IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.53
Volume 4, Issue 6, April 2024

Crop Recommendation System using Machine Learning

Mrs. K. Nithiya[1] and Sureka. S[2], Sweetha. K[3]
Assistant Professor, Department of Computer Science and Engineering[1]
Student, Department of Computer Science and Engineering[2,3]
Anjalai Ammal Mahalingam Engineering College, Thiruvarur, India

Abstract: *Agriculture plays a vital role in India's economy, yet Indian farmers often struggle with selecting the most suitable crops for their specific soil conditions, leading to decreased productivity. Precision agriculture offers a solution by leveraging soil data, crop yield statistics, and site-specific parameters to recommend optimal crops. This project aims to develop An intelligent system designed to assist Indian farmers in making well-informed decisions regarding crop selection, considering factors like the optimal sowing season, geographical location .and soil characteristics. Additionally, the system will provide yield predictions for the recommended crops, enhancing productivity The proposed Crop Recommendation System employs a hybrid model that considers various input parameters to suggest crops tailored to farmers' needs. Accurate yield prediction not only influences national and international economies but also plays a crucial role in food management and security.*

Keywords: Precision agriculture, Yield prediction, Productivity

I. INTRODUCTION

Agriculture means growing plants and taking care of animals for to get food, clothes, and other useful stuff. It's a vital part of our lives, providing the food we eat and materials for many everyday items. Farmers cultivate crops like fruits, vegetables, grains, and raise etc., Agriculture has been essential to human survival and development throughout history, shaping societies and economies around the world. Farming is really important for feeding people, and choosing which crops to grows a big part of farming. But sometimes, it's hard to know which crops will do best in certain places. The proposed system wants to use computer programs called machine learning to help farmers pick the right crops for their fields. This system wants to make it easier for farmers to choose the best crops for their fields. By looking at old information about things like soil, weather, and how well crops have done before, this computer program can give farmers good ideas about which crops will work best in their area. The goal of this project is to help farmers grow more food while using fewer resources and taking less risk. By studying lots lot of different information, the computer program can find patterns and connections that can help farmers make better decisions about what to plant. In the end, the proposed system hopes to make farming easier and more successful by using smart computer tools to help farmers pick the best crops for their fields. By giving farmers good advice based on real data, this system wants to help make sure there's enough food for everyone and make farming more sustainable.

II. MACHINE LEARNING

Machine Learning is a system capable of learning from examples without direct programming by developers. The breakthrough lies in its ability to learn from data to generate accurate outcomes. By merging data with statistical tools, Machine Learning predicts results that businesses utilize for informed decisions. It shares similarities with data mining and Bayesian predictive modeling. Through algorithms, the machine processes input data to generate solutions. One common application is providing recommendations, as seen in services like Netflix, which tailor suggestions based on user history. Tech firms employ unsupervised learning to enhance user experiences through personalized recommendations. Machine Learning also aids in fraud detection, predictive maintenance, task automation, and more. It can be categorized into two main types: Supervised and Unsupervised learning.

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.53
Volume 4, Issue 6, April 2024

A. Supervised learning:

An algorithm, much like a smart student, learns from examples without needing direct instructions from humans. It uses training data and feedback from humans to understand the relationship between given inputs and a desired output. For instance, imagine a marketer inputting data on marketing expenses and weather forecasts into an algorithm to predict the sales of cans. In this way, the algorithm learns patterns and makes predictions based on the provided data.

B. Unsupervised Learning:

Unsupervised learning is a type of machine learning where an algorithm learns from a dateset without any explicit supervision or labeled output. It's like giving the algorithm a bunch of data and letting it explore on its own, without telling it what to look for. Instead of being guided by pre-defined answers, the algorithm discovers hidden patterns and relationships within the data. This contrasts with supervised learning, where the algorithm is trained on labeled data with clear examples of inputs and outputs. In unsupervised learning, the algorithm acts more like a curious explorer, finding insights and making discoveries independently.

