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Intelligent Data Analytics Framework for Precision Farming

Dr. Dhanashree Kulkarni[1], Vaishnavi Patil[2], Spoorti Murgod[3], Supriya Murgod[4], Shraddha Dongare[5]

[1,2,3,4,5]Department of Computer Science and Engineering, Angadi Institute of Technology and Management, Belagavi-590009, India

A B S T R A C T

Agriculture is an important source of income and employment in India. The most common problem farmers in India do not select and use the right crop for their land suitable fertilizer. As a result, their production is significantly reduced. Border the recommendation was used by farmers and #039; weight the cereal recommendation is modern a cultivation strategy that utilizes research data on soil pH, soil nutrient content and weather conditions recommending the best crop to farmers and fertilizer site-specific recommendations properties This reduces the number of times a crop is picked incorrectly and increases productivity. This paper solves this problem by proposing a recommender system using ML models with majority voting technique using Random Forest, Naive Bayes, Support Vector Machine (SVM), logistic regression, decision tree, XG Boost, if the students suggest to the website cut- certain parameters with high accuracy and efficiency. In addition, it appears fertilizer recommendation. The fertilizer recommendation system is based only on python logic in here we compare data (optimum nutrients for crop growth) with user input and proposals are accepted accordingly.

Keywords: Decision tree, Random Forest, Support Vector Machine (SVM), Logistic Regression, Naïve Bayes.

1. INTRODUCTION

A farmer's decision about which crop to grow is usually clouded by his intuition and other inconsistencies factors such as immediate profit, ignorance of market demand, overvaluation of soil the possibility of subsidizing a certain crop, etc. [1]. A very wrong decision by the farmer can seriously damage the financial situation of his family. Maybe it could be one of many Reasons that contribute to the countless peasant suicides we hear about in the media every day [2]. In a country like India where the share of agriculture and allied sectors is around 20.4 percent cent of its Gross Value Added (GVA), such a wrong decision would have negative consequences not only for the farming family, but for the economy of the entire region [3]. That's why we identified the dilemma of the farmer, who harvests to grow in a given season, very serious [4]. The need of the hour is to develop a system that could provide predictive knowledge to Indian farmers, which helps them make informed decisions about which crop to grow [5]. With that in mind, we offer a system, an intelligent system that considers environmental parameters (temperature, rainfall, moisture) and soil properties (N, P, K, pH value) before recommending the most suitable. limit for the user [6]. In addition, fertilizer recommendation is also made based on optimal nutrients for cultivated crops [7]. Farmers' decisions about how to grow food are influenced by unrelated factors, such as the need for quick profits or the lack of profits. Understand the market need or increase your position and strength.

Bad decisions by farmers can lead to financial stress. It contributes to the families and the large number of self-employed farmers in India. Farming is big business Empowering farmers to make decisions about crop selection is important for India and its economy. To meet these needs, it offers an intelligent system that takes into account the differences in the environment and the soil and recommends the best products. special number the system also provides fertilizer recommendations based on the optimal nutrients needed. Recommended practice. This system enables farmers in India to make informed decisions and improve yields. Ultimately, they benefit families and the economy in general. Farmers often decide which crops to grow based on intuition, market conditions, soil and other unrelated factors. Life and economic depression. However, these decisions can have a negative impact on you and your family. the whole economy In India, agriculture and allied industries account for a significant proportion of the total value added. Incorrect crop selection can lead to financial stress and farmer suicide.

Therefore, it is important to decide what foods to grow It is important to think carefully and act wisely. It is important to develop a system that provides predictive information to Indian farmers. Make decisions about the plants to grow. To meet these needs, we offer intelligent systems that perform various assessments. Environmental factors such as temperature, rainfall and geographic location and soil properties including N, P, K and ph. value, soil type and nutrients. The system will recommend a good harvest to farmers and farmers. The standard system also recommends fertilizers based on optimal nutrient requirements of selected products. This approach can help Indian farmers make better decisions and increase their success in agriculture.

