International Journal of Research in Engineering and Science (IJRES)
ISSN (Online): 2320-9364, ISSN (Print): 2320-9356
www.ijres.org Volume 10 Issue 6 ǁ 2022 ǁ PP. 1289-1293

Smart Agriculture Recommender System Using Deep Learning

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Abstract
Agriculture and its affiliated sectors are unquestionably the most important sources of income in rural India. The agriculture industry also contributes significantly to the country's Gross Domestic Product (GDP). The vast scale of the agriculture industry is a boon to the country. However, crop production per acre is disappointing when compared to worldwide norms. For farmers, our study provides a practical and user-friendly crop recommender forecast system, The suggested technology connects farmers with a Chabot that runs on an Android app. Deep learning algorithms allow determining the most profitable crop list or estimating the crop for a user-selected crop based on inputs such as area, soil Nitrogen, Phosphorus, Potassium, temperature, Humidity, ph, and rainfall. Deep Learning Algorithm CNN will be used to anticipate the crop. In addition, the system recommends the appropriate fertilizers based on various user inputs such as soil type, crop type, Humidity, and ph value of soil in order to increase production.

Keywords: Smart Agriculture System; Crop Recommender, Fertilizer Recommender, Deep Learning, CNN.

Date of Submission: 06-06-2022 Date of acceptance: 21-06-2022

I. INTRODUCTION

The agriculture industry employs about half of the country's workers. However, it accounts for 19.9 per cent of GDP (at current prices in 2020-21). Manufacturing and services sectors have increased their contributions to economic growth in recent decades, while agriculture's share has declined from more than 50% of GDP in the 1950s to 19.9 per cent in 2020-21. (at constant prices). India's foodgrain output is expanding year after year, and the country ranks among the top producers of wheat, rice, pulses, sugarcane, and cotton.

Crop output is influenced by a variety of factors, including meteorological, geographic, organic, and economic considerations. Farmers find challenges to select when and which crops to grow since market prices fluctuate. Because of the volatility in climatic circumstances, farmers are unsure of which crop to cultivate and when and where to begin. Due to fluctuations in seasonal meteorological conditions and essential assets such as soil, water, and air, the use of various fertilizers is also unpredictable. The agricultural yield rate is continuously dropping in this situation. The problem can be solved by providing farmers with a clever, user-friendly recommender system. Crop prediction is a major issue in the agriculture industry. Every farmer is interested in determining which crop produces the most yield and whether it matches their expectations. Agriculture yields are mostly determined by weather conditions and soil features. By examining numerous soil and weather parameters, we can accurately anticipate crop yields. We have suggested a model that tackles these difficulties in this research. The suggested approach is unique in that it guides farmers to increase agricultural output while also suggesting the most lucrative crop. The suggested methodology allows for crop selection based on economic and environmental factors, with the goal of boosting agricultural output and thereby helping to satisfy the country's growing food demand. Rainfall, temperature, soil type, nitrogen, phosphorus, potassium, humidity, and other parameters are studied in the suggested model to forecast the crop. The technique also aids in the selection of the optimum fertilizers for increasing crop output.

The paper's significant contributions are given below,

1. Crop prediction using a CNN system for a given type of soil.
2. A user-friendly Android Chatbot that recommends the most lucrative crop.
3. Recommender system that recommends the best fertilizer for increased agricultural productivity.

