SYSTEM FOR FUTURISING FARMING USING ML AND IOT

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Abstract

India is a farming country that has a large population to feed. Efficient Farming is always a great vision. Traditional farming methods have large flaws since it doesn't consider changes in environment .We propose a system that automate almost 90% of plant cultivation. The system uses Machine learning methods identify weather condition as well as soil condition. The IOT methods are used for automating farming. Field of farming is technically advancing day by day. Still a large amount of Indian farmers do cultivation through traditional methods. They are time consuming as well as require high knowledge in farming. Even with the knowledge the crops can be damaged due to different hazardous conditions. The system we propose is a easy and anybody who has zero knowledge in farming can also use. Here we use CNN for soil prediction and Random Forest algorithm for weather prediction. By comparing both these values we can identify a appropriate crop. After crop prediction system with the help ofMicrocontroller helps in creating a automated farming environments

INTRODUCTION

Farming is an inevitable element of India. Field of farming is advancing day by day. Still a large number of farmers cultivate through traditional means. The traditional means only follows already used methods while farming. The disadvantages of such old fashioned methods can be easily seen. For example traditional farming method follow similar crops for a fixed cultivation field and hence we can conclude that traditional farming methods does not consider drastic changes happening in environment. Climate change has become a inevitable condition. So to feed a exponentially increasing population traditional farming methods become ineffective.

What we propose through this paper is a automated farming environmental system with a crop recommendation feature for cultivation fields in different location. Our system mainly has two parts they are crop prediction and farming automation. Both these features will be managed via a application we created. The farmer can create a account in the application and enlist his field. According to the conditions of different farming fields system will recommend most appropriate crops to cultivate. Ones the recommendations are received the user can use farming automation feature in the application. With the help of sensors the farm field can be connected to the app. The usercan see status of his field any time via the app .

The crop prediction is a feature which will be implemented through different machine learning algorithms. Recommendation of crop in a farming field at a certain location mainly depends on two features. The soil condition and weather condition. For different soil types different crops give great productivity. So to identify different soils and best crops we use Deep Learning algorithm Convolutional Neural Network(CNN). Through this algorithm we can train our system in identifying correct soil. Then the weather prediction will also be performed with random forest ML algorithm. So we can identify which crop is better for the upcoming weather.Hence we get a more accurate crop recommendation.

With the help of Node MCU microcontroller each farming field will be able to controlled SMART AGRICULTURE SYSTEM DEPT OF CSE,ICET 7 by application through sensors. So when sensor gives data , farmer can use automatic irrigation system to provide water and fertilizer's in the field with out physical contact. We believe this paper will be a stepping stone for building great farming environment all around the world.

I. RELATED WORKS

In[1] "Factory Splint complaint Discovery and Bracket USING CONVENTIONAL ML and DL" by Hardik Kumar Jayswal The paper focus on prognosticating factory splint complaint in it's early stage which affect in better growth of factory. This check presents detail conversations on factory conditions, complaint discovery and its bracket using traditional styles, machine literacy and deep literacy. The check revealed that the relinquishment of traditional styles, machine literacy ways are still hamstrung. While deep literacy styles delivered superior results for complaint identification and bracket, compare to traditional styles.

In[2] "SMART SYSTEM MONITORING LAND USING IoT
" by K T E Keerthana S. Karpagavalli A. Mary Pasonia This work depicts the real work in agribusiness field which is finished by an android motorized contrivance which fills in according to the charge of the agronomist(in particular to his original shoptalk) exercising android operation which is introduced on the horsewoman's telephone. For planning Android motorized frame, they furnish licit correspondence with the horsewoman, Data focus and the mechanized widgets that are available in the agricultural field. Also, a PIR detector is associated with identify a mortal and critter if its honored the signal will get legislated and picture of the mortal or critter will go to the agriculturist correspondence and temperature detector regard and dankness detector regard will be passed to the horsewoman correspondence. The operation they grow also have the element of making inquiries or questions which makesit agriculturist.