2. METHODOLOGY

During the implementation of the project, the following activities were carried out to achieve the results:

cleaning and pre-processing one of the first steps are to make sure that the data set you are using is correct. The data set if values are missing from your dataset, you need to replace them with fair value you must also ensure a common distribution of your data. Characteristics the stranger must be removed. Feature options it is important to choose the characteristics that you want to determine the type of product. Grow up to do this, we create a correlation matrix that shows the linear relationship of the features and all other features. If a feature is too related, it should be removed. create an example the next step is to build a machine learning model. When building a machine learning model, first the dataset should be divided into two parts: training data and test data. We separate the data The ratio of 80-20. It captures the training data and applies machine learning algorithms to the features in the dataset. We use a machine learning algorithm on our training dataset and using the algorithm gives us accuracy is recommended as evidence. Schematic diagram of a machine learning model.

Building a user interface as a next step, we created a user interface that allows the user to enter their data that if he enters the information, so be it such as N, P, K, soil pH values, temperature, humidity, precipitation, etc. The model processes the data and recommend appropriate crop and N, P, K, soil values in such a space, temperature, humidity, moisture, soil and crop suggest the use of suitable fertilizer. After the user enters the following values and submits, the machine learning model predicts the result. Below is a screenshot of the interface we made as a recommendation for cropping.

1. **Raw Data:** Raw data collected from various sources (e.g. sensors, satellites or IoT devices) containing information about soil, weather, crops etc.
2. **Data processing:** Cleaning, organizing and preparing raw data for analysis. This step involves handling missing values, removing outliers, and converting the data to a usable format.
3. **Input dataset:** Processed data organized into a structured dataset ready for use by machine learning algorithms or analytical tools.
4. **Split data for training and testing:** Split the input data into two parts - one to train the model and one to test the trained model and performance. This ensures that the model not only remembers data, but also learns patterns.
5. **Demonstrate choice:** Select the foremost fitting measurable or machine learning demonstrate based on the nature of the issue and the characteristics of the information set. Accuracy building can include relapse, choice trees, neural systems, etc...
6. **Model Implementation:** Adopting a model in precision agriculture means using machine learning or artificial intelligence models in an agricultural framework to analyze data and make informed decisions for better yields, soil health, pest control and overall agricultural efficiency.
7. **Prediction:** Applying the trained model to new or unseen data to generate predictions or insights. In precision farming, this could mean predicting crop yield, disease detection, or recommending optimal farming practices
8. **Output:** Final results, which can be in the form of reports, visualizations, recommendations or actionable insights that enable farmers to make informed decisions about crop management and resource allocation.

3. EXISTING MODEL

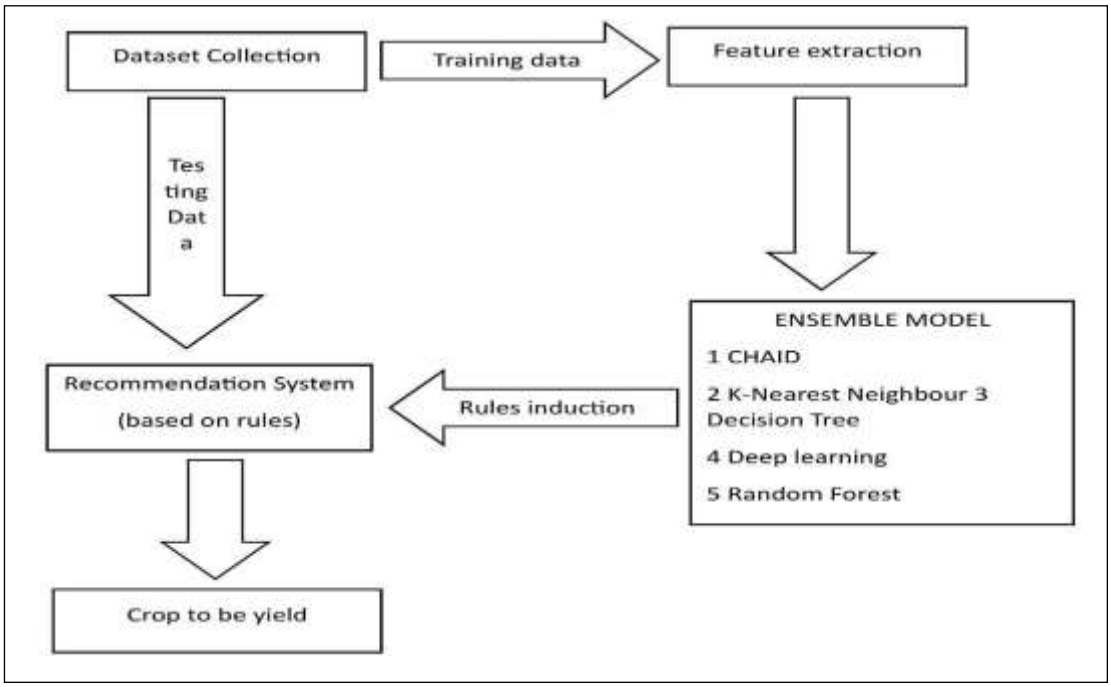
Scientists have become increasingly aware of the problems facing Indian agriculture and are working hard to identify them solutions One option is to use advanced techniques (such as Regularized Greedy Forest) to determine the best harvest period for a given period. Another approach involves using historical meteorological data to train a model that can identify weather patterns can harm the production of apples. The model can then predict apple yields based on monthly weather conditions. The use of different Algorithms such as artificial neural network, K nearest neighbors and random greedy

