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Crop Productivity Analysis and Predictions Using Machine Learning Approach

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Abstract: ***Without a question, the main source of income in rural India is provided by agriculture and its affiliated industries. The country's Real Gdp is also significantly influenced by the agriculture industry (GDP). The country is fortunate to have such a huge agriculture sector. However, the yield of crops per hectare in relation to global norms is unsatisfactory. It is one of the likely reasons why marginal farmers commit suicide at a higher rate. For farmers, this research suggests a practical and approachable yield prediction system. A smartphone application used in the proposed method connects farmers to the internet. GPS assists in locating the user. The user enters the location and soil type.***
Keywords: Crop Productivity analysis and prediction, svm, ICT, visualization

I. INTRODUCTION

Finding pertinent information and conclusions through the analysis, cleaning, and modelling of data is the goal of data analysis. It is a technique for analysing, extracting, and anticipating the important data from enormous amounts of data in order to find a pattern. This process is used by businesses to convert customer information from its raw form into useful information. This strategy can be useful in the agricultural sector. Most farmers use their significant field experience in a particular crop to forecast a higher yield for the future harvest season, but they still don't get paid prices that are in line with the worth of the commodities. It typically happens as a result of improper irrigation, poor crop selection, or sporadically a lower-than-expected crop. Agricultural researchers are sure that an efficient method is required to forecast and improve crop development and In order to monitor crop growth and boost productivity, the majority of agriculture research relies on molecular mechanisms. The key determinants of crop yield include product species, seeds type, and environmental factors such sunlight (temp), sediments (ph), freshwater (ph), rainfall, and humidity. By assessing the soil and atmosphere at a specific location to produce the best crops with highest yields, it is feasible to forecast the gross crop production. Farmers will benefit from this prediction because they may choose the best crop for their land by taking into account the season, fertiliser, soil PH, heat, moisture, soil humidity, separation depth, and months. Crop yield estimation is a challenging process since it depends on so many variables, including soil, weather, cultivation techniques (date of planting, volume of water and fertilisers, etc.), cultivar heritability, and biological stress. Econometric, agronomic, empirical, physical, and mechanistic methodologies are all used in crop yield estimation.

India has a sizable population, so it's crucial to safeguard global food supplies from climatic changes. Whenever there is a shortage, framers experience serious problems. Crop productivity is significantly impacted by the kind of soil. Advising farmers to use fertilisers could help them choose what is best for their particular farming situation. Information and communications technology (ICT) have been used in a number of studies to forecast agricultural production. Conventional farmers may impart new abilities to more experienced farmers by applying farming techniques. To forecast the entire processes in the body for the growing of different crops in specified states, a number of technical parameters and a recently constructed weather index were used as inputs. Recurrence and co-relation of perseverance analyses, as well as average error analyses, were carried out in order to develop a precise correlation between our actual result, which is also known as the target, and the prediction model, which has a user-friendly communication for farmers as well as evaluations of rice production based on historical evidence.

II. LITERATURE SURVEY

A. Rice yield estimation at pixel scale using relative vegetation indices from unmanned aerial systems"

Author: FeilongWang,Fumin Wang*,Yao Zhang,Jinghui Hu

Publications: The National Natural Science Foundation of China (41871328), the Public Budget of Laboratories of Target Background Condition in Landscape Scale, this Microwave Properties, and the National Key Research & Design Plan of China all provided funding for this work. 2019IEEE.

Abstract: The quick and correct prediction of rice production statistics, which has been accorded significant weight by everyone levels of the government, is directly related to the people's ability to support themselves. Satellite remote sensing makes it possible to estimate agricultural productivity on a large scale, however these techniques frequently have spectral and spatial resolution restrictions. Remotely piloted vehicles (RPVs) equipped with hyperspectral sensors may take photographs with high spatial-temporal resolution and in the hyperspectral range. Time-series Vegetation Indices are frequently used in the estimate of grain yield (VIs). Variable background and illumination circumstances, however, might have an effect on multi-day vegetation indices; as a result, variations in vegetation indices might potentially include effects from outside settings. The accuracy of the estimated crop production will suffer as a result. In order to calculate rice yield just at pixel level, the comparison vegetation index and improved capacity were recommended and used in this work. The ideal development stages for determining crop output would also be found. Hyperspectral images of significant rice growth periods during in the tillering, joinery, boot, head, and maturing stages were taken between July 28 and November 24, 2017. First, all practicable 2 combinations of intermittent channels between 500 as well as 900 nm were used to generate the Comparative Normalized Difference Index (RNDVI). The best RNDVI at different stages of development was then determined for calculating rice yield. The results show that a multiple regression function and a four-growth-stage model with RNDVI data for the tillering, joinery, booting, & heading stages produce a higher R2 (0.74) and a smaller RMSE (248.97kg/ha).

The mean absolute percentage error for the predicted rice yield was 4.31 percent. Results show that yield projections made at the pixel scale using comparative statistical parameters were correct. The research finds the ideal combinations of development phases for estimating rice output and suggests a method for yield estimation using relative vegetation indicators. In order to develop the system for distant yield estimation, this research examines the possibility of yield estimation just at pixel level using hyperspectral images from an Uav.

B. "Use Of Deep Neural Networks For Crop Yield Prediction: A Case Study Of Soybean Yield inLauderdale County, Alabama, USA"

Author: AnılSuatTerliksiz,D. TurgayAltılar

Publications: 2019IEEE

Abstract: A sufficient amount of agricultural production is needed because world population is continuously rising. Estimating crop growth and agricultural yields is essential for a nation's economic development. Crop yield forecasts have a considerable impact on the regional, national, and international economy as well as the security management of food. Recent developments in classification tasks utilizing cnn model have increased the importance of deep learning for applications such as crop type detection, agricultural surveillance, and crop yield estimation. Conventional farming production prediction systems use traditional machine learning techniques like SVMs as well as Decision Trees.

