An Integrated Approach for Flood Prediction by Using Block Chain Network and Machine Learning

Kalpana Murugan 1, A.Seeta Reddy2, M.Sivasainath Reddy3, P.Raviteja Reddy4

1 Department of Electronics and Communication Engineering, Kalasalingam Academy of Research and Education, Krishnan Koil, Virudhunagar-626126, Tamilnadu, India
2,3,4 Department of Electronics and Communication Engineering, Kalasalingam Academy of Research and Education, Krishnan Koil, Virudhunagar-626126, Tamilnadu, India

E-mail: drmkalpanaece@gmail.com

Abstract. Now a days heavy rainfall becomes the major problem in India because of the changes that occur in global environment and in climatic conditions this problem rises so, To overcome this problem, this proposed method i.e advanced flood alerting system (AFAS) had been introduced by using machine learning and block chain network. This method helps to predict an early occurrence of flood with an efficient output probability of prediction. The output of this project gives an accurate and approximate probability percentage of flood prediction. After predicting the flood it gives an alert or caution to that particular area that has been effected by flood so, it helps them to take necessary precaution steps to follow ,If this happened then the victims that effected by flood can be saved and also death loss and property loss can be reduced in an effective manner.

1. Introduction
Now a day’s floods becomes the major natural disaster so, Predicting the rainfall prior makes to stop the floods and saves the live of humans, animals and properties. In this [1] exact rainfall prediction is proactive task for engineers and scientists. Several methods are used for rainfall prediction for weather forecasting with circumstances and several neural network algorithms approaches used for heavy rainfall in advance approach of detecting the flood in the prediction by various engineer’s scientists in current generation. In [2] output of the flood accuracy is very less because today it is challenging and complex task. Among all approaches Machine Learning is latest technology for prediction purposes so that using this technology to predict the rainfall earlier. In [3] many methods are available for prediction but accuracy is low, when coming to machine learning it works like human brain and output accuracy is more compare to other methods. In [4] when provide data to ML, give the training to it then it processes data and works according to given input instructions. Occurring many disasters damage the properties, human loss and decrease the country’s economy, in those disasters flood disaster is great impact to the loss.
2. LITERATURE REVIEW

In [5] accuracy of rainfall forecasting is major problem in countries like India whose economy mainly depends on agriculture. Statistical techniques failed to predict the good accuracy but non linearity of rainfall data by artificial neural network makes good accuracy of rainfall prediction. Predicting the rainfall earlier stage help to avoid the floods and save the human lives. In [6] collect data in real time by using internet of things and it transfers data to computer device through big data and by using internet of things they have done the approach of flood prediction they have used sensor to overcome the issue. In [7] predicts the heavy rainfall by using the conversation of the soil and the basin techniques has been implemented so this project may not have high probability of prediction. In [8] proposed heterogeneous wireless sensor network to predict the floods in effective way. Hydraulic spectralsatellitesystem has been used in geographical information concept This cause the high range of complexity. In [9] this model they have developed the algorithm and this algorithm has been introduced in python programming language so, this concept of input pattern to the python has been very complicated like using in prediction model and forecasting model. In [10] proposed flood modelling and rainfall-runoff relationships has been presented by taking parameters like rainfall data, temperature, soil moisture and watersheds. Rainfall runoff defines the amount of water falls in a certain period of time. Flood prediction is defining precipitation data to predict the water levels in timeline model. In [11] predicting the rainfall by using the digital cloud images clustering technique analysing the colour. Dimension of images are 400 x 250 taken from the internet and types of cloud estimated using the clustering methods and finally give the status of rainfall. In [12] discuss the machine learning techniques to predicting the rainfall in earlier. Heavy rainfall causes damage to crops yield due to this decrease the country economy to overcome this problem taking the previous rainfall according to crops seasons like rabbi, Kharif and predict the rainfall in future which crop would be suitable in occurrence of more rain. In [13],[14] solved the problems of short-term rainfall forecasting from the DRCF greedy algorithm using machine learning. External results show that overall performance of the art approaching which intervals on three hours. The greedy algorithm can only determine the optimal structure of local MLP, but could not global optimal structure. In [15],[16] to find another concept of an idea to predict the heavy rainfall network of geographical wavelet through satellite communication via gsm module the alert can be send through the mobile phone of weather department, this makes more complex and cost. The validation performance of the models is valued by the numerical methods. In [17] the artificial approach of deep learning techniques has been implemented in advance model but it is so complex and vast thing of neural based system. In [18] this model of flood prediction system the existing method has been some drawbacks of using basin proposed method, in order to overcome this proposed method has been introduced. In [19] this wireless sensor network for flash flood warning they have used mat lab on neural network using nodes and sensors has been used to solve the problem. In [20] assuming floods as stochastic processes, they can be predicted using certain probability distributions from historical streamflow data.

