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A Survey For Soil Testing And Scheduling In Iot Enabled Farms Using ML Algorithm

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Abstract: Agriculture plays a significant role in increasing the economic development of our nation. Crop production has been greatly affected due to changes in the weather pattern. In the area of Agriculture, computer engineering can be used for farmer decision-making for better yield and crop. Also, for soil quality purposes. Emerging technologies can be used to improve the productivity of crops by converting traditional farming to precision farming. The new technologies that are used include data analysis and the Internet of Things (IoT). The major issue yet to be resolved is cultivating precise crops at the precise time. This can be done with the help of machine learning algorithms which are found to be an effective method for predicting the suitable crop. Machine learning classifiers have a significant role in the determination of making on distinct problems like soil nutrients, and plant disease related. The soil parameters such as soil moisture, temperature, humidity, and pH are collected from the sensors using IoT and given to Graphical User Interface (GUI).

Keywords: *Agriculture, Crop Suggestion System, Precision Farming, Prediction, IOT, Machine Learning classifier, Soil nutrients, pH, N, P, K.*

I. INTRODUCTION

One of the main goals of agriculture is to enhance the growth and value of crops while raising operating costs and degrading the environment. Potential growth and production are influenced by a variety of development-related factors, including the environment, surface characteristics, and irrigation and fertilizer management. The foundation of every economy is agriculture. In a country like India, where the need for food is expanding due to economic expansion, agricultural sector advancements are required to meet the needs. Agriculture has long been seen as the foundation and pinnacle of Indian society. The plants are grown by ancient people on their own land and are specifically adapted to their needs. As a result, numerous species, including humans, animals, and birds, have cultivated, and used natural crops. Due to the advancement of new, creative

technologies and processes, the farming industry is steadily declining. Due to this, many creative folks concentrated on creating synthetic commodities that are composite objects that lead to a life of ill health. Modern people nowadays are ignorant of the proper methods for increasing crops at the appropriate times and locations. These farming techniques frequently balance the seasonal meteorological conditions against the basic resources like land, water, and air, which adds to food insecurity. There is no good solution or engineering to tackle the issue they encounter after considering all these issues and worries, such as climate, temperature, and numerous variables. There are numerous approaches to increasing the economic growth of agriculture in India.

II. LITERATURE SURVEY

[1] Machine Learning Algorithm for Soil Analysis and Classification of Micronutrients in IoT-Enabled Automated Farms was developed by T. Blesslin Sheeba, L. D. Vijay Anand, Gunaselvi Manohar, Saravana Selvan, Bazil Wilfred, K. Muthukumar, S. Padmavathy, P. Ramesh Kumar, and Belete Tessema Asfaw. Micronutrients like Iron, Manganese, Copper, and Zinc are seen using a device that operates on electromagnetic spectroscopy in this system, along with other nutrients like Sulfur, Potassium, Nitrogen, and Carbon. This system is used to check the nutrient statuses of mulberry gardens. This technique allows for the monitoring of both the excess and deficit of nutrients in the soil. 75% of the samples utilised in this system are utilised, with the remaining 25% being used for testing. The samples are analysed using sensors before being delivered to farmers in a matter of seconds. The effective and quick extreme learning method (ELM) is applied. In order to assess the nutrients in the soil, this model is trained using data that has been collected. Following this, the model proceeded through ten iterations.

[2] IoT-Driven Model for Weather and Soil Conditions Based on Precision Irrigation Using Machine Learning was developed by Dushyant Kumar Singh, Rajeev Sobti, Praveen Kumar Malik, Sachin Shrestha, Pradeep Kumar Singh, Kayhan Zrar Ghafoor. They introduce applications of machine learning algorithms in agriculture.

[3] Precision agriculture using IoT data analytics and machine learning was developed by Ravesa Akhter, Shabir Ahmad Sofi, they introduce a precision agriculture model with WSN and IoT, for fertilizer management, pest management, yield prediction and crop disease detection.

