Project Report On

Rising Waters: A Machine Learning Approach To Flood Prediction

INTRODUCTION

1.1 Overview

Floods are inevitable, but with timely alerts, their effects can be minimized. There are a number of people who die every year due to devastating floods, the number of people become homeless and a number of people die due to lack of proper help after a flood. The lack of timely alerts has always been an issue concerning it. Delay in alerts in flood-prone areas is the biggest loophole of an economy. Conventional systems run a little low in forecasting floods at the right time so that proper actions could be taken before any disaster.

By using machine learning we can predict floods or forecast floods with better accuracy. This project aims at building predictive modeling based on the historical weather data of particular areas in order to predict the occurrence of floods. The predictive model is built on different machine learning algorithms. The concerned authority monitor this flood prediction system through a web application.

1.2 Purpose

Rising Waters is a web application that predicts or forecast the possibility of floods based on the historical weather data of a particular area. This can be used to give early flood warnings which helps the authorities to take appropriate actions to minimize the damage as early as possible.
Rising Waters predicts whether there is a chance of flood or not with the help of data like cloud cover, humidity, temperature etc.

2. LITERATURE SURVEY

2.1 Existing Problem

Artificial Neural Networks (ANNs)

Multilayer Perceptron (MLP)

Adaptive Neuro-Fuzzy Inference System (ANFIS)

Wavelet Neural Network (WNN)

Support Vector Machine (SVM)

Decision Tree (DT)

Ensemble Prediction Systems (EPSs)

Random forest model

Xgboost model

K-Nearest neighbours

Above are some of the existing approaches or methods to solve this problem of Early flood prediction

2.2 proposed solution

We have chosen decision tree algorithm for our flood prediction system Decision Tree is a Supervised learning technique that can be used for both classification and Regression problems, but mostly it is preferred for solving Classification problems. It is a tree-structured classifier, where internal nodes represent the features of a dataset, branches represent the decision rules and each leaf node represents the outcome.

From results we have found that Decision tree gave more exact result compared to other algorithms

3. THEORETICAL ANALYSIS

3.1 Block Diagram

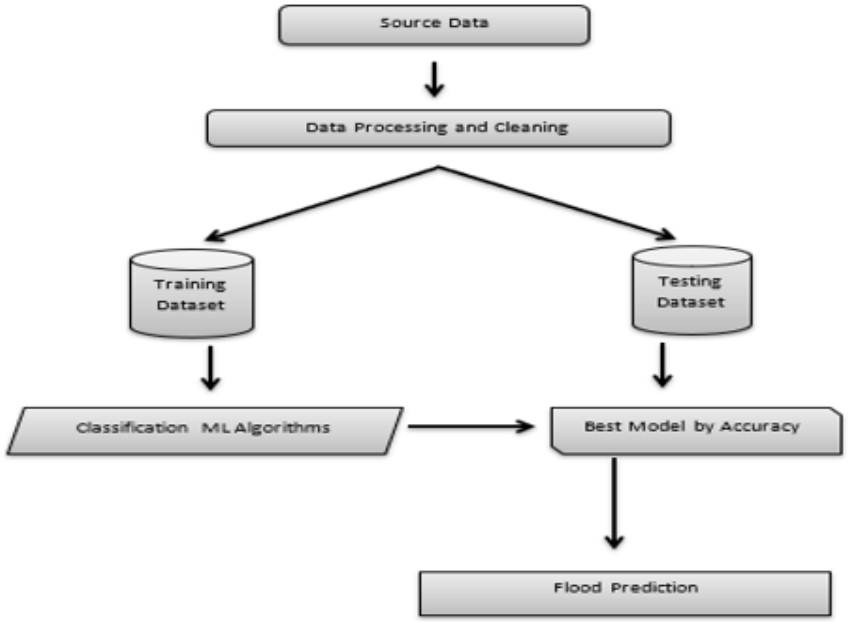


Fig (i) Block Diagram

3.2 Hardware/Software Designing

Install Required Libraries.

Data Collection.

- Collect the dataset or Create the dataset

Data Preprocessing.