In[3] "LOW COST SMART CAMERA SYSTEM FOR WATER STRESS DETECTION IN CROPS " by Paula Ramos- Giraldo,S. Chris Reberg- Horton, Steven Mirsky, Edgar Lobaton, Anna M. Locke, Esleyther Henriquez, Ane Zuniga, Artem Minin The vacuity of easy- to- use, low- cost, and largely scalable tools makes it possible to achieve rapid- fire and wide relinquishment of perfection husbandry. In this paper they outline the development of a smart camera system to descry failure stress in sludge and soybean crops. The system is comprised of a Raspberry Pi Zero W, Raspberry Pi Camera, WittyPi mini, a cooling and solar power system, temperature detectors both outside and outdoors of the box, and infrared cover temperature and light detectors. The system was erected to collect data in a configurable time frame and has an bedded machine- literacy(ML) processing system. The camera was configured using an Internet of effects(IoT) platform to manage the device and shoot images to the Cloud. One of the challenges for this system was to effectively apply machine literacy models on this limited- resource bedded platform. In(4) " CROP WATER demand vaticination IN AUTOMATED DRIP IRRIGATION SYSTEM USING ML AND IOT" by Shilpa
Chandra, Samiksha Bhilare, Mugdha Asgekar This paper proposes to automate the tedious process by proposing amicro-controller grounded system for automatic smart drip irrigation and to prognosticate the precise quantum of water demanded by the crop. Taking into consideration the rainfall, soil and crop parameters it'll prognosticate the volume of water that should flow consequently through drip irrigation with the help of detectors. This can control the humidity content of the soil in the cultivating field. Not only will it help the planter to use water wisely in future but also the water force to crops will be automated grounded on the conditions which is a palm- palm situation for both the planter and the terrain, leading to a good crop yield in a harmonious manner.

In[5] "EDGE AI IN SMART FARMING IOTCNN 'S AT THEEDGE AND FOG COMPUTING WITH LoRa " byT.Nguyen Gia,L. Quingqing, J Pena Queralta By integrating Artificial intelligence at original area network subcaste or Edge AI, they present a they present a system armature and perpetration that expands the possibilities of smart husbandry and husbandry operation with edge and fog computing with LPWAN technology for large area content. They proposed and enforced a system conforming on a detector knot, Edge Gateway, LoRa repeater, Fog Gateways, pall waiters and stoner terminal operations.

In[6] "TOWARDS PADDY RICE SMART FARMINGA REVIEW ON BIG DATA MACHINE LEARNING AND RICE PRODUCTION TASKS " by Rayner Alfred, Joe Henry Obit, Christie Pei- yee Chin In this paper, they perform a check of the rearmost exploration on intelligent data processing technology applied in husbandry, particularly in rice product. This paper describe the data captured and elaborate part of machine literacy algorithms in paddy rice smart husbandry, by assaying the operations of machine literacy in colorful scripts, smart irrigation for paddy rice, prognosticating paddy rice yield estimation, covering paddy rice growth, covering paddy rice complaint, assessing quality of paddy rice and paddy rice sample bracket. This paper also presents a frame that maps the conditioning defined in rice smart husbandry, data used in data modelling and machine literacy algorithms used for each activity defined in the product and post-production phases of paddy rice. Grounded on the proposed mapping frame, our conclusion is that an effective and effective integration of all these three technologies is veritably pivotal that transfigure traditional rice civilization practices into a new perspective of intelligence in rice perfection husbandry. Eventually, this paper also summarizes all the challenges and technological trends towards the exploitation of multiple sources in the period of big data in husbandry.

In[7] “IoT BASED FARMING LPWAN TECHNOLOGIES SUITABLE FOR REMOTE COMMUNICATION” by Nahina Islam, Biplob Ray, Fazeh Pasandideh This paper presented an experimental analysis of LPWAN literature with the support of simulation and factual perpetration of a Long Range Wide Area Network(LoRaWAN) grounded IoT network for smart husbandry. Grounded on their evaluation and trial of the being work and the practical perpetration of IoT grounded smart sprinkler using LoRaWAN communication protocol, this paper has presented a comparison and evaluation of different LPWAN technologies for remote smart husbandry. The empirical equation of wireless communication range of LoRaWAN gateways and power consumption model of LoRaWAN end bias helped us to determine that, the LoRaWAN communication system enables an IoT network to be stationed over 10 kilometers wirelessly in remote settings without being dependent on a Long Term elaboration(LTE- 4G/ 5G) or other backhaul network and the end bias consume as low energy as only15.36 mAh per day.

In[8] “SMART ranch AND MONITORING SYSTEMFOR MEASURING THE ENVIRONMENTAL CONDITION USING WIRELESS SENSOR NETWORK–IOT
TECHNOLOGY IN FARMING” by Tharindu Madushan Bandara, MansoorRAZA This paper is about perpetration of smart husbandry, IoT generalities helps in cost-effective husbandry conditioning like crop and other coffers operation. With wireless detector network it's easy to connect with different detectors used in ranch fields. The proposed system give a further dependable and flexible husbandry terrain for growers, and it's a easy Io T system since wireless detectors give input data’s to the system and from those data the system can manage ranch field.

