



International Journal of Innovative Research in Science Engineering and Technology (IJIRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)



Impact Factor: 8.699

Volume 14, Issue 3, March 2025

Machine Learning for Flood Impact Reduction and Early Warnings

Dr. D. J. Samatha Naidu, B. Sujith Kumar, S. Mezher Basha

Professor (Principal), Dept. of MCA, Annamacharya PG College of Computer Studies, Rajampet, Andhrapradesh, India

Assistant Professor in Department of Computer Applications, Annamacharya PG College of Computer Studies, India

P. G Student, Department of Computer Applications, Annamacharya PG College of Computer Studies, India

ABSTRACT: Natural disasters result in a huge impact on the human race. Floods are one of the most dangerous and can cause a lot of damage to people and property. Predicting floods early is very important to help people prepare and reduce the damage they cause. Traditional methods, like using physical and statistical models, often fall short because they require a lot of data and experts, and they struggle with making accurate short-term predictions. The existing system uses ARMA models, have been used for a long time but have many problems. They are not good at understanding the complex relationship between rainfall and flooding. They also need a lot of effort and time to collect and process data, which makes them hard to use in real-time situations. The proposed system uses the Random Forest and SVM machine learning algorithms in Python to improve flood prediction. These machine learning models are very good at finding patterns in data. Random Forest helps analyze large amounts of data, while SVM is great for classifying information. By using these machine learning algorithms, we can make better flood predictions, giving people enough time to prepare and reduce the damage caused by floods.

KEY WORDS: : Natural Disasters, Predictions, ARMA Models, Machine Learning Algorithms.

I. INTRODUCTION

Flood is caused by an overflow of water from a lake, river, or ocean that submerges neighbouring land. Every year, floods affect roughly 4.84 million people in India, 3.84million in bangladesh, and 3.28 million in China [1]. Other countries' cities are also prone to flooding. The Netherlands, Monaco, Bahrain, and other low-lying areas are at risk of floods. Australia's floods claimed 73 lives between 1997and 2008 [2]. Floods in the United States kill roughly 100people and cost \$7.5 billion in damage yearly [3]. According to the World Resource Institute, floods would affect 147 million people by 2030, causing \$174 billion to\$712 billion in property damage [4].Bangladesh is one of the most vulnerable countries in South Asia to natural disasters, especially floods. According to the study [5], Bangladesh was hit by floods 78 times between 1971 and 2014, killing 41,783people. According to a study, the NARX structure of the Artificial Neural Network model [6] can predict floods 5hours in advance with 73.54% accuracy. This study used upstream river water levels as an input variable because they influence flooding. Another study [7] used Back Propagation Neural Networks (BPNN) to forecast flood levels (BPN). The BPN model uses water level data from stations in Johor, Malaysia. The model's output was unsatisfactory, so an Extended Kalman Filter (EKF) was added to improve it. The paper claims that adding EKF to the BPN model resulted in better accuracy. The EKF algorithm is also used in the paper [8]. The EKF method has two stages: prediction and update. The data used here is to forecast the flood level. This algorithm's RMSE is 0.9236 m, according to this paper [8]. The main goal of this research is to predict floods more accurately using Binary Logistic Regression. It is possible to classify the flood dataset using binary classification. Fitting the model to the training dataset reveals which model parameters should be used to predict unknown labels on other data. So far, classic ML methods like SVC and KNN have shown better accuracy.

II. LITERATURE SURVEY

Flood prediction using artificial intelligence and machine learning has gained significant attention in recent years. Various models have been developed to improve accuracy and efficiency in forecasting floods. Deo and Sahin [1]

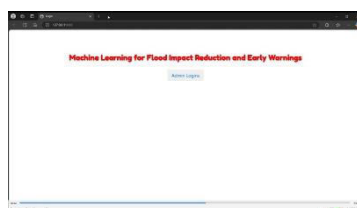
introduced a fuzzy inference system for real-time flood forecasting using the Takagi Sugeno (T-S) fuzzy model. Their system improved the prediction of both frequent and rare flood events, though it lacked precise forecasting capabilities. Pradhan et al. [2] developed a wavelet-neural network hybrid model for river flow prediction. This model combined wavelet transformation with artificial neural networks (ANN) and showed improved performance over conventional approaches, though its efficiency varied with different datasets. Sahoo et al. [3] analyzed flood susceptibility using Support Vector Machines (SVM) with different kernel functions. The study demonstrated the effectiveness of SVM for flood prediction but identified inconsistencies in accuracy that need further refinement. Huang et al. [4] proposed a deep learning-based flood forecasting model using stacked autoencoders and BP neural networks. While the model enhanced predictive capabilities, it suffered from data imbalance issues, affecting overall performance. Praba [5] implemented a feedforward backpropagation network with an optimized conjugate training algorithm. Although the model outperformed the ARIMA approach in accuracy, it was limited in handling deep-layered architectures. These studies highlight the advancements and challenges in AI-driven flood forecasting, emphasizing the need for improved hybrid models and better data preprocessing techniques to enhance prediction accuracy and reliability.