III.SYSTEM ARCHITECTURE:

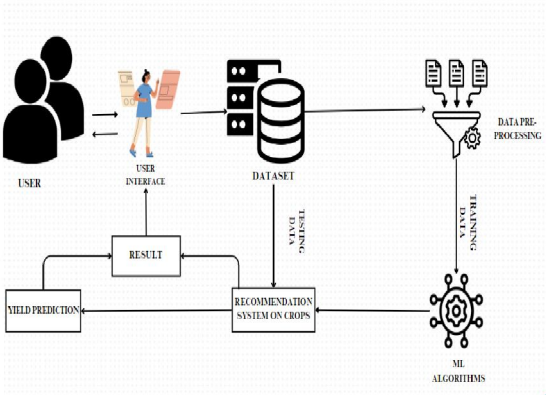

Fig. 1 System Architecture

IV. PROPOSED METHODOLOGY:

Data collection and Data Preprocessing:

In this module, the raw dataset is collected first. Using web forms, the information about the details of the crop (Nitrogen, Phosphorus, Potassium, Temperature, Humidity, pH, Rainfall etc.,) with various behavior (features) like Year, Area, etc., are collected. And then, if there exist any unwanted/null data, they will be eliminated. This is known as data wrangling. The dataset has been classified, so that the wrangled data is grouped as per our usage.

Model Training:

This module highlights the training and testing module, the refined data is given as an input to train and build up a model. The data models are trained for high level of accuracy (80%). For testing dataset, it is essential to make sure the data model can predict well (20%). This test set is used to validate the model which is built.

Crop Recommendation:

In this module, We've developed a new model to help farmers overcome these challenges. Our system stands out by not only helping farmers boost their crop yield but also recommending the most profitable crops for their specific needs. The module describes how strong the relations between the two quantities are. The performance report is generated by applying the linear regression algorithm. The prediction process takes place and the report of student's grade is generated.

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.53
Volume 4, Issue 6, April 2024

Yield Prediction:

The module describes how strong the relations between the two quantities are. The performance report is generated by applying the random forest algorithm. The prediction process takes place in the yield of the crop based on various factor.

App Development:

To deploy the app using Koyeb, start by signing up for an account and accessing the Koyeb Dashboard. Upload the app code and its dependencies, configure any necessary environment variables, and adjust networking settings to ensure accessibility. In Android Studio for Android app development, begin by setting up the environment with Flutter and Dart plugins installed. Users can then install app in their Android devices or run it directly in the Chrome browser using Chrome Remote Devices, making the app accessible to a wide audience of Android users across different platforms.

V. MACHINE LEARNING ALGORITHM

A. Random Forest:

Random Forest is a widely recognized machine learning method in supervised learning. It isproficient in tackling classification and regression tasks within ML. The core principle behind Random Forest utilizes ensemble learning techniques, where multiple classifierscollaborate to tackle intricate problems and enhance model efficacy. Instead of depending on just one decision tree, Random Forest operates by deploying numerous trees on different segments of the dataset. It then aggregates their predictions to yield a more robust outcome. This collective decision-making process guards against errors, and by increasing the number of trees in the 'forest,' accuracy improves without succumbing to overfitting issues.

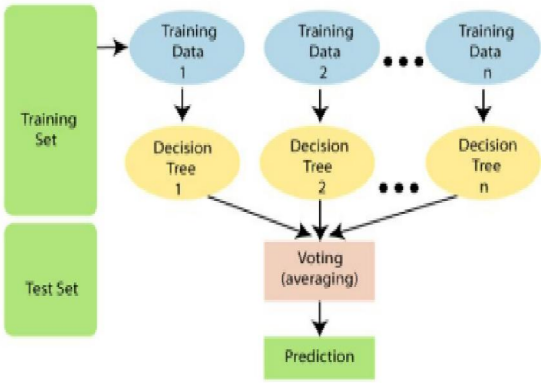

Fig. 2 Random Forest

Random Forest operates in two primary stages: initially, it constructs the random forest by aggregating N decision trees, followed by making predictions for each tree created in the initial phase.

Here's how the process works:

Step 1: Pick K data points randomly from the training set.

Step 2: Build decision trees using these chosen data points.

Step 3: Determine the desired number, N, of decision trees to build.

Step 4: Repeat Steps 1 and 2.

Step 5: When you get new data points, predict the outcome for each decision tree. Then, assign the new data points to the category that most decision trees agree on.

B. Decision Tree:

Decision Tree, a technique in supervised learning, is utilized for both classification and regression tasks, with a predominant focus on classification. It's visualized as a tree-like structure, where nodes stand for dataset features, branches represent decision rules, and each leaf node denotes an outcome.

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.53
Volume 4, Issue 6, April 2024

C. Decision Tree Regression:

Decision tree regression is a machine learning method for predicting continuous outcomes. It constructs a tree-like structure where each node represents a decision based on features, aiming to minimize variance within subsets. To predict a new instance, it traverses the tree, averaging target variable values in leaf nodes. Pruning may be applied to prevent over-fitting, but decision trees can still be prone to over-fitting without proper control measures.