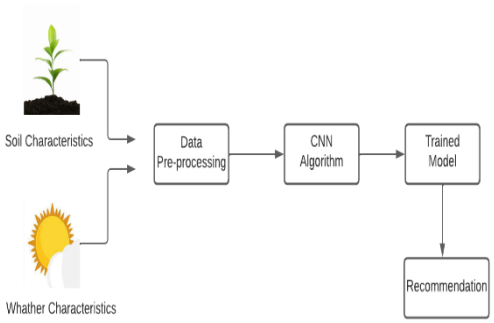
II. RELATED WORK

Agricultural crop suggestion frameworks are accessible in the market which consider different parameters like climate at the time the yield is to be planted, soil type, geology of the locale, temperature and precipitation in the area, showcase costs of the harvest, trim length, and so on. Research has been completed in this field and the accompanying papers have been alluded with the end goal of research and study. The framework in paper [1] recommended by creators S.Pudumalar and related co-creators utilizes a gathering system called Majority Voting Technique which consolidates the intensity of numerous models to accomplish more prominent forecast precision. The strategies utilized are Random Trees, KNN, CHAID and Naïve Bayes for gathering so that regardless of whether one strategy predicts erroneously, alternate models are probably going to make right forecasts and since the greater part casting a ballot system is utilized, the last expectation is right one. On the off chance that rules are the fundamental segments which are utilized in the expectation procedure. The exactness got is 88% utilizing the gathering model. Paper [2] is an audit paper for concentrate different calculations and their exactness in the rural field proposed by Yogesh Gandge and Sandhya. It was seen that Multiple Linear Regression gave a precision of 90-95% for rice yield. Choice tree utilizing ID3 calculation was considered for soybean edit and the proposals were created. The third calculation was SVM which was utilized on every one of the harvests and the precision was great with computationally less prerequisites.

Neural system was utilized on corn information to accomplish 95% of precision. Different calculations were additionally utilized which are KNN, C4.5, K-implies, J48, LAD Tree and Naïve Bayes. The end was that still enhancement is required for the calculations to accomplish better precision. Being used of Data Mining in Crop Yield Prediction [3], paper [3], the dataset utilized was gathered from Kaggle.com The creator has broke down the information utilizing WEKA apparatus for calculations which are LWL, J48, LAD Tree and IBK. The exactness was estimated utilizing explicitness, affectability, precision, RMSE and mean outright blunder. For every classifier, perplexity network was utilized to get the effectively distinguished occurrences. The perception was that better precision can be acquired if pruning is utilized. Paper [4] displayed by Rakesh Kumar, M.P. Singh, Prabhat Kumar and J.P. Singh proposed utilization of seven machine learning methods for example ANN, SVM, KNN, Decision Tree, Random Forest, GBDT and Regularized Gradient Forest for crop choice. The framework is intended to recover every one of the yields sowed and time of developing at a specific time. Yield rate of each harvest is acquired and the crops giving higher yields are chosen. The framework additionally proposes an arrangement of crops to be planted to get the higher yields. Prof. Rakesh Shirsathand other co-creator in paper [5] proposed a framework which causes the clients to settle on choices with respect to the crop to be planted.

III. MODELS AND METHODOLOGY

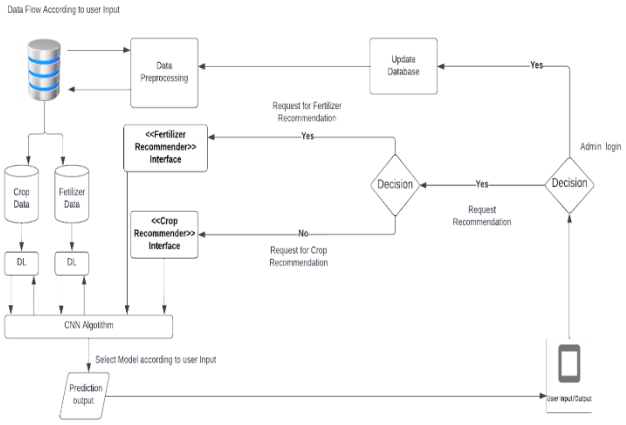
Despite several recently offered solutions, there are still outstanding obstacles in developing a user-friendly crop suggestion tool. The method suggested here tries to address these restrictions by creating a user-friendly application that incorporates a chatbot that examines elements such as rainfall, temperature, humidity, soil type, soil characteristics, and weather circumstances. The major goal is to increase the range of crops that can be cultivated throughout the season. The suggested approach will aid farmers in minimizing crop selection challenges and increasing productivity.