- Import the Libraries.
- Importing the dataset.
- Understanding Data Type and Summary of features.
- Take care of missing data
- Data Visualization.
- Drop the column from DataFrame & replace the missing value.
- Splitting the Dataset into Dependent and Independent variables
- Splitting Data into Train and Test

Model Building

- Training and testing the model
- Evaluation of Model
- Saving the Model

Application Building

- Create an HTML file
- Build a Python Code

Final UI

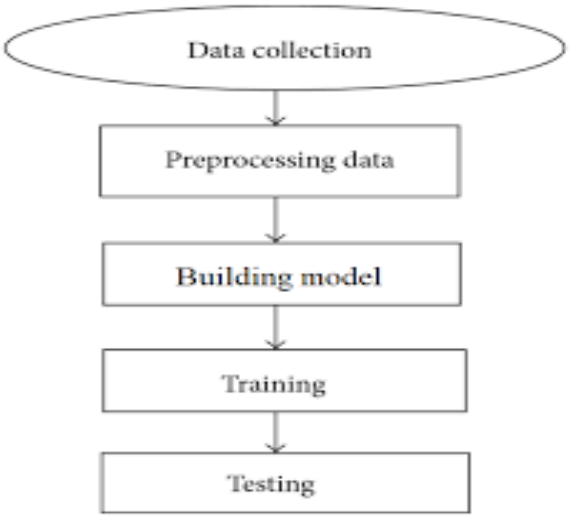
- Dashboard Of the flask app.

4. EXPERIMENTAL INVESTIGATION

The Weather forecast data of previous years are collected which contains the information to predict the chances of flood. The data contains the following fields:

- Temperature
- Humidity
- Cloud cover
- Annual rainfall
- Rainfall between months
- Result (flood occurred or not)

5. FLOW CHART



6. ADVANTAGES AND DISADVANTAGES

Advantages

Increased accuracy: Machine learning algorithms can analyze large amounts of data, identify patterns and relationships, and make predictions with greater accuracy than traditional methods.

Real-time predictions: Machine learning models can make predictions in real-time, which is crucial in the case of floods where early warnings can save lives and minimize damage.

Continuous improvement: With machine learning, the models can continuously learn and improve over time, leading to better accuracy and more reliable predictions.

Automation: Machine learning algorithms can automate the prediction process, reducing the need for manual intervention and freeing up time for other critical tasks.

Disadvantages

Data quality: The quality and accuracy of the data used for training the models is critical for the success of machine learning algorithms. If the data is unreliable or biased, the predictions will also be unreliable.

Technical expertise: Building and maintaining machine learning models requires technical expertise and a good understanding of the algorithms and tools used.

Computational resources: Machine learning algorithms require a lot of computational resources, including powerful computers and large amounts of data storage.

Model generalization: Machine learning models can sometimes struggle to generalize beyond the data they were trained on. This can lead to poor predictions in new and unseen situations.

7. APPLICATIONS

1 Disaster management: Early flood prediction systems can provide early warnings to disaster management agencies, allowing them to take necessary measures to mitigate the impact of floods.

2 Emergency response: Emergency response teams can use early flood prediction systems to quickly respond to flooding incidents, evacuating people and providing aid where necessary.
3 Infrastructure protection: Early flood prediction systems can help to protect critical infrastructure such as roads, bridges, and power plants, by providing early warnings and allowing for proactive measures to be taken.
4 Agricultural management: In agriculture, early flood prediction systems can help to manage irrigation systems, protect crops, and minimize damage to farmlands.
5 Insurance: Insurance companies can use early flood prediction systems to better understand the risks associated with floods and develop more accurate and effective insurance products and services.
6 Water resource management: Early flood prediction systems can provide crucial information for water resource management, helping to optimize water usage, minimize waste, and prevent over-extraction.
7 Climate change research: Early flood prediction systems can contribute to research on the impact of climate change on flooding, helping to inform mitigation and adaptation strategies.
8 Real-time monitoring: Machine learning algorithms can process large amounts of data in real-time, allowing for continuous monitoring of flood-prone areas and providing early warnings when necessary.

