MACHINE LEARNING FOR ELEVATED AGRICULTURAL PRODUCTIVITY

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ABSTRACT

60.45% of total land area is agricultural land in India- reports the World Bank collection of development indicators in 2015. Furthermore, agriculture contributes about 16% of total GDP. Modernizing the agriculture techniques is of utter importance. Agriculture seems to be deprived of technological advancement as compared to other sections. The new emerging technologies like Machine Learning, AI, Big Data etc. can be implemented for making the agriculture system more reliable & profitable.

This paper has been prepared as an effort to reassess the studies on the relevance of machine learning techniques in the field of agricultural crop production. Machine learning has rose with big data technologies and high-performance computing to make new open doors for data intensive science in the multi-disciplinary agriculture-technological area. Currently, agriculture uses about 83% of the total water consumption in India. This paper deals with Smart Agriculture methods for monitoring soil's water retentivity, type of crop, climate in a field, water requirement, water availability and providing a decision support system that is able to learn with the help of supervised learning algorithms resulting in improving the productivity and profit margins.

Keywords: *ML, agriculture, productivity, algorithms, GDP.*

1. INTRODUCTION

Agriculture provides employment to 67% of country's population. The term Agriculture is made from two Latin words ager or agri and cultura. Agri means soil and Cultura means cultivation. Farming is an applied science which envelops all parts of yield creation including horticulture, animals rearing, fisheries, forestry, etc. In the earlier times, India was largely dependent upon sustenance imports, but the progressive story of the horticulture division of Indian economy has made it self-sufficing in grain generation. The Green Revolution came into existence with the mean to enhance farming in India. The services upgraded by the Green Revolution are obtaining more region for cultivation purposes, extending irrigation facilities, utilization of enhanced and propelled high- yielding types of seeds, implementing better strategies that developed from agriculture research, water management, plan assurance activities through judicious utilization of fertilizers, pesticides. The agriculture sector acts as a bridge in continuing food security and national security as well. India having a different climate conditions, have six major climatic conditions as characterized under Köppen system. Climate is a vital phenomenon and experiences consistent changes over hundreds of years. The nation's meteorological divisions pursue the universal standard of four climatological seasons. The important factors, which are responsible for environmental change contributed by human progress on earth are Greenhouse Gases, Deforestation, Land- use Change, Energy Usage, Vehicular Usage.

Income Distribution In Agriculture sector Year/ Period	Agriculture Share in GDP	Population Dependent on Agriculture	Agriculture Per Capita (in Rs.)
1980	39	70	4745(56%)
1990	31	65	5505(48%)
2000	25	59	6652(42%)
2010	16	58	10865(32%)

Fig 1: Agriculture Per Capita over Decades

Machine learning (ML) has developed together with huge data advances and high- performance computing to make new chances to unravel, evaluate, and comprehend data intensive procedures in agricultural operational conditions. Machine learning intends to give the information to the machine. There are different sorts of machine learning strategies such as supervised and unsupervised learning. In the supervised learning, the trained model is utilized to foresee the missing labels for the test data. In unsupervised learning, there is no refinement between training and test sets with data being unlabelled. The learner procedure input data with the objective of finding hidden patterns [1]. There are many Machine Learning algorithms namely K- Nearest Neighbours, Logistic Regression, Linear Regression, SVM, Linear SVM, Decision Tree, Random Forest etc. Year by year, ML applies in an ever-increasing number of scientific fields including, for instance, bioinformatics, biochemistry, medicine, meteorology, financial sciences, robotics, aquaculture, food security and climatology.

2. EXISTING APPROACHES

Liakos et al in this paper introduce the concept on Machine Learning in Agriculture. By applying machine learning to sensor, the information, farm management systems are developing into real time artificial intelligence enabled projects that give rich proposals and insights for farmer decision support and activity [1]. Mishra et al explain in this paper the new approach for production of agriculture crop production. The few Machine Learning techniques like Artificial Neural Networks, Information Fuzzy Network, Decision Tree etc. are implemented to increase the crop productivity [2]. Zingade et al explain in this paper incorporation of the data acquired from repository, climate department and by applying machine learning algorithm: Multiple Linear Regression, a forecast of most appropriate product as per current economic condition is made. This project improves the crop yield productivity and increases the profits [3]. Suma et al explain in this project includes various features like GPS based remote controlled monitoring, moisture and temperature sensing, intruders scaring, security, leaf wetness and proper irrigation facilities. It makes use of wireless sensor networks for noting the soil properties and environmental factors continuously. [4].

Kang et al explain in this paper that the concept of Knowledge Data Driven Model (KDDM)is utilised for new generation of smart farming which break the bottleneck of model application from laboratory ambience to real world [5]. Cunningham et al, explain in this paper to develop a innovative application in agriculture using data mining and the objective is to mine the information from existing data & basic research in data mining by developing new Machine Learning algorithms [6]. Truong et al, explain in this paper that there is a device which give real time environmental data to cloud storage and a machine learning algorithm to anticipate ecological condition for parasitic detection and avoidance [7]. Yun Shi et al, explain in this paper introduce the idea of Internet of things (IoT). plant infections and insect pests cause huge decrease in quality just as amount of agricultural item so plant disease and insects pests forecasting is of great significance and very vital. By utilizing machine learning algorithm, the principle objective is to accomplish the disease and insect pests monitoring information and collection of IoT.[8] Xin Zhao et al, explain in this paper proposed a transient breeze speed for-throwing model with tests choice by another active learning algorithm. Active learning is utilized in test determination for machine learning. In this investigation active learning was valuable for applications described by a substantial number of training sample in wind speed expectation [9]. Ravichandran et al, explain in this paper Artificial Neural Network is utilized which is one of the most effective tool in modelling and forecasting. Feed forward Back Propagation Network is utilized together to actualize the Artificial Neural Network. The proposed system is made as an Android Application, where the client could feed the inputs and obtain the attractive application.[10]. Dahikar et al, explain in this India cultivating is the fundamental Occupation. In these paper Artificial Neural Network technology was utilized. The rational system has brought artificial neural network (ANN) to become a new technology which provides arranged answer for the mind blogging issue in agriculture

