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IoT Enabled Sensor Network and Machine Learning

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ABSTRACT

Floods are one of the most commonplace natural failures that influences humanity. Unless we take the proper precautions, it'll endanger human existence itself. Flood prediction the usage of IoT enabled sensor network and system getting to know outlines a totally green manner to nicely recognize and manage floods. This generation may be used to evaluate the risk of flooding, there by way of rushing up precautionary measures. IoT is a network of computing devices By using distinctive sensors, statistics approximately numerous environmental conditions had been gathered and switch it to google sheet with the help of IoT era. The client can examine the statistics in the form of dataset from a far off device and predict the danger of flood.

Keywords—Classification, Decision tree, IoT-Internet of Things, Machine Learning

I. INTRODUCTION

Flood is a natural chance that causes many losses in every united states inside the world. To a few extent, it's far possible to display the weather the usage of numerous technology, but it requires accurate actual-time tracking of records to manage up with surprising flooding .Since floods are most damaging and has some distance greater effect on human life than different herbal disasters , it's far a challenge for the authorities to discover the quality way to cope with it. water degree and go with the flow information from diverse geo-sensor networks and is added together in an internet-based platform that disseminates information to the public [2]. The necessities of actual- time records and know-how-intensive levels of automation and supervision offers with the uncertain, unfrozen, heuristic and fuzzy facts [8].

Flood tracking and prediction models have huge importance for danger assessment and control. So, an efficient prediction version will contributes a lots to monitoring, analysing and prevention strategies of government. It introduces an method which allows to 25 predict the chance of flooding in a completely value effective, smooth and strong way. Flood prediction using IoT enabled sensor network and gadget studying introduces a new manner of predicting the risk of flood in an clean and green way by the combination of IoT and machine masteringtechnologies.

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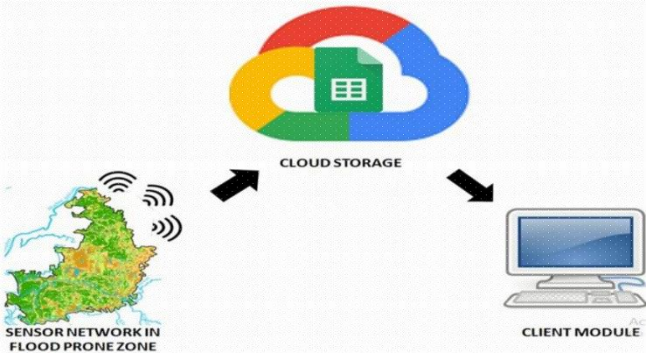

Figure1: Sensor basedcentralizedflooddetection

II. LITERATUREREVIEW

Flood tracking, prediction and forecasting is maximum vital in these days. There are many query arises related to the flooding problems. It is the urgent want of the nowadays's international to live on from the flooding. With the resource of computational techniques has been studied and introduced different methods and technology to are expecting, monitor and forecast the flood.

M. S. Baharum, R. A. Awang and N. H. Baba [1] offer a flood monitoring and alerting machine to reveal the flood in distinctive water resources. They used Graphical User Interface (GUI) display to monitor and Short Messaging Services (SMS) Gateway for sending signals by way of Visual Basic6.0 and Ubuntu Server Edition. The machine is aimed to display the water degree the use of water sensors which are positioned in distinct low mendacity areas either in everyday risky conditions. They divided the system into unique stages including ordinary area, degree 1, level 2, stage three and threatening quarter. The facts from the sensors are collected is analysed and sends signals to the person throughGlobal System for Mobile communique (GSM). It is price powerful and efficient facts measurement can be carried out. But the gadget may reason troubles of misguided facts from the sensors, faults in sending indicators. Ribeiro Alexandra, Cardoso Alberto, Marques Alfeu S, SimoesNuno E [2] talk the case observe, the stretch of the Portuguese Mondego River between the upstream dam system Aguieira – Raiva – Fronhas and the downstream Dam Bridge of Coimbra City. For the net based totally platform the communication between customer and server finished thru AJAX (Asynchronous JavaScript and XML) and prototype implementation is based at the DHI MIKE OPERATIONS framework .They provide an internet primarily based platform for river flood tracking by way of accumulating extraordinary information inclusive of water degrees, flows and rainfall by using geo-sensor networks. The measurements are downloaded and represent as maps the use of GIS. The platform can efficaciously reveal the water degree in a region handiest. Swapnil Bande and Prof. Dr. Viranda V. Shete [6] brought a flood prediction gadget which is based totally on IoT and neural networks. ANN is used to expect flood. They measured temperature, pressure, rainfall, humidity, river water stage using sensors and to locate the temporal correlative information for flood evaluation. It enhances the scalability and reliability of flood control device. But the usage of Wi-Fi, there might be a danger of connection misplaced or any other disruptions and the fee is high.