In[9] “SMART AGRICULTURE IoT WITH CLOUD
COMPUTING” by Mahammad Shareef Mekala, P Viswanathan In this paper, they surveyed some typical operations of Agriculture IoT Sensor Monitoring Network technologies using pall computing as the backbone. This check is used to understand the different technologies and to make sustainable smart husbandry. Simple IoT husbandry model is addressed with a wireless network.

In[10] “AI AND IoT Grounded MONITORING SYSTEM
FOR adding THE YIELD IN CROP product ” by Richa Singh, Sarthak Srivastava, Rajan Mishra In this paper, the exploration is performed on a marigold factory to descry the most suitable conditions for factory growth. The gospel behinds this work is to reduce the pitfalls in husbandry and to promote smart husbandry practices. The effect of physical conditions like moisture, temperature, soil temperature and humidity and light intensity on the factory growth, is covered using IoT grounded monitoring system. The data responsible for the factory growth is attained using different detectors units like DHT11, LDR, DS18B20, Soil humidity detectors, Noir camera, single board microcontrollers and Application Programming Interfaces(APIs). The variation of factory growth ratew.r.t. the intensity of sun was observed within the range of 1000 lx- 1200 lx, order- 2(stylish). The farther analysis of the uprooted parameters is done using different Machine literacy(ML) algorithms.

In[11]“ REAL TIME MONITORING OF AGRICULTURAL LAND WITH CROP PREDICTION AND ANIMAL INTRUSION PREVENTION USING IoT AND ML AT
EDGE ” by Nikhil R, Anisha B S, Ramakanth Kumar The proposed system describes how the use of the IOT and ML ways can be combined to make the irrigation smart. The proposed system saves time avoiding problems like constant alert over the field by using IOT bias, crop vaticination helps the growers to grow suitable crops depending on the soil parameters by the use of machine literacy ways and it also helps in forestallment of the interferers like wild creatures into the field. It also helps in water conservation by supplying the shops field with minimum quantum of water automatically through the help of detectors depending on the water conditions. and eventually, SMS and Dispatch announcements will be transferred to the planter mobile phone during the abnormal conditions of his ranch. The proposed system can beused for taking edge opinions in real time.

In[12] “ Smart Farming and Plant Disease Discovery using IoT and ML" by Arathy Nair, Gouripriya J, Marie James The thing of this paper is to produce a Smart Agriculture System that utilizes slice- edge technologies including Node MCU, IoT, Android, Wireless Sensor Networks, and Machine literacy. Monitoring climatic conditions and early opinion of factory conditions are two critical factors of adding crop affair. A point of the proposed system is the capability of a system to cover temperature, moisture, and wetness through detectors using NodeMCU and shoot SMS warnings and a announcement on the application intended for the same on the planter's smartphone using Wi- Fi/ 3G/ 4G. A duplex communication link grounded on a cellular Internet interface is used by the system. growers can gain lesser benefits from this dependable, nondestructive technology by detecting factory conditions before. By exercising three classes of tomato shops(two infected and one healthy), system for smart husbandry and factory complaint discovery using IoT and ML was developed.

II. PROPOSED SYSTEM

The main goal we plan to achieve from this project is a better farming conditions for more production and profits. The correct crops in correct environment with proper cultivation can boost the economy of any country greatly. With our smart farming system we wish to achieve this result. We propose a system which uses machine learning algorithms such as Convolutional Neural Network and Random Forest algorithm to predict appropriate crops in a farming field also we wish to automate the cultivation process with the technology IoT, using microcontrollers such as NodeMCU.

The system use 3 types of dataset . The image dataset of different soils , Weather dataset for predicting whether and finally data about crops growing in different soil in different environment. Convolutional Neural Network algorithm accepts soil dataset and train with it to identify different type of soil to make prediction. Random forest algorithm is used in predicting weather condition . It accepts the weather dataset and train with it for predicting while crop selection. When a farmer need to identify the crops he want to cultivate he gives the picture of the soil and present weather to the system. The already trained system make prediction on crops by comparing with the crop database.

When farmer start cultivation the field condition is continuously monitored using sensors. Sensors identify moisture in air and soil , components inside the soil and dryness
. The values of each are given to microcontroller. The micro controller is programmed to identify the abnormalities . When such abnormalities occur the microcontroller instructs the hard wares connected in IoT modules to do certain task(Provide water , fertilizer etc.) . Through this, most of the farming process become easier and even novice can do farming.