The suggested model estimates the crop for the supplied parameter data sets. Integrating agriculture and DL will help to improve the agriculture industry by improving yields and maximizing the resources required. This dataset was created by supplementing records of rainfall, climate, and fertilizer data available for India from a variety of trustworthy sources, like kaggle.com.

Fields of data:

N-nitrogen content ratio in soil, P-phosphorus content ratio in soil, K-potassium content ratio in soil Temperature - the temperature in degrees Celsius Humidity - relative humidity in percentage ph - soil ph-value, rainfall - rainfall in mm



IV. MODULE IMPLEMENTATION

4.1 Database

The collected and pre-processed data are stored in a database. SQL is an abbreviation for Structured Query Language. SQL is a programming language used to interface with databases. According to ANSI, it is the standard language for relational database management systems. SQL statements are used to both update and retrieve data from databases. Oracle, Sybase, Microsoft SQL Server, Access, Ingres, and other SQL-based relational database management systems are some examples. Although most database systems use SQL, they frequently have their proprietary extensions that are only used on their platform. SQL commands like "Select," "Insert," "Update," "Delete," "Create," and "Drop" can perform almost anything with a database. SQL Server is a software library that implements a relational database management system.

The recommended crop and fertiliser data are stored in a SQL Server database, which the CNN Algorithm may access during the prediction process.

4.2 Admin

Admins can change the current database in this module for improved accuracy in any season. Admins can be authenticated by username and password, and only if the credentials are legitimate, the system will let them into the admin module. Admins can do the following tasks:

i. Admins can change crop and fertilizer information as well as parameters.

ii. Admins have the option of deleting an existing database.

iii. Admins have the ability to establish new crop and fertilizer records.

4.3 Users

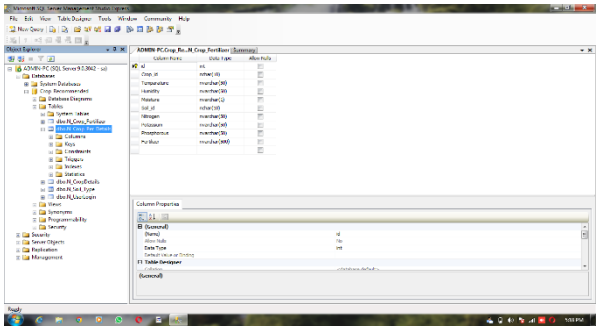
Crop Recommendation System and Fertilizer Recommendation System are available in the user module.

i. In the Crop Recommendation System, the chatbot prompts the user for information such as NPK levels, temperature, humidity, pH, and rainfall. The CNN Algorithm filters the current database based on the user's inputs and recommends the optimal crop for a higher yield.

ii. In the Fertilizer Recommendation System, users provide NPK levels, temperature, humidity, moisture, soil type, and crop kind in response to Chat bot questions. The CNN Algorithm predicts and recommends the optimum fertiliser based on the inputs.