Mohammed Khalaf, AbirJaafarHussain, Dhiya Al-Jumeily, Paul Fergus and Ibrahim OlatunjiIdowu [7] proposed the machine which employed via machine mastering set of rules. Data from the sensors are taken and analyses it. Based at the analysed facts, it sends indicators as sms to the users by means of the use of GSM era. Accuracy of the gadget is lots higher. But it isn't always smooth to music the device that placed in various area including riverbank or low-lying area. IndraRiyanto, Lestari Margatama, AnggaAriawan, LuhurBayuaji, Mia Rizkinia, DodiSudiana, Harry Sudibyo S and JosaphatTetuko Sri Sumantyo

[8] brought the flood caution device that is an internet digicam sensor coupled with Lidar facts. The water degree picture is taken the usage of an internet digicam and the ensuing photograph is represented as flood map.They segmented the flood associated place from Lidar records at 1 m intervals and the water stage is recorded at 10 cm periods. It is efficient to display flooded regions while the river upward push.

The pics taken may be inappropriate, erroneous and result in a few faults in sending signals to the customers.

III. SYSTEMARCHITECTURE

Theproposed systemmainlyconsistofthreemodules:

a. **Sensor Module**
b. **Cloud Storage**
c. **ClientSystemModule**

Sensormoduleincludesmainlyfivesensorstomonitorte mperature, humidity, soil moisture, water level and rainfall.Toimprovethesystemperformancemoresensors canbeincluded to the module easily. All these sensors are directlyconnectedtoESP8266NodeMCUwhichisanIoT platform.Thedatasignalsreceivedfromthesensorsareclu stered and transfers to the drive (as google sheets).In thedrive, client obtains data in the form of data sheets. So there isnoneedforfurtherconversion.Theclientcandirectlydo wnload the data set for the application of Machine Learningalgorithm to predict if there any chances of flood. Decisiontree classificationalgorithm is used to predict the flood risk intheproposedsystem.

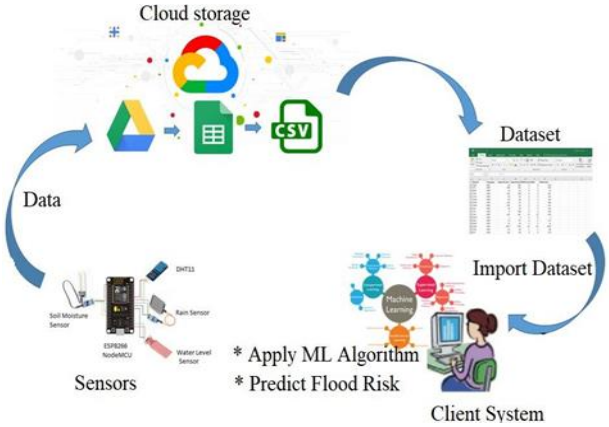

Figure2: FloodPredictionSystem

IV. DETAILEDFUNCTIONING

4.1 IoTEnabledSensorNetwork

The internet of things (IoT) is an interconnection of deviceslikesensorsoractuatorswhichtransfersdataandin formation over the internet with less human intervention.The internet and the devices are the two important parts ofIoT. In short, it is the network of smart sensors and helps toreduce humans work load [3][4].Sensors are devices thatcollect information from the surroundings, by detecting thechanges and transfer the data to other devices or a computerprocessorbydifferentmeans.TheWSNstructu resareintegratedwiththegatewayareofferedwireless connectivity that supports the wired globe and disseminated nodes. The energy of wireless sensor network offered with the capability of huge amount of data with minute nodes which are collected and organized for their transmission. Data are produced by the nodes are usually relay with the sink node across a multi hop network. Network coverage is one of the major estimation process in the wireless network. It is constantly beneficial for the capability of organizing the network over the improved physical region. This can considerably enlarge the system importance to the end user [8]. Sensors, which forms the base for IoT systems, connect to IoT network after the processing of the information. The converted output signal from the sensor act as input for the microcontroller.

4.2 Applicationofmachinelearningalgorithm

Machine gaining knowledge of is a part of synthetic intelligence, in which the pc system or device analyze from reviews (by way of analysing the patterns within the database). Different sorts of algorithms are using in machine studying era for exclusive purposes. Machine Learning procedure entails amassing all the data, cleansing the records and takes the best statistics's which can be wished for the trouble solution.