3. PROPOSED METHOD

3.1. An Advanced Flood Alerting System (AFAS method)

Many people in India has been subjected to the effects of climatic conditions like natural calamities i.e. tsunami, heavy flood and heavy rainfall. Due to this all disasters that occur in India the people who were living in India has been suffering a lot so, in order to give solution to this type of problems, Came to an idea i.e. ‘Early detection of flood forecasting system’ This proposed method has been introduced to find solution for above issue mentioned. Our proposed method (AFAS) is that predict an early occurrence of flood and after prediction making an alert to the public that there may be an occurrence of flood in your city, by giving an alert or cautioning them, they can able to take safety and precaution measurements. The main motive of this project idea is that by using this idea and approach at least one mankind death loss can
be reduced. In this machine learning and blockchain technology has been used. Machine learning is an algorithm that has an ability to learn from the past experiences and learn itself it is an advanced model and method that are going to use in this project, this helps the data to process and compare the data that are taken i.e. previous year data it will compare the year by year by taking all ten years of rainfall data in June, July and August i.e. (past ten years data). After processing the data of ten years by taking the mathematical average values and the genetic decision making tree graph of all the possible methods to find an average value and decision making figure i.e. value or can be defined as probability percentage of mathematical value that is going to make a decision or coming to a conclusion to prediction of flood probability percentage value of the processed data. By using this machine learning techniques accuracy and efficiency of the output will be increase.

Table 1. Weather parameters

| S.N | STATE | CITY | YEAR | JUNE | JULY | AUGUST | AVG | JUNE | JULY | AUGUST | AVG | JUNE | JULY | AUGUST | AVG |
|-----|-------|------|------|------|------|--------|-----|------|------|--------|-----|------|------|--------|-----|
| 1.   | KERAL | KOC  | 2010 | 27   | 26   | 26.3   | 88  | 90   | 88   | 88.6   | 1009| 1009| 1009| 1009   |     |
| 2.   | KERAL | KOC  | 2011 | 27   | 26   | 26.3   | 88  | 89   | 89   | 88.6   | 1009| 1009| 1009| 1009   |     |
| 3.   | KERAL | KOC  | 2012 | 27   | 27   | 27     | 86  | 85   | 86   | 85.6   | 1009| 1009| 1010| 1009   |     |
| 4.   | KERAL | KOC  | 2013 | 26   | 26   | 27     | 26.3 | 90   | 89   | 86.3   | 1009| 1009| 1010| 1009   |     |
| 5.   | KERAL | KOC  | 2014 | 28   | 27   | 26     | 86  | 87   | 88   | 87     | 1009| 1010| 1010| 1009   |     |
| 6.   | KERAL | KOC  | 2015 | 28   | 27   | 27.6   | 86  | 85   | 82   | 84.3   | 1009| 1010| 1010| 1009   |     |
| 7.   | KERAL | KOC  | 2016 | 27   | 27   | 28.3   | 87  | 85   | 83   | 85     | 1010| 1010| 1010| 1010   |     |
| 8.   | KERAL | KOC  | 2017 | 27   | 27   | 27     | 88  | 86   | 85   | 86.3   | 1010| 1010| 1010| 1009   |     |
| 9.   | KERAL | KOC  | 2018 | 27   | 26   | 26.3   | 88  | 89   | 87   | 88     | 1009| 1010| 1010| 1009   |     |
| 10.  | KERAL | KOC  | 2019 | 28   | 27   | 26     | 82  | 84   | 87   | 84.3   | 1008| 1009| 1010| 1009   |     |
| 11.  | AVERAGE|      |      | 27.2 | 26.6 | 26.7   | 26.8 | 86.8 | 86.9 | 86.1   | 86.8| 1009.1| 1009.5| 1009.7| 1009.4 |