8. CONCLUSION

In conclusion, early flood prediction systems using machine learning have the potential to greatly improve our ability to predict and mitigate the impacts of floods. By analyzing large amounts of data and making predictions in real-time, these systems can provide critical information for disaster management, emergency response, infrastructure protection, agricultural management, insurance, water resource management, and climate change research.

However, it is important to consider the limitations of machine learning and ensure that the appropriate resources and expertise are in place to effectively implement and use these systems. The quality and accuracy of the data used for training the models is critical, and the algorithms may struggle to generalize beyond the data they were trained on.

Overall, early flood prediction systems using machine learning represent an exciting and promising technology with the potential to save lives, protect critical infrastructure, and minimize the impacts of floods. However, careful consideration of the advantages and limitations of the technology is necessary to ensure that these systems are used effectively and responsibly.

9. FUTURE SCOPE

The future scope of early flood prediction systems using machine learning is very promising, and the technology is likely to play an increasingly important role in the coming years. Some potential areas of future development include:

1 Improved data sources: New and more diverse sources of data, such as remote sensing and IoT devices, will become increasingly available, providing more information for machine learning algorithms to analyze.

2 Enhanced algorithms: Machine learning algorithms are constantly evolving and improving, and new techniques such as deep learning and reinforcement learning will likely become increasingly prevalent in the field of flood prediction.

3 Greater integration with other systems: Early flood prediction systems are likely to become more integrated with other disaster management and response systems, providing a more comprehensive and coordinated approach to flood mitigation.

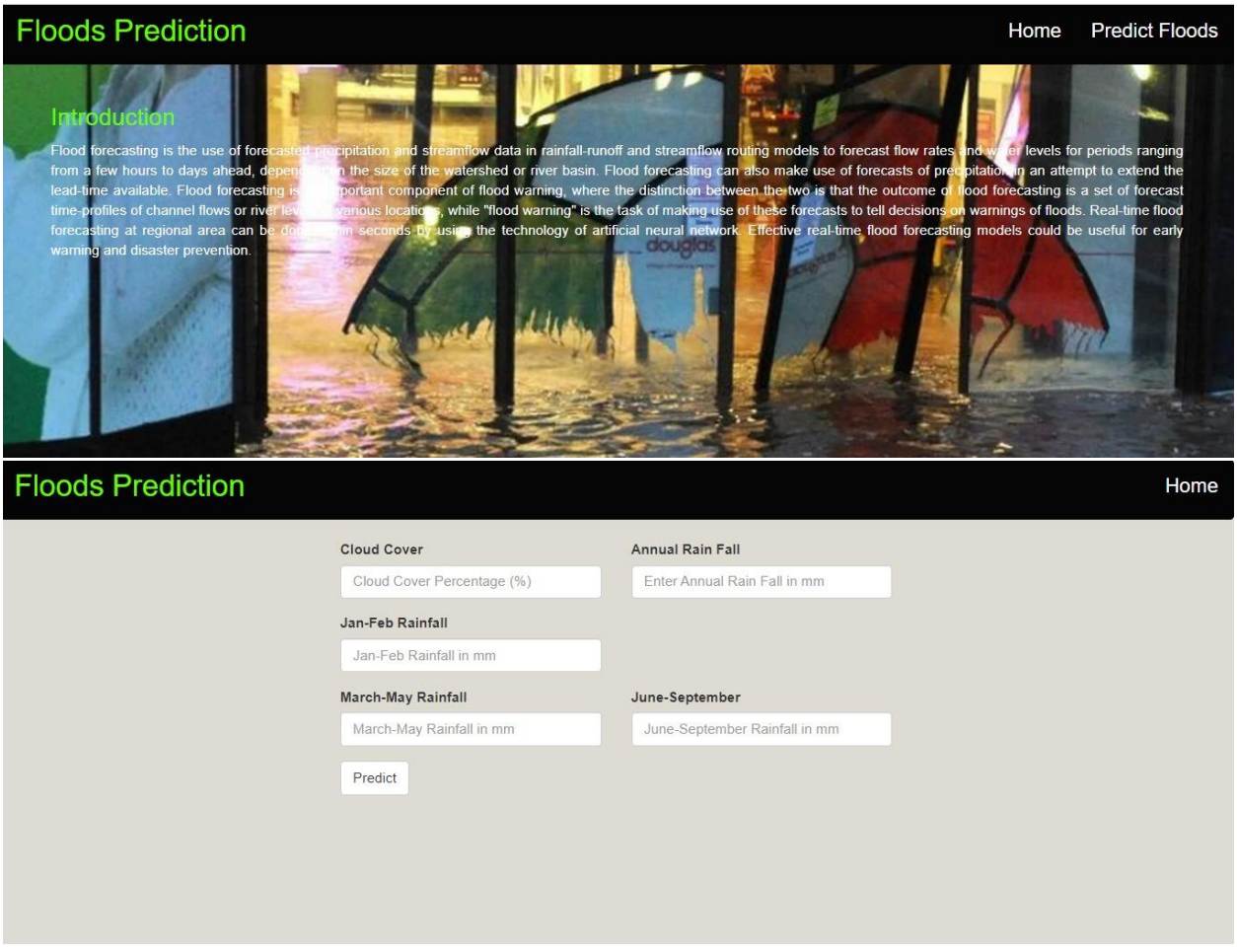
4 Increased use of artificial intelligence: The use of artificial intelligence (AI) will likely become more widespread, allowing for more sophisticated and automated analysis of data, and the development of more advanced early flood prediction systems.