[4] Soil Temperature Prediction Using Convolutional Neural Network Based on Ensemble Empirical Mode Decomposition by Huibowen Hao, Fanhua Yu, and Qingliang Li. In this article, they introduce the Convolutional Neural Network for soil temperature prediction.

[5] Machine Learning Strategy for Soil Nutrients Prediction Using Spectroscopic Method by Janez Trontelj ml. and Olga Chambers. They introduce Artificial Intelligence for soil nutrient prediction using a spectroscopic method. For thes,e they use various ML algorithms like, SVM, Random Forest,and decision tree.

[6] Improving the prediction accuracy of soil nutrient classification by optimizing extreme learning machine parameters by M.S. Suchithra , Maya L. Pai. Classification of soil fertility by village wise they introduce extreme learning machine algorithm to classify soil parameters, nutrient availability at a particular area.

[7] Machine Learning and Soil Humidity Sensing: Signal Strength Approach by LEA DUJIĆ RODIĆ, TOMISLAV ŽUPANOVIĆ, TONI PERKOVIĆ, and PETAR ŠOLIĆ. In this research author introduce LoRaWAN based soil moisture sensor system, LoRaWAN is used for long-ranging data collection. In these various studies done for connectivity and signal strength.

[8] Analysis and Prediction of Soil Nutrients pHNPK for Crop using Machine Learning Classifier: A Review by Mrs. Disha S.Wankhede. This article studies the soil pH, N, P, K for various crop growth using Machine learning classifiers. Classifiers used such as Naïve Bayes, ANN, KNN.

[9] Prediction of Soil Quality Using Machine Leaning Techniques by T. Venkat Narayana Rao. This article highlights on soil characteristics, soil type, Chemical Parameters, Physical parameters, and biological parameters. As concern with chemical parameters; soil texture, water retention character. Physical parameters such as extractable N, P, K and pH, biological parameters like natural manure, biomass etc.

[10] Random Forest Algorithm for Soil Fertility Prediction and Grading Using Machine Learning by Keerthan Kumar T G, Shubha C, Sushma S A. Random Forest algorithm is used for soil fertility prediction.

[11] Crop Yield Prediction using Machine Learning Algorithm was implemented by D Jayanarayana Reddy and Dr M.Rudra Kumar. To anticipate crop production, many methods were developed with the use of artificial intelligence techniques. This study examines the process of analyzing the parameters and other soil factors that are taken into account when predicting crop development. By considering weather conditions, crop nutrients, diseases, humidity, soil information, solar information, wind speed, pressure, and images of the growing phase, this system offers an accurate and efficient system for classifying crops. It then uses ML techniques to estimate crop yield and provides detailed information about the soil and the crop. The CNN method is used to reduce agricultural output decline and relative error. Together with the small datasets, the time series model of BPNNs is also utilized.

III. METHODOLOGY

A. Site of Study

Due to poor crop and soil management practices, there has been a significant decline in soil quality in recent years. This is mostly due to the number of chemical fertilizers utilized, which has upset the equilibrium of the nutrients in the soil. The productivity of soils is significantly impacted by these variables. The presence or absence of elements will cause soil erosion, soil imbalance, and other soil concerns because of the nature of the soil. This will cut down on agricultural land productivity. Soil management and conservation are given a lot of attention in systematic models. The integration of information technology with auxiliary inputs and services is found to close the gaps in earlier techniques.

B.IoT for Data Collection

Firstly, it involves the collection of data from the field area. The parameters such as N, P, K, pH, Soil Moisture, Temperature, and Humidity are collected from the field area. The collected data is then stored and given as input to GUI. The water content in the soil is measured using a soil moisture sensor.

C. Machine Learning for Classification and Prediction

Collected data is then stored in a database for further machine learning operations Like Data Preprocessing, Classification, Feature Scaling, and Suggestions/Predictions.