Table 2. Rainfall data
Figure 1. Flow Diagram of AFAS Method

Flow Diagram description:
Figure 1. depicts the flow diagram for AFAS method. First identifying the problem in a particular city or in an area and collect the previous ten years data in that city from the various source and this data has been processed by using machine learning algorithm and dataset. By the concept of machine learning techniques the processed data has been compared year by year and come to a conclusion that the prediction take place or not and if it happens how much amount of the probability will occur if the probability of prediction is high then it comes to a conclusion that there is an early occurrence of flood in that city. Finally, the prediction data has been forwarded to the weather forecasting department by using block chain network that is used for security purpose. Block chain network has been used here in this project for security purpose and after making the decision of flood prediction the data has to be secured in a very confidential manner in order to avoid the miscommunication of data. This act as a barrier of security line between the sender and receiver.

4. RESULTS AND DISCUSSION

Flood is one of the major problem that occurs due to natural calamities, An Advanced Flood Alert System (AFAS) is proposed to predict the heavy rainfall and protect the lives of humans, animals, and properties. In order to overcome the drawback this work proposes the AFAS method to predict the rainfall using the machine learning algorithm and block chain technology. AFAS method make an alert to the public and provide a caution in an earlier or before the occurrence of flood. So the people can take necessary safety measurements to overcome the flood. The result shows that the AFAS method has more accurate than the Artificial Neural Network (ANN) method in terms of rainfall prediction. By using this project an early occurrence of flood can be detected and this result i.e. the probability of prediction can be used to make an alert to the public in order to avoid the death and property loss. In Anaconda software by using Jupyter notebook the data set has been used which inserted in separate file to access this file

![Rainfall Prediction graph of June month](image)

**Figure 2.** Rainfall Prediction graph of June month
Import function be used then using our method that has been introduced in this project predicts the flood in 2020. Observe that June, July months prediction graph as show in fig 2,3,4 with the normal rainfall values but in August month prediction graph shows higher rainfall so there is chances to occur the flood in the month of august in Kerala. Figure 5. shows the performance level graph for the AFAS and ANN method.

Figure 3. Rainfall prediction graph of July month

Figure 4. Rainfall prediction graph of August month.

Figure 5. Performance of Rainfall prediction in AFAS and ANN
5. CONCLUSION AND FUTURE WORK

This proposed method (AFAS) predicts the rainfall prior makes to stop the floods and saves the life of humans, animals and properties. Exact rainfall prediction is proactive task for engineers and scientists. Several methods are used for rainfall prediction for weather forecasting with circumstances and several neural network algorithms approaches used for rainfall prediction by various engineers and scientists in current generation. In order to save the people from natural disaster like floods and heavy rainfall the prediction concepts has been introduced and this (AFAS) method predicts an early occurrence of flood has been useful for the areas where flood occurrence is more and in order to solve the problem of heavy flood that causes the human death and property loss, this project helps to make an alert in the public and make a caution in early or before occurrence of flood so, that the people can take necessary safety measurements to overcome the flood.

References

[1] Akhtar, N., Rehman, A., Hussnain, M., Rohail, S., Missen, M. S., Nasir, M., ... & Pasha, M. (2019). Hierarchical coloured petri-net based multi-Agent system for flood monitoring, prediction, and rescue (fmpr). *IEEE Access*, 7, 180544-180557.

[2] Fleming, S. W., & Goodbody, A. G. (2019). A Machine Learning Metasystem for Robust Probabilistic Nonlinear Regression-Based Forecasting of Seasonal Water Availability in the US West. *IEEE Access*, 7, 119943-119964.

[3] Puttinaovarat, S., & Horkaew, P. (2020). Flood Forecasting System Based on Integrated Big and Crowdsourced Data by Using Machine Learning Techniques. *IEEE Access*, 8, 5885-5905.