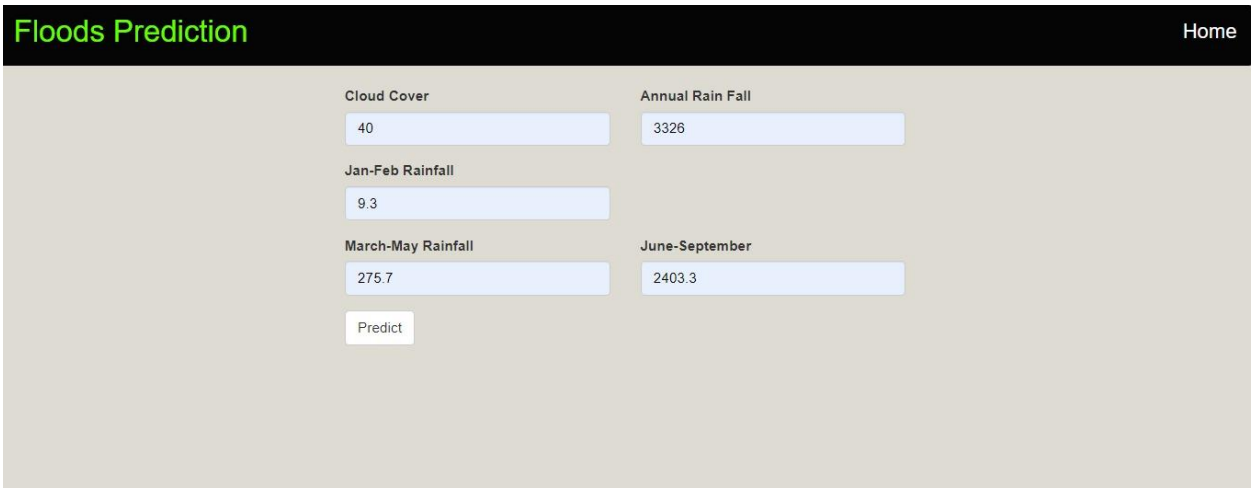
5 Expansion to new regions: Early flood prediction systems will likely become more widely adopted in new regions, providing critical information and support to communities that are particularly vulnerable to floods.

