



e-ISSN: 2319-8753 | p-ISSN: 2347-6710

IJRSET

International Journal of Innovative Research in
SCIENCE | ENGINEERING | TECHNOLOGY

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 12, Issue 7, July 2023

ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

Impact Factor: 8.423

9940 572 462

6381 907 438

ijirset@gmail.com

www.ijirset.com

Crop Yield Prediction Data Analytics in Indian Agriculture Using Deep Learning

Mrs. P. Abinaya M.E¹, Jothilakshmi.T²

Assistant professor, Department of Computer Science and Engineering, Selvam College of Technology,
Namakkal, India¹

M.E CSE IInd Year, Department of Computer Science and Engineering, Selvam College of Technology,
Namakkal, India²

ABSTRACT : India is a country where agriculture and agriculture related industries are the major source of living for the people. Agriculture is a major source of economy of the country. It is also one of the country which suffer from major natural calamities like drought or flood which damages the crop. The existing system are regression techniques like Kernel Ridge, Lasso and ENet algorithms to predict the yield and uses the concept of Stacking Regression for enhancing the algorithms to give a better prediction. Analyze and mine this agricultural data to get useful results using technologies like data analytics and machine learning and this result will be given to farmers for better crop yield in terms of efficiency and productivity. We propose to developing is the effective techniques to predict crop productivity in different climatic conditions can assist farmer and other stakeholders in accurate decision making in terms of agronomy and crop choice. We used the DNN algorithm, Multilayer Perceptrons (MLP). Furthermore, additional features which contribute little to the DL (Deep Learning) model will increase its time and space complexity and affect the accuracy of the model's output. The results depict that an ensemble technique offers prediction accuracy than the existing classification technique.

KEYWORDS: Crop yield prediction, Lasso, Kernel Ridge, ENet, Stacked Regression.

I. INTRODUCTION

Deep neural networks, deep belief networks and recurrent neural networks have been applied to fields such as computer vision, speech recognition, natural language processing, audio recognition, social network filtering, machine translation, and bioinformatics where they produced results comparable to and in some cases better than human experts have.

Deep Learning Algorithms and Networks are based on the unsupervised learning of multiple levels of features or representations of the data. Higher-level features are derived from lower level features to form a hierarchical representation.

PREDICTIONS OF THE CROP PRODUCTION

Rice is an important crop and consumed widely across the globe as a staple food. India is amongst the leading rice producers in the world. India produces rice in a large quantity and in the last financial year 2014-2015, rice production was more than 100 million tonnes. Apart from the leading producer, India is also one of the largest exporters of rice. In the last financial year, India exported more than 8 million tonnes of rice to many countries. Given the importance of rice to world's food security, any improvements in the forecasting of rice crop yield under different climatic and cropping scenarios will be beneficial. The ability to predict the future yield enables the farmer and decision makers to take the most appropriate decision for seasonal and long term farm sustainability. There are various computer science techniques such as data mining and machine learning which have been used to determine the influence of these parameters and make predictions of the crop production. A decision support system (DSS) tool which uses basic inputs from the farmers or decision makers and provides a simple prediction of crop yield under a particular scenario on the basis of historical climate and crop production data and environmental information can assist farmer decision making in terms of agronomy and crop choice.

DECISION SUPPORT SYSTEMS (DSS)

An interactive computer based systems can be termed as Decision Support Systems (DSS) which provide help

to decision makers utilize data and models to solve unstructured problems. The performance of decision makers for analysing complex decisions can be improved using these tools by reducing the time and human resources required. There are various DSS tools existing in the agricultural domain that help the farmers or decision makers make a decision based on the climatic scenario and other parameters. For information dissemination an Agriculture-based decision support framework has been proposed by. Before the delivery of integrated information to the farmer this framework involves data capture, analysis and data processing. For the benefit of farmer and agricultural industry, the information collected, captured and validated from various sources is formatted that contributes to their knowledge base after defining set of rules and data mining tools used to process and integrate the data.

CROP MANAGEMENT STRATEGIES

A DOS-based decision tool, software package integrating the effect of soil, crop phenotype, and weather and management options is referred as DSSAT. DSSAT offers users information with which to rapidly appraise new crops, products, and practices for adoption by simulating probable outcomes of crop management strategies. Users of DSSAT can compare these simulated outcomes with observed results. The DSSAT software allows linking the crop models and linkage with Geographic Information Systems (GIS). Other examples include web based agricultural DSS that provides appropriate strategies for crop growth monitoring and food security which purport to accurately assess the condition of crop growth and food supply. Another study described a GIS-based fertilizer decision support system to help farmer select fertilizer application rates and manage soil nutrients have been under use by the farmers of northeast China. Other studies reported on a fuzzy based decision support system for groundwater pollution risk evaluation. Other studies have the effectiveness of a decision support system, which used artificial neural network to predict rice production in Phimai district, Thailand. A similar study also reported on the development of a decision support system to study climate change impacts on crop production, which was found to be useful in predicting climate impacts. Many DSS on regional farm planning have also been developed. For example, described the usefulness of a GIS-based decision support system for groundnut assessment in large irrigation project areas.