[4] Parmar, A., Mistree, K., & Sompura, M. (2017, March). Machine learning techniques for rainfall prediction: A Review. In *International Conference on Innovations in information Embedded and Communication Systems*.

[5] Venkatesan, C., Raskar, S. D., Tambe, S. S., Kulkami, B. D., & Keshavamurty, R. N. (1997). Prediction of all India summer monsoon rainfall using error-back-propagation neural networks. *Meteorology and Atmospheric Physics*, 62(3-4), 225-240.

[6] Sahai, A. K., Soman, M. K., & Satyan, V. (2000). All India summer monsoon rainfall prediction using an artificial neural network. *Climate dynamics*, 16(4), 291-302.

[7] Philip, N. S., & Joseph, K. B. (2001, May). On the predictability of rainfall in Kerala-An application of ABF neural network. In *International Conference on Computational Science* (pp. 400-408). Springer, Berlin, Heidelberg.

[8] Philip, N. S., & Joseph, K. B. (2003). A neural network tool for analyzing trends in rainfall. *Computers & Geosciences*, 29(2), 215-223.

[9] Akyildiz, Ian F., Weilian Su, Yogesh Sankarasubramaniam, and Erdal Cayirci. "A survey on sensor networks." *IEEE Communications magazine* 40, no. 8 (2002): 102-114.

[10] Seal, V., Raha, A., Maity, S., Mitra, S. K., Mukherjee, A., & Naskar, M. K. (2012). A simple flood forecasting scheme using wireless sensor networks. *arXiv preprint arXiv:1203.2511*.

[11] Sehgal, V., & Chatterjee, C. (2014). Auto updating wavelet based MLR models for monsoonal river discharge forecasting. *Int. J. Civ. Eng. Res.*, 5, 401-406.

[12] Bakhtyari-kia, M., Pirasteh, S., Pradhan, B., Mahmoud, A. R., Sulaiman, W. N. A., & Moradi, A. (2012). An Artificial Neural Network Model for Flood Simulation Using GIS. *Johor River Basin, Malaysia. Environmental Earth Sciences*, 67(1), 251-264.

[13] Fang, S., Xu, L., Pei, H., Liu, Y., Liu, Z., Zhu, Y., ... & Zhang, H. (2014). An integrated approach to snowmelt flood forecasting in water resource management. *IEEE transactions on industrial informatics*, 10(1), 548-558.

[14] Tuxworth, G. (2016). Automated Morphology-based Analysis of Neural Cells.
[15] Abhishek, K., Kumar, A., Ranjan, R., & Kumar, S. (2012, July). A rainfall prediction model using artificial neural network. In 2012 IEEE Control and System Graduate Research Colloquium (pp. 82-87). IEEE.

[16] Mishra, N., & Jain, A. (2014). Time Series Data Analysis for Forecasting–A Literature Review. International Journal of Modern Engineering Research, 4(7), 1-5.

[17] Lee, S., Cho, S., & Wong, P. M. (1998). Rainfall prediction using artificial neural networks. Journal of Geographic Information and Decision Analysis, 2(2), 233-242.

[18] Mitra, P., Ray, R., Chatterjee, R., Basu, R., Saha, P., Raha, S., ... & Saha, S. (2016, October). Flood forecasting using Internet of things and artificial neural networks. In 2016 IEEE 7th Annual Information Technology, Electronics and Mobile Communication Conference (IEMCON) (pp. 1-5). IEEE.

[19] Castillo-Effer, M., Quintela, D. H., Moreno, W., Jordan, R., & Westhoff, W. (2004, November). Wireless sensor networks for flash-flood alerting. In Proceedings of the Fifth IEEE International Caracas Conference on Devices, Circuits and Systems, 2004. (Vol. 1, pp. 142-146). IEEE.

[20] Basha, E. A., Ravela, S., & Rus, D. (2008, November). Model-based monitoring for early warning flood detection. In Proceedings of the 8th ACM Conference on Embedded Network Sensor Systems (pp. 295-308).