researches. This project only displayed the most commonly used type of ANN, which is the feed forward back propagation network. Here the ANN is utilized for possible crop for specific soil and also furthermore suggesting proper fertilizer for that crop.[11]

3. PROPOSED METHOD

In this proposed system the Machine Learning Algorithm that is more precisely used to predict the data is Random Forest Algorithm. RF Algorithm builds multiple decision trees and combine them together to acquire more accurate and stable prediction. The advantage of RF is it can be used in both classification and regression problems. Prediction of each feature in RF is very easy. It also works with the real-time applications. Till date there is no available system which recommends crops based on numerous factors such as nutrients in soil and weather components which include temperature and rainfall. The proposed system develops an android based application, which identifies the most preferable crop. With the help of GPS, the location is selected and according to that location, the achievable product in the particular area is recognized from the soil and climates database. These soils are contrasted with past year database to distinguish the most beneficial product in the present area. In the field section, different sensors are organized like temperature sensor, moisture sensor, ultrasonic sensor and humidity sensor and PIR sensor. The data accepted from these sensors are associated with the Arduino UNO. In control section, the collected data is checked with the threshold values. If moisture level is less then Arduino switches on the water pump to provide water to the plant. Naturally the water pump gets off when system discovers enough moisture in the soil and a message is sent to the client by means of IOT module, refreshing the status of water pump and soil moisture. In programmed mode, if the value surpasses the threshold values it automatically gets ON and OFF. After this preparing is done at server side, the outcome is sent to the client's android application. The past generation of harvests is likewise considered which leads to exact crop proposition. Area is the only input for the computational system. According to the customer's requirements and depending on many situations the most producible crop is proposed. Factors like the temperature, humidity, moisture and the PIR sensors shows the threshold value and the water level sensor is utilised just to show the level of water inside a tank or the water resource.

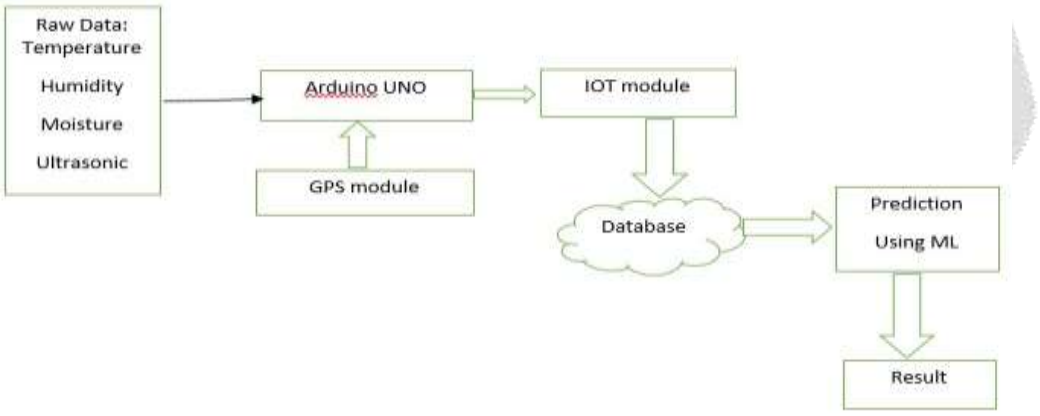

Fig 2: Design Flow

Sensors: - Sensors are used to sense the raw data related to temperature, humidity, moisture, ultrasonic an infrared radiation. **Arduino UNO: -** The Microcontroller used here is an Arduino UNO and is used to pass the data from sensor to IOT module **IoT Module: -** IoT module is used to transfer data to the database. **Prediction (using Machine Learning):-** Here Random Forest algorithm is used for classification of data stored on database and generate result. **Result: -** Display the result to the client by android app.

4. DISCUSSIONS

Agriculture remains a partially predictable and controlled section of India in terms of types and amount of crop production. It is generally seen that a particular entity is produced in large amount or vice versa creating the producer consumer problem and price low or rise. To combat this issue, again the big data and machine learning can be taken in work. Analysing the back records of demand, production, price, transportation and present statistics of farming, prediction can be made on the amount of production. Hence, preparations for storage and business can be taken care of at prior basis. Moreover, if farmers could be connected right in the sowing time, control over quantity of crop sowing and land area engagement can be monitored.

5. CONCLUSION

Leaving nearly 17% of rest of our country depends on Agriculture. It is mandate that a technological advancement required to uplift the domain of agriculture. Aligning our thoughts on the same, we proposed a novel method comprising the novel architecture using a combination of Machine Learning Algorithms that is Random Forest. The proposed technology will be first of its kind to address stressed agricultural fraternity. As our GDP is 16% according to 2015. So by implementing these new technologies can increase the percentage of GDP. In this proposed system the sensors sense the data and corresponding output to that trained data is projected. Improving the oldest path of India that is agriculture can make huge difference in the future improvement.

6. References

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