IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 3, Issue 1, January 2023
Impact Factor: 6.252

Crop Recommendation and Early Detection of Lack of Nutrients Using Machine Learning and Image Processing

Mr. Pradeep Nayak[1], Adwaith P[2], Bhagyalakshmi Annappa Naik[3], Mamatha D[4], Gagan Raghavendra J[5]
Assistant Professor, Department of Information Science and Engineering[1]
Students Department of Information Science and Engineering[2,3,4,5]
Alva's Institute of Engineering and Technology, Mijar, Mangalore, Karnataka, India

Abstract: *In a country where farming is still the most common vocation and conventional agricultural practises are still used, farmers can only expect a limited amount of crop yields, which is ultimately less advantageous for them than the inputs they provide. So, in order to maximise crop yields for a given input, we are demonstrating various techniques that will be helpful to create a recommendation system for smart farming. Agriculture has never been a lucrative industry in India despite being a big industry and major occupation there. We suggest a system that would evaluate soil properties (pH value, soil type, and nutrient concentration) as well as environmental factors (temperature, rainfall, and geographic location in terms of state) before advising the user on the best crop to plant. The numerous data mining approaches are discussed in this work along with how they relate to soil fertility, nutrient analysis, and rainfall forecasting. Using decision trees, classification can be accomplished in data mining. One of the major problems that farmers confront is diseases that are affected on plant leaves, especially rice leaves. As a result, it is very challenging to deliver the amount of food required to feed the world's expanding population. Diseases affecting rice have reduced production and cost the agricultural industry money. Image acquisition, picture pre-processing, image segmentation, feature extraction, and classification are processes in the disease detection process. The techniques for identifying plant diseases using photographs of their leaves were covered in this essay. The segmentation and feature extraction algorithms utilised in the identification of plant diseases were also covered in this research.*

Keywords: Crop.

I. INTRODUCTION

The need for food is rising as the world's population continues to rise. Farmers, agricultural scientists, the government, and researchers are always looking for ways to increase agricultural production using a variety of methods. As a result, the amount of information produced from agricultural data is growing daily. To extract and evaluate such a vast amount of data, a spontaneous approach is required. Machine learning algorithms and data mining techniques are essential for assessing various types of data in the agricultural industry. For the purpose of building models, drawing appropriate inferences, forecasting the trends of agricultural processes, and other purposes, these approaches and algorithms are directly applied to a data set. Precision farming is not highly valued in India. Today, we discovered that the environment is constantly changing, harming the crops and pushing farmers into debt and toward suicide. In many instances like these, farmers use more pesticides and fertilisers in an effort to increase production while also reducing soil fertility, decreasing soil holding capacity, and raising soil toxicity. Growing industrialisation uses more farmland, which increases soil contamination rates and lowers plant quality. Our method helps farmers choose the best crop, the appropriate quantity of fertiliser for the soil and crop, and early detection of diseases and nutritional deficiencies. We use meteorological data in our system since the monsoon is absolutely essential to Indian agriculture. The type of soil and its fertility are also crucial, therefore we utilise an NPK sensor to get data on soil parameters that are then utilised in the system. To forecast the ideal crop and crop yield, machine learning techniques like the Random Forest Algorithm are applied. Additionally, the system

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 3, Issue 1, January 2023
Impact Factor: 6.252

offers advice on how to improve soil quality. Additionally, we apply image processing methods to spot diseases and nutritional deficiencies.

II. LITERATURE SURVEY

[1] P. A., S. Chakraborty, A. Kumar, & O. R. Pooniwala (2021). Machine learning-based intelligent crop recommendation system.

Machine learning, one of the applications of artificial intelligence that enables the systems to learn and evolve automatically without being explicitly coded by a programmer, is used to create the proposed system. The suggested approach assists farmers in selecting the best crop by offering information that typical farmers do not monitor, reducing the likelihood of crop failure and increasing output. Additionally, it stops them from suffering losses. The incorporation of a mobile app and a web interface to deliver crop cultivation advice is envisaged for the future. Millions of farmers worldwide have access to n to the farmers.