We expect our system to achieve maximum efficiency while farming. Usage of deep learning and machine learning methods in crop prediction is much more efficient than other techniques like IoT and crop prediction does not require any type of hard wares. On the other hand the cultivation automation will be more accurate with IoT techniques. Both these section of our system will be SMART AGRICULTURE SYSTEM DEPT OF CSE,ICET 30 functioned under a web application in which a farmer can create his account and use for smart farming. Automation of farming fields will be achieved through this application . The farmer can easily access status of his farming field through application. The data's are received from the sensors and microcontrollers in the farming field. In this way farmer can cultivate without much of physical labor and produce efficient productivity.

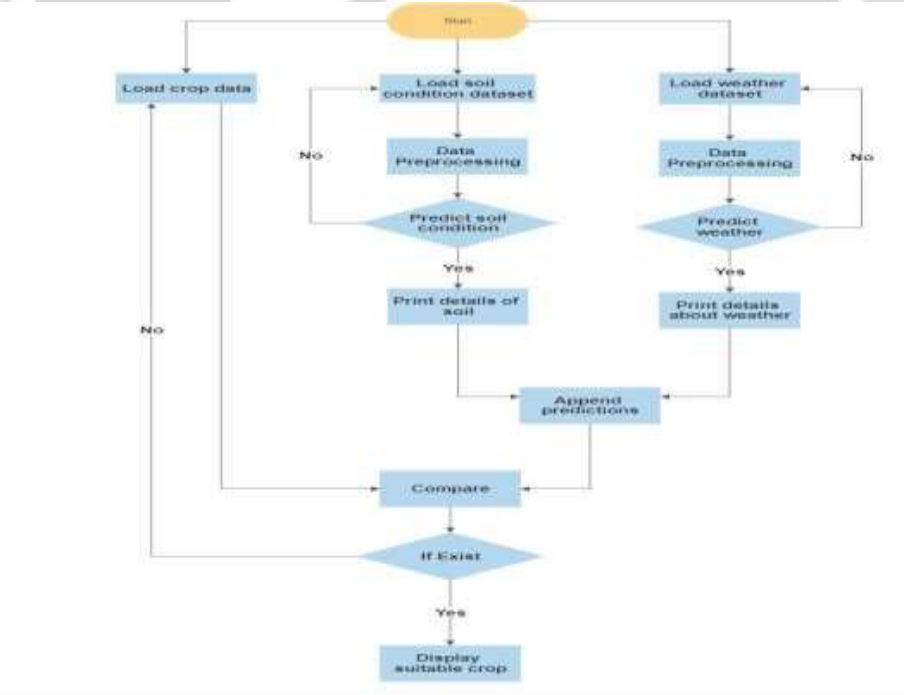

Fig. 1. The architecture(soil prediction)

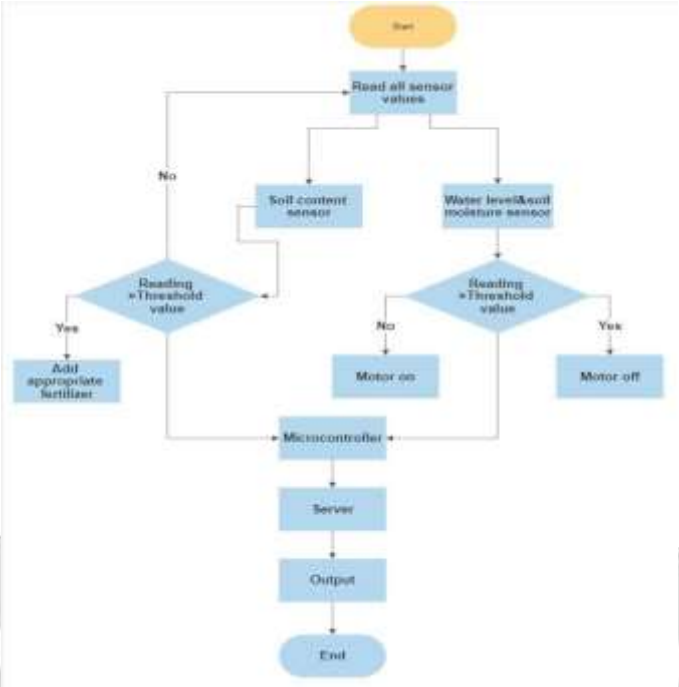

Fig. 2. The architecture(automated farming.)

III. MODULES

A. Admin

Admin mainly manages database and admins trains machinelearning and deep learning models.

Admin can edit the application.