II. RELATED WORK

The objective of this paper is to describe the proposed Decision Support System (DSS) for rice crop production. The DSS comprised of a graphical user interface (GUI) shell for predicting rice yield for Maharashtra state, India and associated data visualisation to assist farmers, policy makers, planners and researchers who are involved in planning and promoting rice production. Machine Learning is the study of computer algorithms that can improve automatically through experience and by the use of data. It is seen as a part of Artificial Intelligence. Machine learning algorithms build a model based on sample data, known as training data, in order to make predictions or decisions without being explicitly programmed to do so. Machine learning algorithms are used in a wide variety of applications, such as in medicine, email filtering, speech recognition, and computer vision, where it is difficult or unfeasible to develop conventional algorithms to perform the needed tasks. In India, there are more than a hundred crops planted around the whole country. These crops are categorized for better understanding and visualization. The data for this research has been acquired from the Indian Government Repository. The data consists of attributes – State, District, Crop, Season, Year, Area and Production with around 2.5 Lakh observations. Depicts the states and territories of India which visualize that which category of crops are famous in which season.

PROPOSED SYSTEM

In this paper, We propose to developing is the effective techniques to predict crop productivity in different climatic conditions can assist farmer and other stakeholders in accurate decision making in terms of agronomy and crop choice.

ADVANTAGES.

- Accurate decision making in terms of agronomy and crop choice.
- Model will increase its time and space complexity and affect the accuracy of the model's output.
- The results depict that an ensemble technique offers prediction accuracy than the existing classification technique.

III. SYSTEM ARCHITECTURE

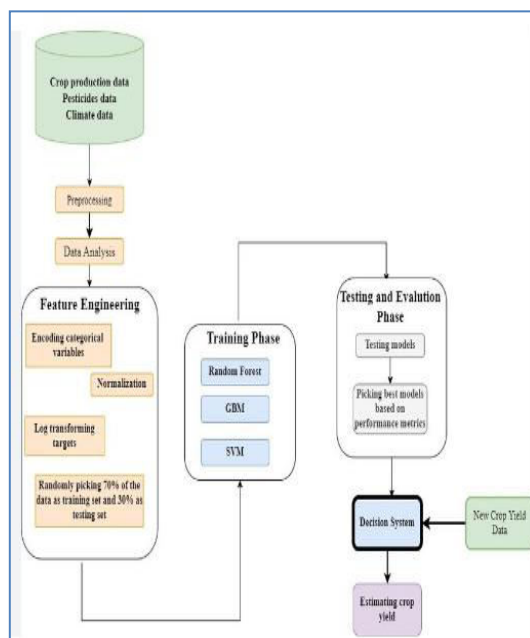


Fig. 1.1 System Architecture

IMPLEMENTATION.

DATA PREPROCESSING

Pre-processing refers to the transformations applied to our data before feeding it to the algorithm. Data Preprocessing is a technique that is used to convert the raw data into a clean data set. In other words, whenever the data is gathered from different sources it is collected in raw format which is not feasible for the analysis. To achieving better results from the applied model in Machine Learning method of the data has to be in a proper manner. Some specified Machine Learning model needs information in a specified format; for example, Random Forest algorithm does not support null values. Therefore, to execute random forest algorithm null values have to be managed from the original raw data set. And another aspect is that data set should be formatted in such a way that more than one Machine Learning and Deep Learning algorithms are executed in given dataset

WEATHER PREDICTION

The Weather module inputs daily weather data and also can generate long term (e.g., 30-year) series of daily weather data that reproduce the statistical properties of a shorter series of weather years. The minimum daily weather data required are solar radiation, minimum and maximum air temperatures, and precipitation. However, for more accurate estimation of evapotranspiration, humidity (e.g., as daily mean dewpoint temperature) and wind speed are required.

ACCURACY

Model accuracy is defined as the number of classifications a model correctly predicts divided by the total number of predictions made. It's a way of assessing the performance of a model, but certainly not the only way.

RAINFALL

Precipitation data were collected from Rwanda meteorology agency. Since crops have various water needs according to their stage of development, the monthly total rainfall has been calculated from the daily precipitation to identify the correlation between monthly water requirements and crop production.

PREDICTION

Predictive modeling is a commonly used statistical technique to predict future behavior. Predictive modeling

solutions are a form of data-mining technology that works by analyzing historical and current data and generating a model to help predict future outcomes.

CLASSIFICATION

In machine learning, classification is a predictive modeling problem where the class label is anticipated for a specific example of input data. For example, in determining handwriting characters, identifying spam, and so on, the classification requires training data with a large number of datasets of input and output.

TESTING

The project's implementation phase is where the theoretical design becomes a functional system. This is the last and significant stage in the framework life cycle. It is really the most common way of changing over the new framework into a functional one. Cloud Testing refers to the verification of software quality on a real-device cloud. QA teams can access thousands of real desktop and mobile devices for testing websites and apps in real time. Since these devices are hosted on cloud-based servers, they're accessible online at all times.