[2]. Shobana, M., Sabitha, R., Vaishnavi, S., & Karthik, S. (2021). recommendations for agricultural crops based on productivity and season.

In this essay, recommender systems have given users the freedom to select the goods they prefer. A recommendation system is a method of giving consumers suggestions based on their interests. This can also be done for agricultural purposes. Farmers are offered suggestions for their growing procedure based on the agricultural parameters.

Additionally, fresh approaches to boosting agricultural cultivation may be suggested. Fertilizers and pesticides may also be advised. The importance of crop management has been extensively researched. To grow their crops, farmers need help from modern technology. Agriculturists can be promptly informed of accurate crop predictions. Several machine learning methods.

[3]. Prof. Shrikant Kokate, Deepti Dighe, Harshada Joshi, Aishwarya Katkar, Sneha Patil (2020). Crop Recommendation Method.

They have suggested in this study an analysis of the soil data that uses C 4.5 and Multi Linear Regression methods to check for nutrients like N, P, K, and pH level as well as to predict rainfall in the region. When utilised as a Decision Tree Classifier in data mining, the C4.5 algorithm can produce a decision based on a specific sample of data. A statistical method known as multi linear regression algorithms combines many explanatory variables to forecast the result of a response variable. OLS (linear) regression with only one explanatory variable is expanded in multiple regression. Based on the two factors mentioned above, the algorithm suggests crops. For the front end, we have displayed many modules for farmers and administrators. We can design a crop recommendation system in the future that takes the temperature parameter into account. Based on nutrients, rainfall, and temperature, this system will suggest suitable crops for the provided soil sample.

[4]. Shirish Sabnis, Prachi Meghani, Mrunal Jamsandekar, and Prasad Gavas (2020). Systems for recommending crops.

The paper describes agricultural crop recommendation systems that are on the market and take into account a variety of factors, including weather conditions at the time the crop is to be planted, soil type, regional topography, local temperatures, local rainfall, market prices for the crop, crop duration, etc. The study in particular shown that elements like the user's investment in farming, the number of employees needed for upkeep, and the amount of cultivable area were not taken into account for the previously presented recommendation systems. The primary factor for a farmer to employ a crop recommendation system is the importance of these criteria to his or her profits.

[5] Patil, A. B., and Khirade, S. D. (2020). Image processing for the detection of plant disease

This research examined the segmenting of the plant's sick portions utilising a variety of methods. This study also examined the methods for feature extraction and classification as well as the classification of plant diseases. Plant diseases can be effectively classified using SVMs, back propagation methods, self-organizing feature maps, and other ANN techniques. These techniques allow us to precisely identify and classify a wide range of plant diseases using image processing tools.

[6] Pothen, M. E., and Pai, D. M. L. (2020). Image Processing for Rice Leaf Disease Detection.

The suggested method covers a variety of methods for classifying illnesses of rice leaves. Photos of sick plants with bacterial leaf blight, leaf smut, and brown spot are segmented using Otsu's method. Different characteristics are separated from the segmented area using "Local Binary Patterns (LBP)" and "Histogram of Oriented Gradients (HOG)". The

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 3, Issue 1, January 2023
Impact Factor: 6.252

qualities are then categorised using a Support Vector Machine (SVM), and polynomial Kernel SVM with HOG was used to obtain 94.6% accuracy.

III. FUTURE SCOPE

The system can be improved further to include the following features:

- "Improving dataset with more attributes is the key goal of future effort,"
- We must create a model that can distinguish between healthy and unhealthy crop leaves and, if the crop has a disease, identify it.
- To create a user-friendly website and mobile application.

It is capable of many extra system functionalities. Currently, it recommends a very suitable crop to be grown by taking relevant environmental parameters as inputs. However, the Automation component can be incorporated as a response system at the next level.