forest have been shown to help to select the best yield based on predicted yield rates influenced by several factors. Additional system functions include pesticide forecasting and online trading of agricultural products. These measures can help Indian farmers improve their operations decisions and increase their chances of success in agriculture. Further research revealed that scientists and others are primarily concerned with plant care focus on soil or weather conditions, but not both factors together. It is important to consider both factors as such they play an essential role in the growth and success of crops. By adopting a holistic approach that takes into account both soil and weather conditions, better solutions can be developed for crop management and yield optimization.

4. PROPOSED MODEL

In order to address the drawbacks mentioned above, we have developed an efficient Crop Recommendation system. This system considers all the relevant parameters, such as temperature, rainfall, location, and soil condition, to predict the most suitable crop for farmers to grow. Essentially, this system serves as an Argo Consultant, providing farmers with expert recommendations on which crops to grow. Additionally, we offer fertilizer recommendations for crops grown in different states, making it easy and reliable for farmers to plan and make informed decisions about their crop choices.

The introduction of a plant care recommendation system is a new technology that enables various connections, e.g. database, csv files. This allows farmers to access real-time data and make informed decisions to optimize their production. This system allows farmers to collect data on their various crops, including soil moisture, temperature, humidity and nutrients levels, this information can help farmers make informed decisions about managing their crops and lead to growth efficiency and productivity. The use of this technology can also reduce the need for manual labor, making agriculture more efficient and provide a more sustainable approach to agriculture. In addition, it can help farmers to detect problems such as pest's infestations and soil nutrient deficiencies to address these problems before they become large problems.



An agricultural management system using a recommended crop management system can serve several purposes including soil and crop monitoring and water resource management. The system monitors soil moisture, temperature, humidity and nutrients levels and other soil properties to ensure optimum crop yield. Data collected in real time provides valuable information about the crop and soil conditions, allowing growers to make informed decisions about plant care and management. This can lead to reproduction efficiency, productivity and sustainability in agriculture. By providing farmers with real-time information and insights, they can do just that make informed decisions about which crops are suitable for their land based on the NPK value (Nitrogen, Phosphorus and Potassium).

A crop management recommendation system can provide farmers with accurate and up-to-date information on nutrient concentrations their soil, which helps them determine which crops are best for their land. The NPK value is an important soil parameter by monitoring fertility and this value, growers can make informed decisions about which plants will thrive in their particular soil. conditions the first step in creating a recommended plant care system is to identify the various components needed to control and collect data including NPK value. This includes sensors, actuators and other hardware that can be used for tracking soil moisture, temperature, humidity, nutrient levels and other soil properties. Once the data is collected, it can be analysed and used to make better decisions about when and how to apply fertilizer, water, and other parts of the agricultural process. This can help farmers optimize their crop and at the same time increase their income reduce waste and environmental impact.

5. CONCLUSION

This technology helps growers to choose the best crop by providing information that most farmers don't monitor, which reduces probability of crop failure and increased production. A system that recommends the right crop to farmers can be useful information to help reduce the risk of crop failure and increase productivity. It can also help to prevent financial losses. The Millions of farmers across the country can access the system online. We have achieved a high level of accuracy that varies 70.06% to 95.09% using different models such as decision trees, support vector machine, logistic regression and random forest algorithms. Our next goal is to integrate the crop recommendation system with a crop forecasting subsystem capable of this provides farmers with an estimate of their potential production if they follow recommended yields.

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