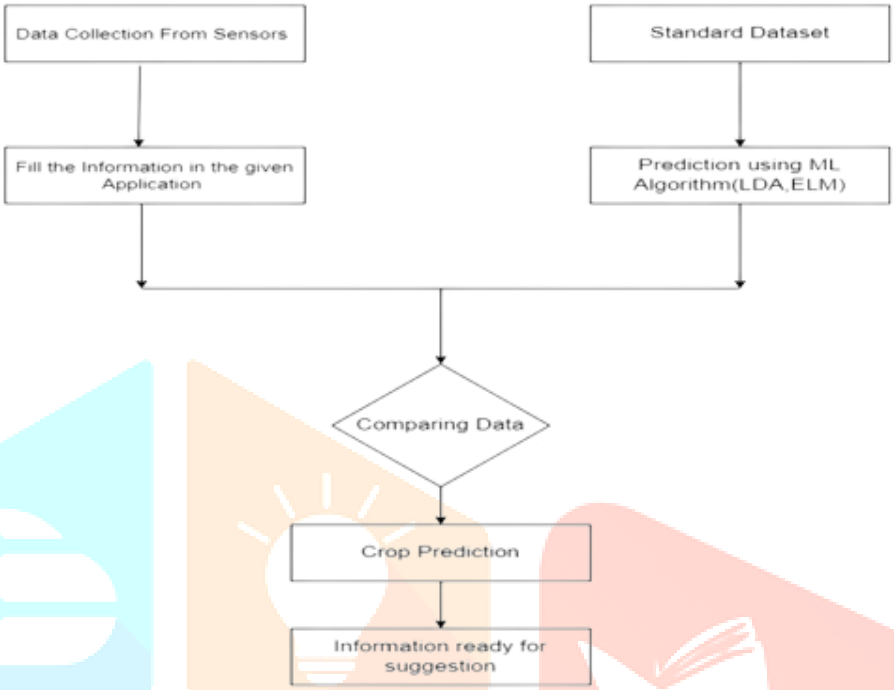

Fig 1: Flow of SoilMaster

D. Data Transmission for field data

Collected data from the farm field is transmitted through MQTT protocol to the cloud storage server i.e., google firebase. The microcontroller esp32 collects the data from the soil sensor. RS-485 is a connector that behaves as an electrical interface and layers for the sending of data from sensors to esp32 is done many ways but the proposed system uses RS485.

IV. Application of ML algorithm

To determine if there are insufficient or too many nutrients in the soil, the sensor data is pre-processed and employed in a trained model. Crop yield predictions are made using ML algorithms. With the ML method, the main problem in crop yield prediction can be resolved. The created model assesses the pre-processed sensor data values. Based on the collected sensor data, it creates a prediction that affects the crop's yield. The yield of the specific crop can be forecast based on information about the nutrients in the soil and other factors. Nutrient level balance and the necessary amount of fertilizer can both be predicted based on the ML algorithm that was utilized.

V. Remote Monitoring

An app shows the user the updated value after using the soil data to track the behavior of the soil. The data is updated on a regular basis. The app's updated value is shown, providing users with the most recent knowledge on the amount of nutrients in the soil. In order to help the user, understand fertility and the best types of crops to plant, it also provides information on crop production based on soil characteristics and environmental factors.

VI. CONCLUSION

For estimating soil series and offering suitable crop yield suggestions for that particular soil, this model is put out. The suggested technique enables the farmer to choose which plant to grow by providing a list of all possible probable crops in a specific location. The computer proposes the most viable crops that can be produced in the ideal environmental conditions after carefully examining the climate, weather, and pH information. Several machine learning algorithms will be used to test the model, and LDA has the best accuracy of all the classifiers. A correctly constructed dataset and machine learning methods will support the suggested model.

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[7] Machine Learning and Soil Humidity Sensing: Signal Strength Approach LEA DUJIĆ RODIĆ, TOMISLAV ŽUPANOVIĆ, TONI PERKOVIĆ, and PETAR ŠOLIĆ (CORRESPONDING AUTHOR), University of Split, Croatia JOEL J. P. C. RODRIGUES, Federal University of Piauí (UFPI), Teresina - PI, Brazil and Instituto de Telecom union cações, Portugal. Evaluation of California

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