MitiFlood

Let’s make it through, together

Research

- Objective: Enhance flood prediction accuracy and risk management using advanced machine learning (ML) techniques.

- Significance: Floods threaten lives and property; accurate predictions can significantly reduce risk, guide policy, and minimize damages.

- Focus:

1. Evaluation of ML Models: Analyze current ML models for flood prediction based on robustness, accuracy, effectiveness, and speed.
2. Performance Comparison: Compare various ML techniques to identify the most effective methods for both long-term and short-term flood forecasting.
3. Key Trends: Investigate improvements in ML models through hybridization, data decomposition, algorithm ensemble, and model optimization.

- Impact: Provide a comprehensive resource for hydrologists and climate scientists to select and implement the most suitable ML methods for flood prediction.

A Recap

First goal: Analyse the Flood data for Prediction

ANNS

ANNs are efficient mathematical modeling systems with efficient parallel processing, enabling them to mimic the biological neural network using inter-
connected neuron units. Among all ML methods, ANNs are the most popular learning algorithms, known to be versatile and efficient in modeling
complex flood processes with a high fault tolerance and accurate approximation

SVM

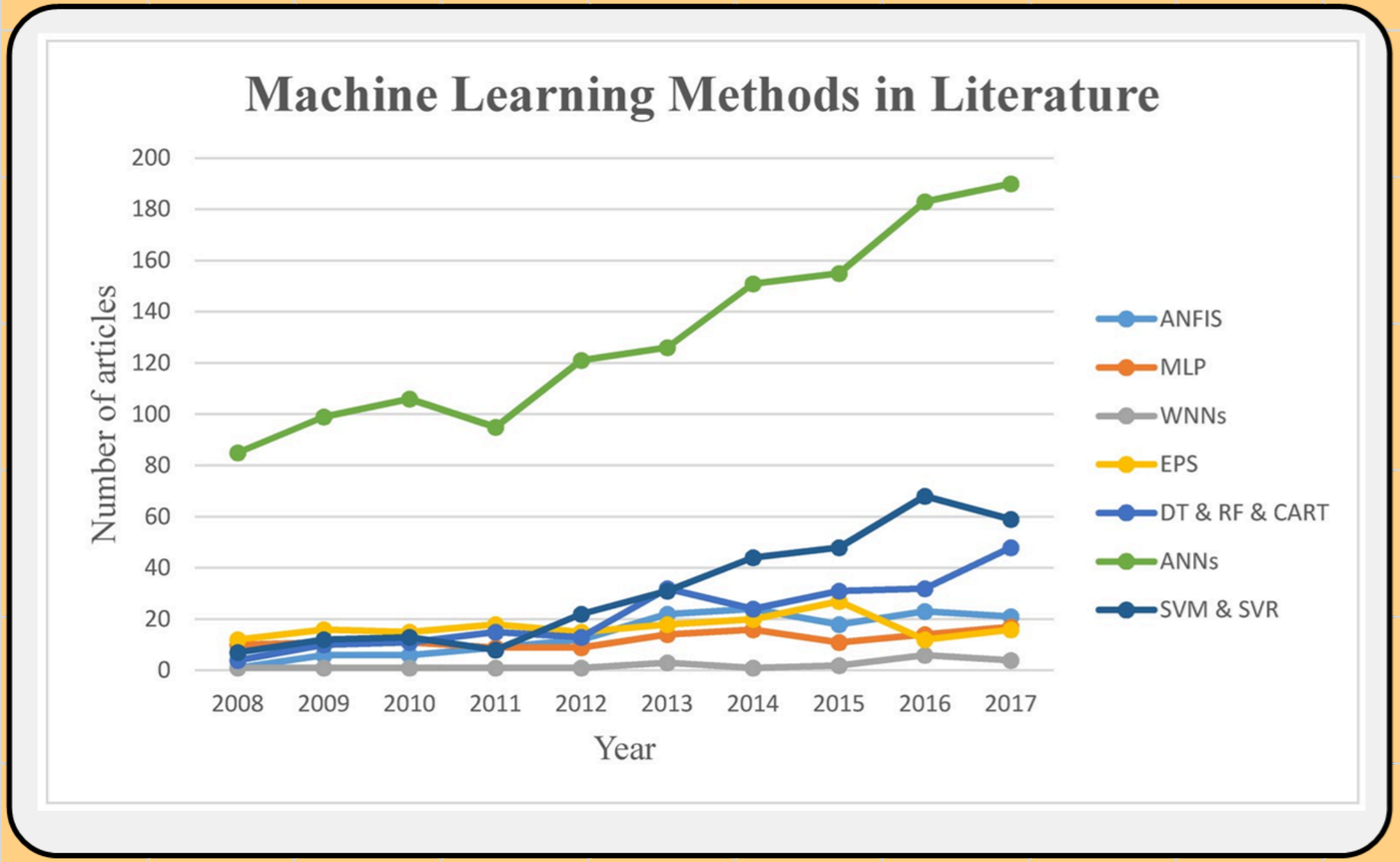
SVM is greatly popular in flood modeling; it is a supervised learning machine which works based on the statistical learning theory and the structural risk minimization rule. The training algorithm of SVM builds models that assign new non-probabilistic binary linear classifiers, which minimize the empirical classification error and maximize the geometric margin via inverse problem solving