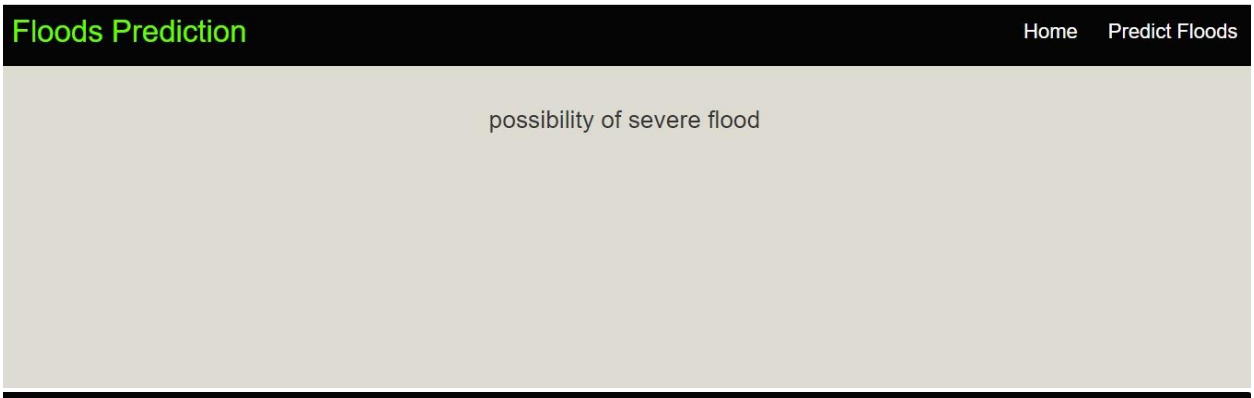
6 Improved accessibility and scalability: Efforts will likely be made to make early flood prediction systems more accessible and scalable, so that they can be used by a wider range of organizations and individuals.

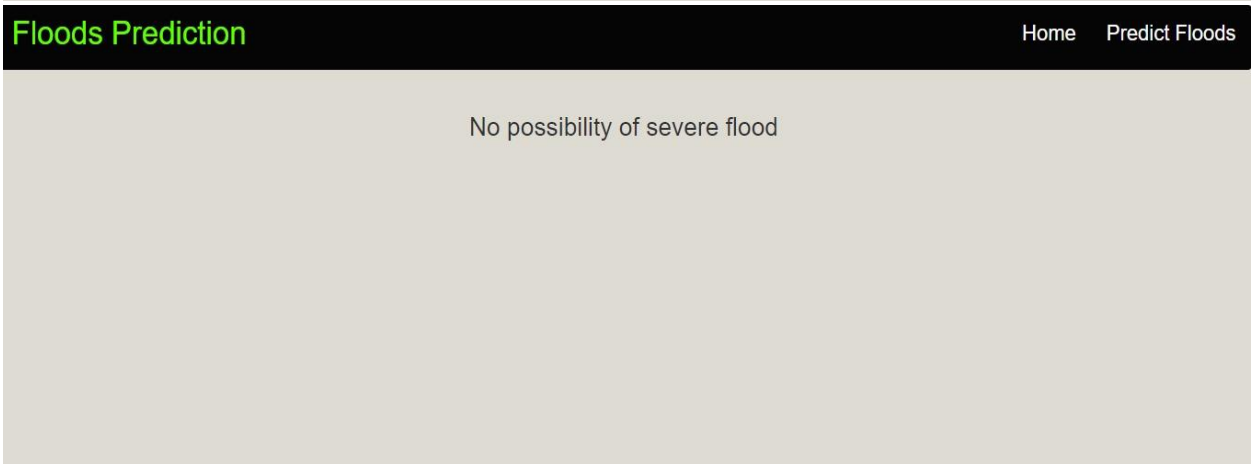
These are just a few examples of the potential areas of future development for early flood prediction systems using machine learning. The technology is constantly evolving, and new applications and innovations are likely to emerge in the coming years.

10. UI Design




Floods Prediction
Home
Cloud Cover
40
Annual Rain Fall
3326
Jan-Feb Rainfall
9.3
March-May Rainfall
275.7
June-September
2403.3
Predict


Floods Prediction
Home
Predict Floods
possibility of severe flood


Floods Prediction
Home
Predict Floods
No possibility of severe flood