UNIT TESTING.

The set of tests performed by a single programmer prior to the unit's integration into a larger system is known as unit testing. Tests are performed on the module interface to guarantee that data properly enters and exits the program unit.

The local data structure is looked at to make sure that temporarily stored data stays the same at every step of an algorithm's execution. The module is tested under boundary conditions to ensure that it functions properly within limits imposed to limit or restrict processing.

BLOCK BOX TESTING.

Black-box testing is a method of software testing that looks at an application's functionality without looking inside to see how it works or how it was built. Virtually every level of software testing can be tested using this method. Black box testing involves testing a system with no prior knowledge of its internal workings. A tester provides an input, and observes the output generated by the system under test.

IV. CONCLUSION

Agriculture is the field which helps in economic growth of our country. But this is lacking behind in using new technologies of machine learning. Hence our farmers should know all the new technologies of machine learning and other new techniques. These techniques help in getting maximum yield of crops. Many techniques of machine learning are applied on agriculture to improve yield rate of crops. These techniques also help in solving problems of agriculture. We can also get the accuracy of yield by checking for different methods. Hence we can improve the performance by checking the accuracy between different crops. Sensor technologies are implemented in many farming sectors. This paper helps in getting maximum yield rate of the crops. Also helps in selecting proper crop for their selected land and selected season. These techniques will solve the problems of farmers in agriculture field. This will help in improving the economic growth of our country.

REFERENCES

- [1] Javadinejad, S.; Eslamian, S.; Askari, K.O.A. The analysis of the most important climatic parameters affecting performance of crop variability in a changing climate. *Int. J. Hydrol. Sci. Technol.* 2021, 11, 1–25.
- [2] Beillouin, D.; Schauburger, B.; Bastos, A.; Ciais, P.; Makowski, D. Impact of extreme weather conditions on European crop production in 2018: Random forest—Yield anomalies. *Philos. Trans. R. Soc. B Biol. Sci.* 2020, 375, 20190510.
- [3] Yadav, M.R.; Choudhary, M.; Singh, J.; Lal, M.K.; Jha, P.K.; Udawat, P.; Gupta, N.K.; Rajput, V.D.; Garg, N.K.; Maheshwari, C.; et al. Impacts, Tolerance, Adaptation, and Mitigation of Heat Stress on Wheat under Changing Climates. *Int. J. Mol. Sci.* 2022, 23, 2838.
- [4] Chakraborty, D.; Saha, S.; Sethy, B.K.; Singh, H.D.; Singh, N.; Sharma, R.; Chanu, A.N.; Walling, I.; Anal, P.R.; Chowdhury, S.; et al. Usability of the Weather Forecast for Tackling Climatic Variability and Its Effect on Maize Crop Yield in Northeastern Hill Region of India. *Agronomy* 2022, 12, 2529.
- [5] Kang, Y.; Ozdogan, M.; Zhu, X.; Ye, Z.; Hain, C.R.; Anderson, M.C. Comparative assessment of environmental variables and machine learning algorithms for maize yield prediction in the US Midwest. *Environ. Res. Lett.* 2020, 15, 064005.



- [6] Nishant, P.S.; Venkat, P.S.; Avinash, B.L.; Jabber, B. Crop Yield Prediction based on Indian Agriculture using Machine Learning. In Proceedings of the 2020 International Conference for Emerging Technology (INCET), Belgaum, India, 5–7 June 2020; pp. 5–8
- [7] Reddy, D.; Kumar, M.R. Crop Yield Prediction using Machine Learning Algorithm. In Proceedings of the 2021 5th International Conference on Computational Intelligence in Information Systems (CIIS 2022), Madurai, India, 6–8 May 2021; pp. 1466–1470.
- [8] Wang, X.; Huang, J.; Feng, Q.; Yin, D. Winter Wheat Yield Prediction at County Level and Uncertainty Analysis in Main Wheat-Producing Regions of China with Deep Learning Approaches. *Remote. Sens.* 2020, 12, 1744
- [9] Kumar, Y.J.N.; Spandana, V.; Vaishnavi, V.; Neha, K.; Devi, V. Supervised Machine learning Approach for Crop Yield Prediction in Agriculture Sector. In Proceedings of the 2020 5th International Conference on Communication and Electronics Systems (ICCES), Coimbatore, India, 10–12 June 2020; pp. 736–741.
- [10] Prajwala, T.R.; Ramesh, D.; Venugopal, H. Modeling and Forecasting of Rainfall using IoT sensors and Adaptive Boost Classifier for a Region. *SSRN Electron. J.* 2021, 58–61.



INNO SPACE
SJIF Scientific Journal Impact Factor
Impact Factor: 8.423



ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

9940 572 462 6381 907 438 ijirset@gmail.com



www.ijirset.com

Scan to save the contact details