DECISION TREE (DT)

The ML method of DT is one of the contributors in predictive modeling with a wide application in flood simulation. DT uses a tree of decisions from branches to the target values of leaves. In classification trees (CT), the final variables in a DT contain a discrete set of values where leaves represent class labels and branches represent conjunctions of features labels.

ML METHODS

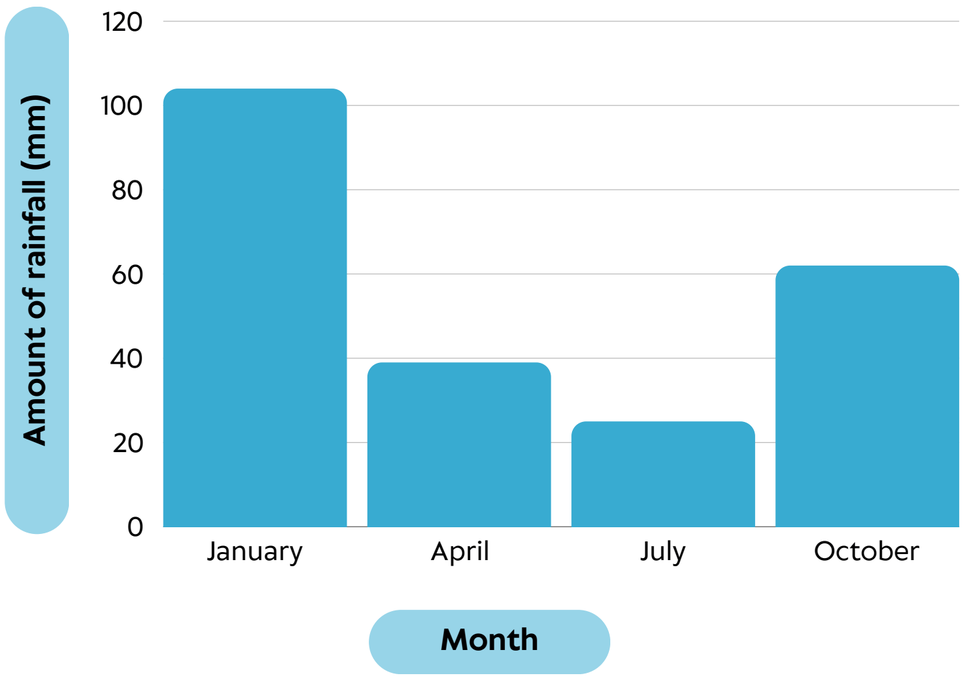
The most popular ML modeling methods for flood prediction include ANFIS, MLP, WNN, EPS, DT, RF, CART, and ANN. This graph presents the major ML methods used for flood prediction, and the number of corresponding articles in the literature over the last decade. This figure was designed to communicate to the readers which ML methods increased in popularity among hydrologists for flood modeling within the past decade.



Graphs and Data

Now, to build an application for the user

WHAT ALL GOES IN THERE?



- Real-time Alerts: Build a system that sends real-time flood alerts to affected populations via SMS, emails, or push notifications.
- Vulnerability Mapping: Identify and map flood-prone areas using historical data, population density, and infrastructure vulnerability.
- Interactive Dashboards: Create dashboards that display flood risk levels and mitigation suggestions based on real-time data.
- Integrate Early Warning Systems (EWS)

Future Scope

How can we put this to practical use?

- Centralize the application for governmental use.
- Combine the mitigation applications for other disaster management,
- Extend it to rural areas.
- Work on mitigation in case of lack of internet access.