V KEY RESULTS

5.1 Database



5.2 Admin Module

5.3 User Module

Fig 5.3.2 Crop Recommendation

Fig 5.3.3 Fertilizer Recommendation

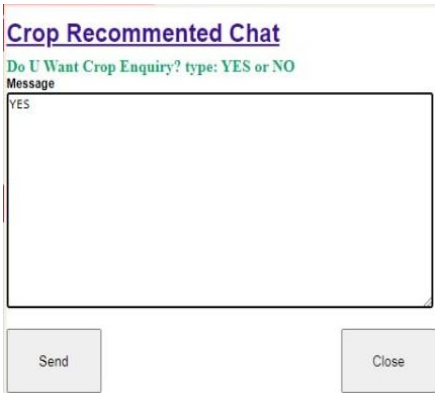
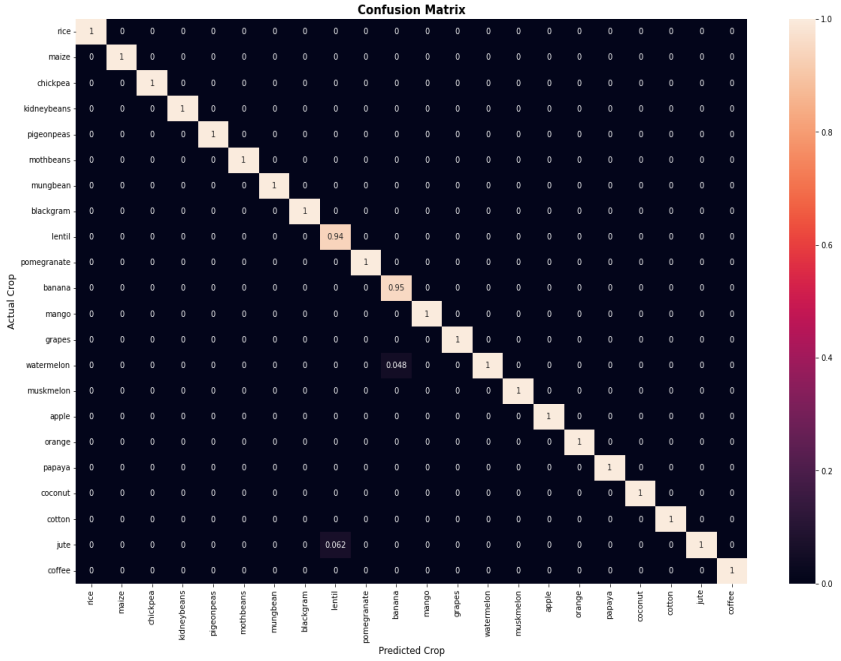


Fig 5.3.3 Chatbot



VI FUTURE WORK

In future, Development is to integrate the crop recommendation system with another subsystem, a yield predictor that would also provide the farmer an estimate of production if he plants the recommended crop.

VII CONCLUSION

This system helps the farmer to choose the right crop by providing insights that ordinary farmers don't keep track of thereby decreasing the chances of crop failure and increasing productivity. It also prevents them from incurring losses. The system can be extended to the web and can be accessed by millions of farmers across the country. We could achieve an accuracy of 98.88 percent from the CNN and an accuracy of 96.26 percent from the KNN model.

REFERENCES

[1]. Umamaheswari S, Sreeram S, Kritika N, Prasanth DJ, "BIoT: Blockchain-based IoT for Agriculture", 11th International Conference on Advanced Computing (ICoAC), 2019 Dec 18 (pp. 324-327). IEEE.

[2]. Jain A. "Analysis of growth and instability in the area, production, yield, and price of rice in India", Journal of Social Change and Development, 2018;2:46-66

[3]. Manjula E, Djodiltachoumy S, "A model for prediction of crop yield" International Journal of Computational Intelligence and Informatics, 2017 Mar;6(4):2349-6363.

[4]. Sagar BM, Cauvery NK., "Agriculture Data Analytics in Crop Yield Estimation: A Critical Review", Indonesian Journal of Electrical Engineering and Computer Science, 2018 Dec;12(3):1087-93.

[5]. Wolfert S, Ge L, Verdouw C, Bogaardt MJ, "Big data in smart farming– a review. Agricultural Systems", 2017 May 1;153:69-80.

[6]. Jones JW, Antle JM, Basso B, Boote KJ, Conant RT, Foster I, Godfray HC, Herrero M, Howitt RE, Janssen S, Keating BA, "Toward a new generation of agricultural system data, models, and knowledge products: State of agricultural systems science. Agricultural systems", 2017 Jul 1;155:269-88.

[7]. Johnson LK, Bloom JD, Dunning RD, Gunter CC, Boyette MD, Creamer NG, "Farmer harvest decisions and vegetable loss in primary production. Agricultural Systems", 2019 Nov 1;176:102672.