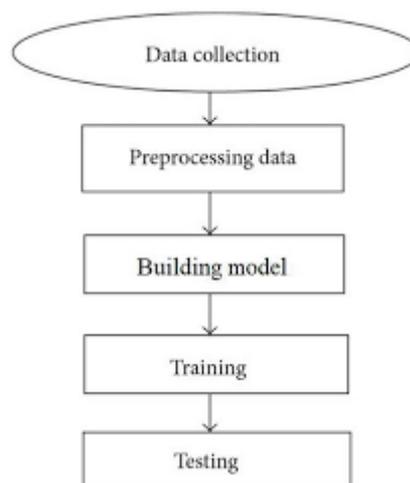
EXISTING SYSTEM

The present study carried out on Wardha River basin .The Upper Wardha project is one of the major irrigation project in Vidharbha region of Maharashtra state. This project is across Wardha River near village SimbhoraTalukaMorshi of Amravati district. The Upper Wardha project consists of earthen dam on a both flanks with a centrally located gated spillway and canal on left and right flanks. The Upper Wardha dam has total grass irrigation (GI) of 11690 (ha) with gross capacity of 786 MCM in Godavari River Basin with annual rainfall in the catchment is 840 mm\

PROPOSED SYSTEM

Flood forecasting technique organized method suitably based on available data and an appraisal of rating criteria with an inspired performance. Flood forecasting using real time estimation gives chances of flood value in GUI. Flood estimation using Machine Learning in real time can calculate large data instantly. Comparison between flood modelling by machine learning and stochastic method (i.e. Muskinghum method) gives machine learning is accurate, easy and can be applied for numbers of calculation.

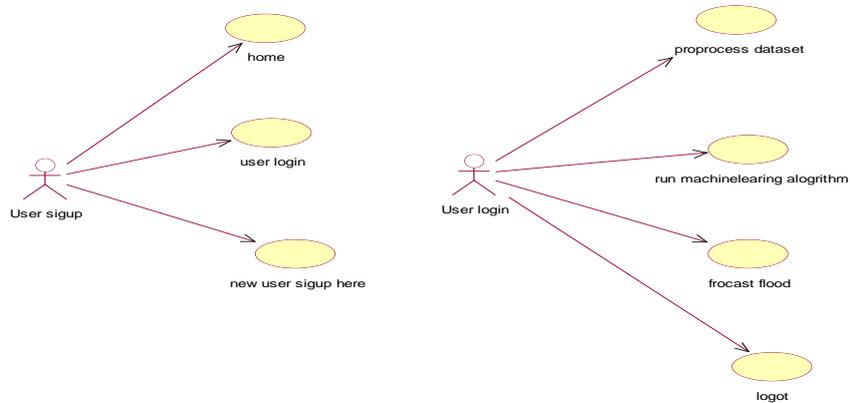
SYSTEM ARCHITECTURE :



USE CASE DIAGRAM

A use case diagram in the Unified Modeling Language (UML) is a type of behavioral diagram defined by and created from a Use-case analysis. Its purpose is to present a graphical overview of the functionality provided by a system in terms of actors, their goals (represented as use cases), and any dependencies between those use cases. The main purpose of a use case diagram is to show what system

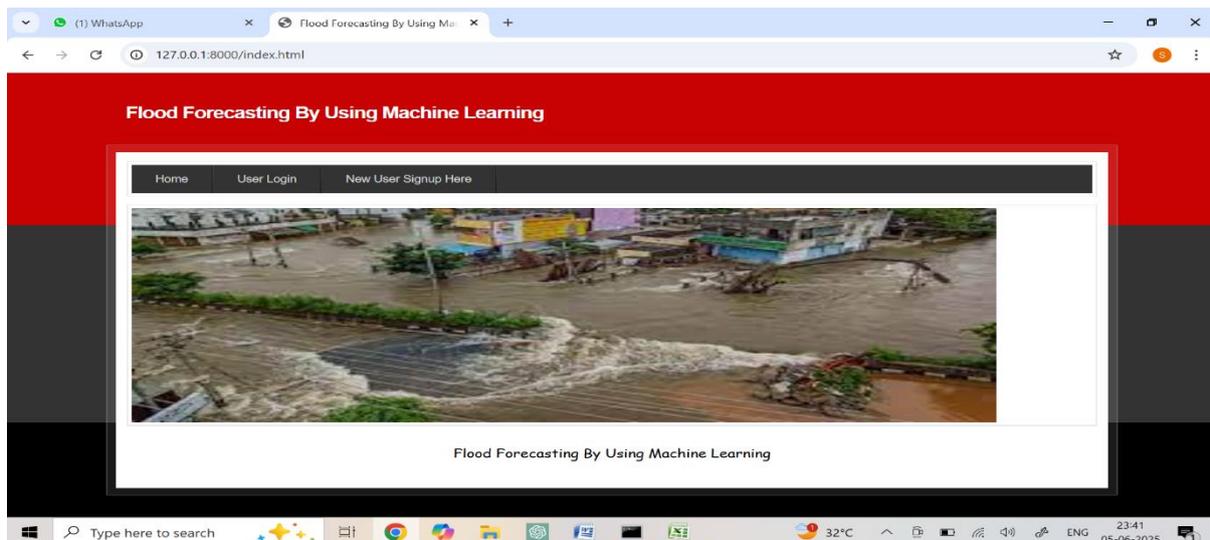
functions are performed for which actor. Roles of the actors in the system can be depicted.