Correlation Diagram:

Correlation between attributes helps us assess the strength of their relationship. A numeric value of 1 indicates a strong positive correlation, while darker colors near 0 signifya more negative relationship between variables.

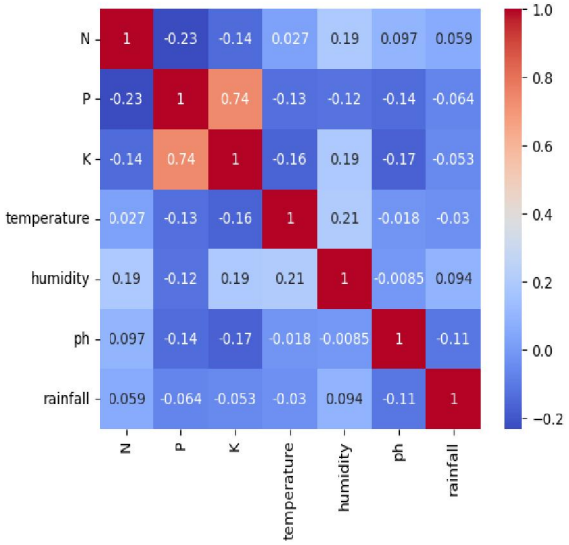

Fig.3 Correlation Diagram

VI. CONCLUSION

Machine learning methods find application across diverse sectors of agriculture. Presently, random forest is employed to distinguish promising crops from weeds. In agriculture, yield predictions are notably significant. Higher yields often correlate with increased profits. The suggested techniques aid farmers in considering diverse crop needs and costs, facilitating informed decisions on what to plant. Such endeavors also identify additional plants that can be harvested economically and efficiently. This technology offers potential for the cultivation of a broad range of crops."

VII. FUTURE SCOPE

This research has the potential for significant advancement through the development of an agricultural production and distribution recommender system for farmers. InIndia, agriculture holds immense importance, as the prosperity of farmers directly impacts the prosperity of the nation. In Our project aims to aid farmers in selecting the most suitable seeds based on soil requirements to boost productivity and maximize efficiency. Consequently, farmers can cultivate the right crops, leading to increased yields and enhanced national productivity. Our future endeavors will focus on expanding the dataset with a wider range of attributes, as well as improving yield prediction accuracy.

REFERENCES

[1]. Amulya K.S , Radhika K B.E., M.Tech., "Crop Recommendation and Yield Prediction using ML Techniques" Assistant Professor, CSE Department, Cauvery Institute of Technology, Mandya-2023.

[2]. Mishra. D ,Santra G.H"Applications of machine learning techniques in agricultural crop production" Indian Journal of Science and Technology-2022.

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.53
Volume 4, Issue 6, April 2024

[3]. Anakha Venugopal, Aparna S, Jinsu Mani, Rima Mathew and Prof. Vinu Williams "Crop Yield Prediction using Machine Learning Algorithms"-2021.

[4]. D.Jayanarayana Reddy and Dr. M.Rudrakumar "Crop Yield Prediction Using Machine Learning Algorithm" IEEE-2021.

[5]. Dr.Y.Jeevan Kumar, "Supervised Learning Approach for Crop Production"-2020.

[6]. Rakesh Kumar, M.P. Singh, Prabhat Kumar and J.P. Singh, "Crop Selection Method to Maximize Crop Yield Rate using Machine Learning Technique", International Conference on Smart Technologies and Management for Computing, Communication, Controls, Energy and Materials (ICSTM)-2019.

[7]. Leo Brieman "Random Forests", IEEE Transactions on Instrumentation and Measurement- 2019.

[8.] Rakesh Kumar, M.P.Singh, Prabhat Kumar and J.P. Singh "Intelligent Crop Recommendation System using ML" -2019.

[9]. Ramesh Medar,Vijay S, Shweta, "Crop Yield Prediction using Machine Learning Techniques"-2019.

[10]. Pudumalar S., E. Ramanujam, R. Harine Rajashree, C. Kavya, T. Kiruthika, and J.Nisha. "Crop recommendation system for precision agriculture." In 2016 Eighth International Conference on Advanced Computing (ICoAC), pp. 32-36. IEEE, 2017.

[11] Bhuvana , Dr.C.Yamini," Survey on Classification Algorithms in Data mining ",International Conference On Recent Advances in Engineering Science and Management-2015.