III. METHODOLOGY

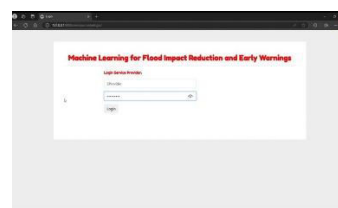
The project addresses the problem of forecasting the river flow on the basis of rainfall and runoff data. The objective of the paper was twofold: one was to demonstrate the potential of the Random Forest Regression (RF) computing paradigm in modeling the rainfall-runoff process; and second was to evaluate the relative merits and demerits of this paradigm with reference to already popular SVM, ANN and GP modeling approaches. The study suggests that the RF model is able to capture the inherent nonlinearity in the rainfall-runoff process better than the other three, and is able to forecast flows satisfactorily up to 5 hours in advance. A very close fit was obtained between computed and observed flows up to 1 hour in advance for all models, but only the RF tends to preserve this performance at higher lead times. A comparative analysis of prediction accuracy of these models in different ranges of flow indicates that the RF is better than the ANN, SVM.

IV. EXPERIMENTAL RESULTS

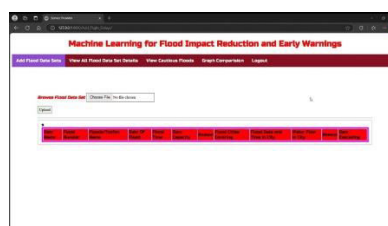
Figures shows that the results of Detection of Mental Health Risks In Social Media by using machine learning algorithms. Fig 1(a) Home Page of Admin Login. (b) User Login Home Page. (c) Home page of Flood server.



(a)



(b)



(c)

Fig. 2. Shows Admin responsibilities (a) Selection Our Prepared Flood Data set. (b) Uploading our Prepared Data set. (c) To See Caution Floods.



Fig. 3. Shows detection of Hate speech from the post. (a) User uploads a post. (b) Other friend post comments. (c) Detection a hate speech comment.



V. CONCLUSION

Finally I conclude that The current state of ML modeling for flood prediction is quite young and in the early stage of advancement. Despite the promising results already reported in implementing the most popular machine learning methods, e.g., ANNs, SVM, SVR, ANFIS, WNN, and DTs, there was significant research and experimentation for further improvement and advancement. In this context, there were four major trends reported in the literature for improving the quality of prediction. The first was novel hybridization, either through the integration of two or more machine learning methods or the integration of a machine learning method(s) with more conventional means, and/or soft computing. The fourth was the use of add-on optimizer algorithms to improve the quality of machine learning algorithms, e.g., for better tuning the ANNs to reach optimal neuronal architectures. It is expected that, through these four key technologies, flood prediction will witness significant improvements for both short-term and long-term predictions. Surely, the advancement of these novel ML methods depends highly on the proper usage of soft computing techniques in designing novel learning algorithms. This fact was discussed in the paper, and the soft computing techniques were introduced as the main contributors in developing hybrid ML

REFERENCES

- [1] C.-J. Hsiao, E. Hing, and J. Ashman, "Trends in electronic health record system use among office-based physicians: United states, 2007–2012," Nat. Health Stat. Rep., vol. 75, pp. 1–18, May 2014.
- [2] R. Smith-Bindman et al., "Use of diagnostic imaging studies and associated radiation exposure for patients enrolled in large integrated health care systems, 1996–2010," JAMA, vol. 307, no. 22, pp. 2400–2409, 2012.
- [3] E. H. Shortliffe, Computer-Based Medical Consultations: MYCIN, vol. 2. New York, NY, USA: Elsevier, 1976.
- [4] G. Litjens et al. (Jun. 2017). "A survey on deep learning in medical image analysis." [Online]. Available: <https://arxiv.org/abs/1702.05747>
- [5] W. S. McCulloch and W. Pitts, "A logical calculus of the ideas immanent in nervous activity," Bull. Math. Biol., vol. 5, nos. 4, pp. 115–133, 1943.
- [6] F. Rosenblatt, "The perceptron: A probabilistic model for information storage and organization in the brain," Psychol. Rev., vol. 65, no. 6, pp. 365–386, 1958.
- [7] D. H. Hubel and T. N. Wiesel, "Receptive fields, binocular interaction and functional architecture in the cat's visual cortex," J. Physiol., vol. 160, no. 1, pp. 106–154, 1962.
- [8] K. Fukushima and S. Miyake, "Neocognitron: A self-organizing neural network model for a mechanism of visual pattern recognition," in Competition and Cooperation in Neural Nets. Berlin, Germany: Springer, 1982, pp. 267–285.
- [9] Y. LeCun et al., "Backpropagation applied to handwritten zip code recognition," Neural Comput., vol. 1, no. 4, pp. 541–551, 1989.
- [10] D. E. Rumelhart, G. E. Hinton, and R. J. Williams, "Learning representations by back-propagating errors," Nature, vol. 323, pp. 533–536, Oct. 1986.



INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

 9940 572 462  6381 907 438  ijirset@gmail.com



www.ijirset.com

Scan to save the contact details