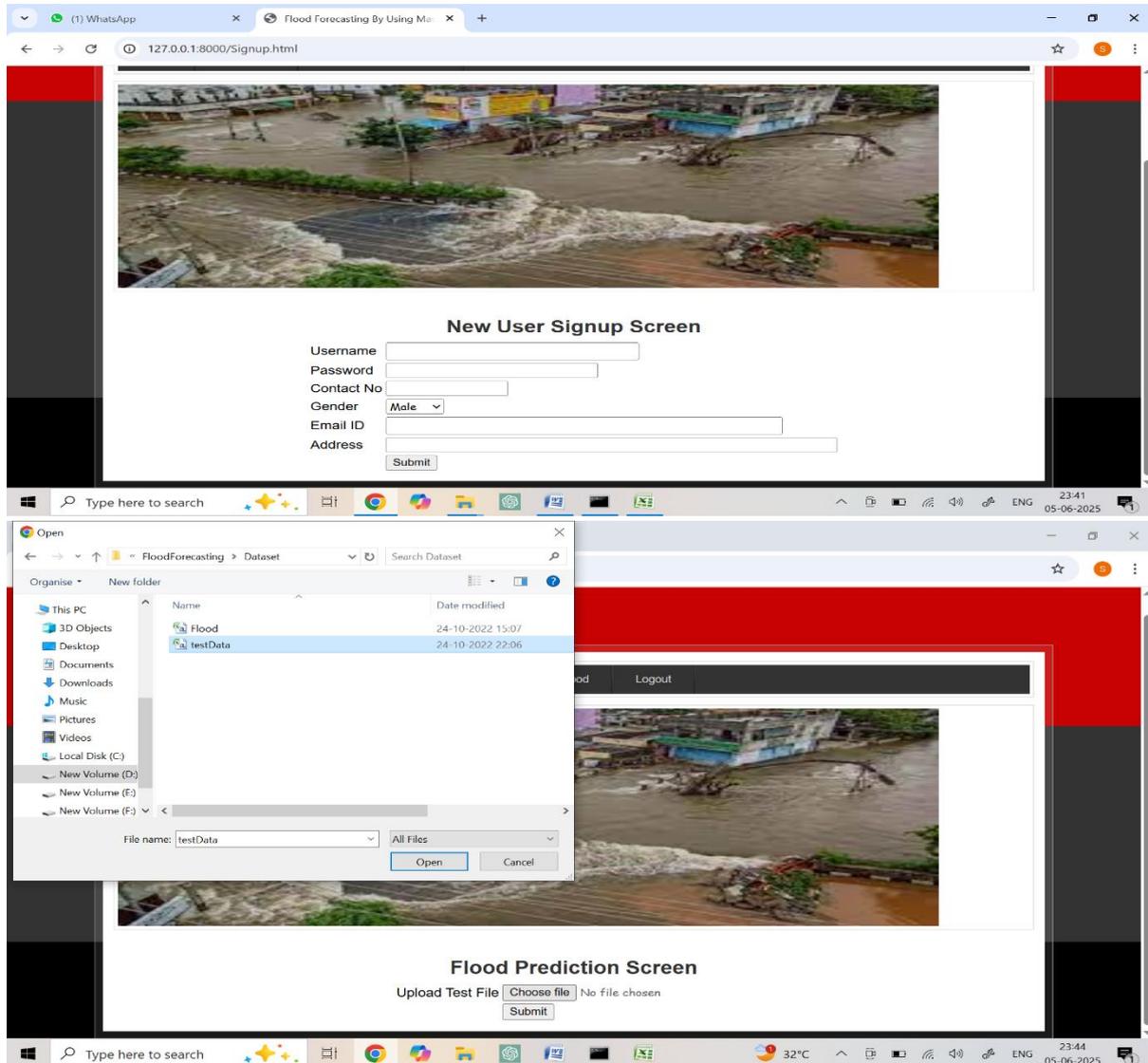


IMPLEMENTATION

- 1) New User Signup Here: using this module we will allow user to signup with the application
- 2) User Login: using this module we will allow user to login to application
- 3) Preprocess Dataset: using this module we will read flood dataset and then remove missing values and then normalize dataset values and then split dataset into train and test where application use 80% dataset for training and 20% for testing.
- 4) Run Machine Learning Algorithms: using this module we will train all 4 machine learning algorithms such as SVM, Logistic Regression, KNN and MLP and calculate prediction accuracy on test data.
- 5) Forecast Flood: using this module we will upload test data and then MLP will predict flood from that test data.

SCREEN SHOTS





CONCLUSION

The process of flowing in values at the starting time and end of the j th time interval are I_j and I_{j+1} respectively and corresponding the value of outflow are Q_j and Q_{j+1} . Machine learning able to learn and improve system in an explicit manner. Machine learning provides computer programs that can approach or obtain or retrieve access data with learning it. Machine learning able with to calculate large data set. Artificial Intelligent system (AIS) used to train data in such way to improve flood forecasting system with occurring at an early stage development warning system

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