This can be changed to meet the needs of the farmer in order to adjust the humidity, water level, etc. Currently, all environmental elements are inputs into the system, but as an added feature, an algorithm can be used to forecast one factor using the values of the other two factors. (For instance, estimating the soil pH level from soil moisture and sunlight) This would reduce the initial expense of setting up the sensors and make them simpler to maintain.

IV. CONCLUSION

We successfully devised and implemented an intelligent crop recommendation system in this study that Indian farmers can utilise right away. This system would aid farmers in selecting the best crop to produce based on factors such as nitrogen, phosphorus, potassium,PH value,humidity, temperature, and rainfall. We can use the findings of this research to boost national production and turn a profit. The farmers can grow the appropriate crop in this way.

The new approaches for determining and categorising the degree of macronutrient deficit have been put forth. On the basis of the literature review process, unique methods are applied at every stage of image processing. The smartphone camera will be used for picture capture to help farmers spot the signs of nutritional insufficiency.

REFERENCES

[1]. M. S. Munir, 'Identifikasi Kekurangan Unsur Hara Primer Pada Daun Menggunakan Support Vektor Machine', SCAN J. Teknol. Komunilasi dan Inf., vol. X, no. 2, pp. 45–54, 2015.

[2]. A. McCauley, C. Jones, and J. Jacobsen, 'Plant Nutrient Functions and Deficiency and Toxicity Symptoms', Nutr. Manag. Modul., vol. 9, no. 9, pp. 1–16, 2011, doi: 10.1109/ISTC.2012.6325235.

[3]. S. Jeyalakshmi and R. Radha, 'A Review On Diagnosis Of Nutrient Deficiency Symptoms in Plant Leaf Image Using Digital Image Processing', ICTACT J. Image Video Process., vol. 7, no. 4, pp. 15151524,2017,doi:10.21917/ijivp.2017.0 216.

[4]. M. A. H. Shibghatallah, S. N. Khotimah, S. Suhandono, S. Viridi, and T. Kesuma, 'Measuring leaf chlorophyll concentration from its color: A way in monitoring environment change to plantations', AIP Conf. Proc., vol. 1554, no. May, pp. 210–213, 2013, doi: 10.1063/1.4820322.

[5]. G. Sun, X. Jia, and T. Geng, 'Plant Diseases Recognition Based on Image Processing Technology', J. Electr. Comput. Eng., vol. 2018, pp. 1–8, 2018.

[6]. D. Majumdar, D. K. Kole, A. Chakraborty, D. Dutta Majumder, and D. D. Majumder, 'Review: Detection & Diagnosis of Plant Leaf Disease Using Integrated Image Processing Approach', Int. J. Comput. Eng. Appl., vol. VI, no. October, 2014.

[7]. Shreya S. Bhanose, Kalyani A. Bogawar (2016) "Crop And Yield Prediction Model", International Journal of Advance Scientific Research and Engineering Trends, Volume1,Issue 1, April 2016.

[8]. Ramesh Babu Palepu (2017) " An Analysis of Agricultural Soils by using Data Mining Techniques", International Journal of Engineering Science and Computing, Volume 7 Issue No. 10 October.

[9]. Kahar MA, Mutalib SO, Rahman A. Early detection and classification of paddy diseases with neural networks and fuzzy logic. In 17th International Conference on Mathematical and omputational Methods in Science and Engineering (MACMESE'15) 2015; 248-257

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 3, Issue 1, January 2023
Impact Factor: 6.252

[10]. Prajapati H.B., Shah J.P., Dabhi V.K.: Detection and classification of rice plant diseases.Intelligent Decision Technologies, 11(3), 357–373 (2017).

[11]. Wenjiang Huang, Qingsong Guan, Juhua Luo, Jingcheng Zhang, Jinling Zhao, Dong Liang, Linsheng Huang, and Dongyan Zhang, "New Optimized Spectral Indices for Identifying and Monitoring Winter Wheat Diseases", IEEE journal of selected topics in applied earth observation and remote sensing,Vol. 7, No. 6, June 2014.