Admin need to train machine learning model using differentdatasets to receive most accurate results

B. User

Farmer can create account in the application and log in to the application. After login they can provide data about their cultivation fields and receive appropriate crop recommendation. Ones the IoT modules and sensors are installed in the farming field and connected to the application user can control his farming fields from anywhere

C. CROP PREDICTION

The system use 3 types of dataset . The image dataset of different soils , Weather dataset for predicting whether and finally data about crops growing in different soil in different environment 8.1.3.2 Convolutional Neural Network algorithm accepts soil dataset and train with it to identify different types of soil to make prediction. 8.1.3.3 Random forest algorithm is used in predicting weather condition . It accepts the weather dataset and train with it for predicting while crop selection
8.1.3.4 When a farmer need to identify the crops he want to cultivate he gives the picture of the soil and present weather to the system. The already trained system make prediction on crops by comparing with the crop database

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D. CULTIVATION AUTOMATION

When farmer start cultivation the field condition is continuously monitored using sensors. Sensors identify moisture in air and soil , components inside the soil and dryness
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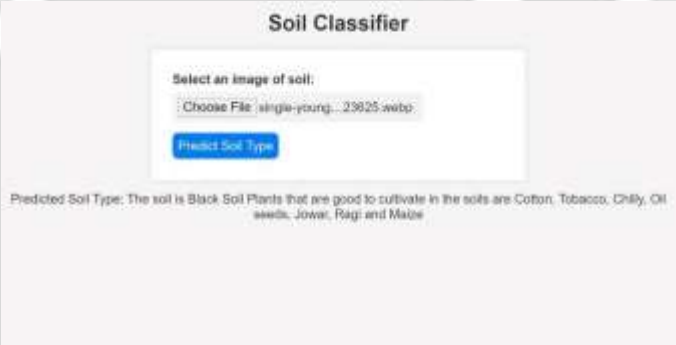
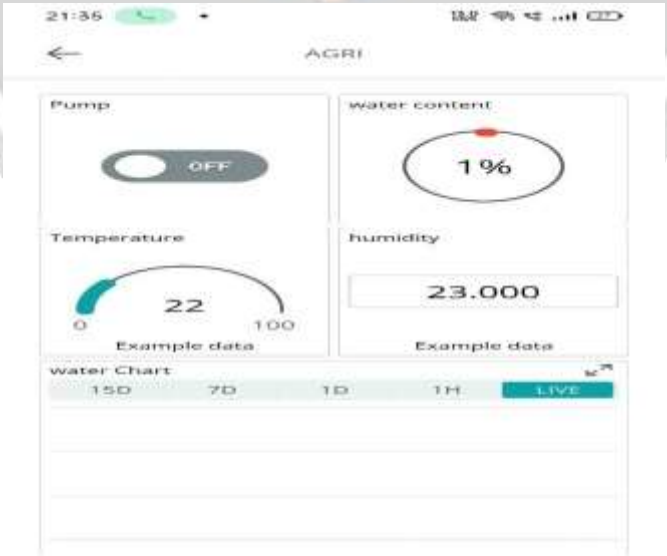
IV. RESULT AND DISCUSSION

RESULT

Crop prediction in different places using monthly weather info.



Crop prediction according to soil type



IoT mobile app for water dripping from anywhere

FUTURE SCOPE

The future scope for smart farming using ML and IoT is highly promising and can bring about significant advancements in agricultural practices. Here are some potential areas of development and opportunities Predictive Analytics: ML algorithms can analyze historical data from IoT devices such as sensors, drones, and satellites to predict crop yields, disease outbreaks, and market trends. This information can assist farmers in making informed decisions about crop selection, planting strategies, and resource allocation, leading to improved productivity and profitability.

Autonomous Farming: ML and IoT can enable the automationof various farming tasks through the use of robotics and autonomous systems. Robots equipped with ML algorithms and IoT sensors can perform activities like planting, harvesting, and spraying with precision and efficiency. This reduces manual labor requirements, enhances productivity, and enables 24/7 operations.

CONCLUSION

World with minimal food poverty is a vision we are pursuing. We believe the project we are implementing will be a starting solution for this wide problem. By removing traditional farming methods and implementing latest technologies like machine learning , deep learning and IoT will boost global agricultural production. For this purpose we implemented our smart farming system. It uses modern advanced technologies to farming which in result helps greatly in the field of cultivation. Increasing population need modern solutions for future food production. What we are currently implementing is a small system which can further upgraded to feed a large amount of people and it can completely remove the poverty that is affecting the poor countries.

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