Using the training facts, machine getting to know set of rules can be skilled so that it will create a version. The device gaining knowledge of set of rules is then carried out to the input dataset to predict the output. Here, to predict the threat of flood the choice tree class algorithm in gadget studying is used. Decision tree makes use of supervised studying idea. Using selection tree algorithm the dataset is sampled into

different clusters. Theinformation set the usage of is the actual time information from the sensors. Since the sensors produces quite a few information, advent of delay inside the circuit enables a confined amount of statistics to be stored in pressure. Client can download the datasheet from the power to check and train the use of selection tree set of rules. Decision tree model is great desirable for this prediction.theformof.csvfilebyapplyingmachinelearningalgorithmthechanceoffloodcanbepredicted.

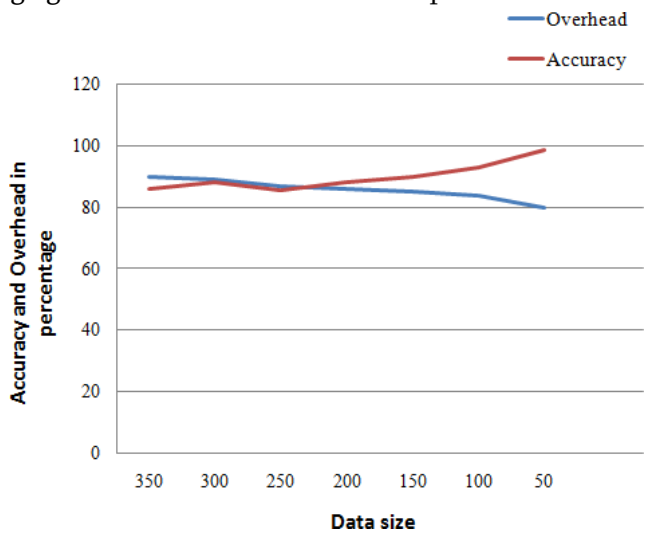

Figure6: Classification

Figure5: MachineLearningProcess

V. EXPERIMENTALANALYSISANDRESULTS

At first the sensors are located inside the flood prone vicinity. Client can import pressure-loaded sensor facts into his system wherever he is. All it takes is ideal net access. To down load the statistics in the customer system, the client need to login to the page. If the user does no longer have an account, user can create an account and login along with his very own username and password. Client can convert sensor facts into one of a kind clusters.

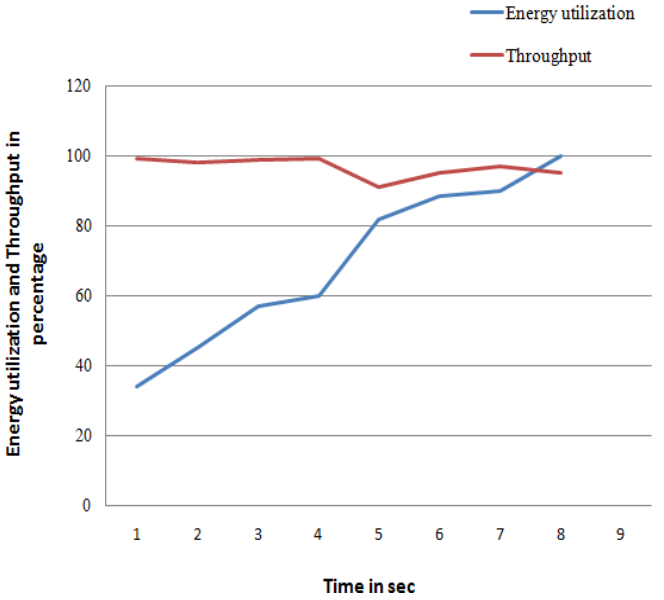

Figure7: Systemperformance

The graphisvisualizedusingWEKAtool.Datasetsaretaken in .arff format (attribute relation file format).In thefigure 6, classification overhead and accuracy is analysed.Asthesizeofdatasetincreasesaccuracyincreasesandoverhead decreases. Figure7 indicates the performance ofthesystem.Theenergyutilizationandthroughputisanalysed. As the time increases energy utilization increases.Thethroughputshowssmalldeviationswithrespecttotime. The deviations Sensor network can be implemented in remote areas proneto flooding and its potential can be predicted from anyotherlocation.TheconnectivityisdonethroughIoTtechnology. Real time monitoring and forecasting floodsacross multiple sectors can be done. Flood prediction usingIoTenabledsensornetworkplaysanessentialroleinenabling people to prepare for unnecessary losses. There isno need for manual recording of data to an excel format totrain the model. Therefore this

approach is most efficient,reliable and requires little time for prediction. Using bettersensorsmoreefficientfloodpredictionsystemcanb eimplementedinfuture.

VI. CONCLUSION

The development and implementation of a real time flood monitoring and forecasting system helps to accurately predict flooding. Advanced and fee efficient sensor generation is used to reveal environmental conditions. By the usage of IoT and Machine Learning technologies it's miles possible to collect enter statistics as it should be and reach to the preferred output.

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