C. "Crop Yield Prediction and Efficient use of Fertilizers."

Author: S.Bhanumathi, M.Vineeth and N.Rohit

Publications: International Conference on Communication and Signal Processing, April 4 - 6, 2019, India

Abstract: India is a nation that practises agriculture, hence the expansion of agricultural yields and agroindustry products are crucial to the country's economy. The analysis of crop productivity is a growing field of data mining research. Crop yield is an important factor in agriculture.

How much more of a crop a farmer can expect to receive intrigues him. Analyze the several aspects that are related, such as the setting and pH level that d India is a nation that practises agriculture, hence the expansion of agricultural yields and agroindustry products are crucial to the country's economy.

The analysis of crop productivity is a growing field of data mining research. Crop yield is an important factor in agriculture. How much more of a crop a farmer can expect to receive intrigues him. Analyze It is possible to determine the percentage of elements like nitrogen (N), phosphorus (P), and potassium by using third-party applications like interface for weather & temperatures, kind of soil, and soil's nutritive quality in that place (K).

Every one of these data characteristics will be looked at, as well as the information will be learned to produce a model utilising a variety of efficient machine learning techniques. The system comprises a model that is accurate and dependable in predicting crop production and offers the end user relevant recommendations for necessary fertiliser ratios based on local climate and soil parameters that enhance to increase agricultural output and farmer profitability.

III. METHODOLOGY

A. SVM Method

Classification or regression issues may be addressed using the "Support Vector" (SVM) guided machine learning method. However, it is most typically used when categorization problems exist. Using this method, each data point is represented as a point in an n-dimensional space, wherein n represents the size of features you have so each feature's value corresponds to a particular coordinate value. Then, classification is achieved by locating the hyper-plane that successfully separates the two classes.

Support vectors resemble a single observation's coordinates more closely. The method that distinguishes between both the 2 classifications (hyper-plane/line) the best is support vector machine.

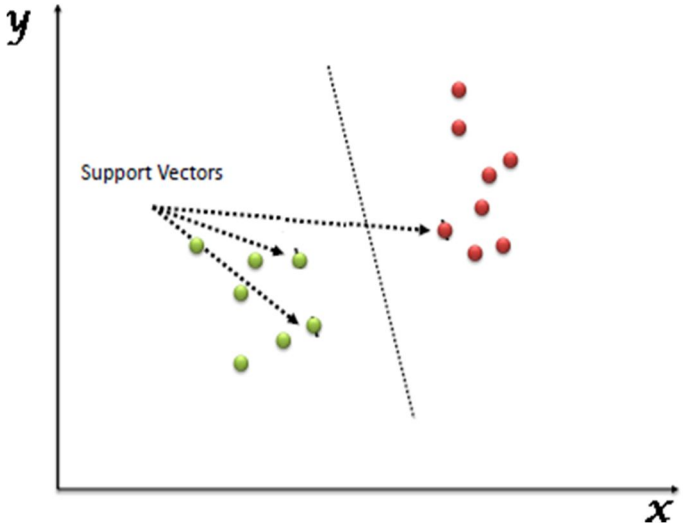


Fig. 3 Example of an SVM Algorithm

IV. IMPLEMENTATIONS

This project forecasts crop production and the best crop by using data on soil type, temperature, moisture, season, fertiliser, and months. In order for users to analyse crops and select the Predictions option, where they can select agricultural production factors that find the best harvest for their farms, they must first access all the basic data about the neighbourhood, rainfall, surface watered, crop, seasonal yield, and fertilisers used. This system provides simple visualisation so that people can interpret and analyse items with ease.

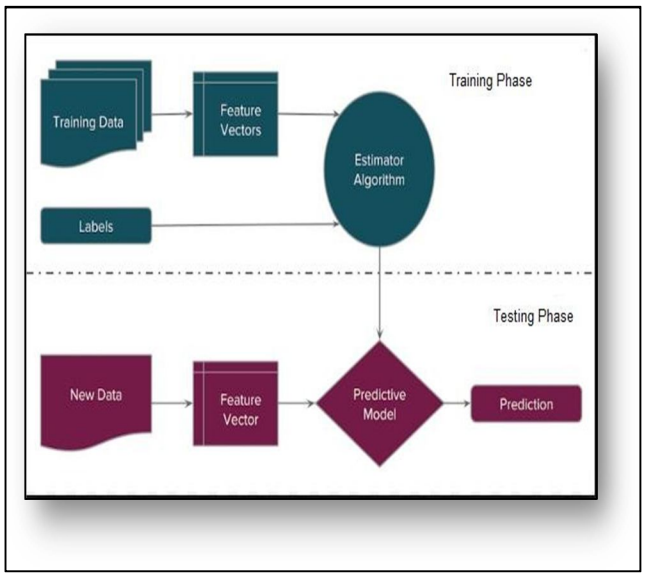


Fig. 4 Example of an Implementation

V. RESULTS AND DISCUSSION

A. *User Interface*

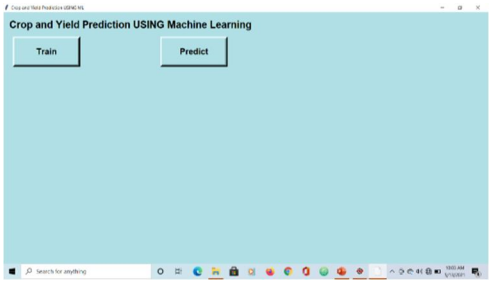


Fig. 5.1 Example of an Tain or Predict Snap

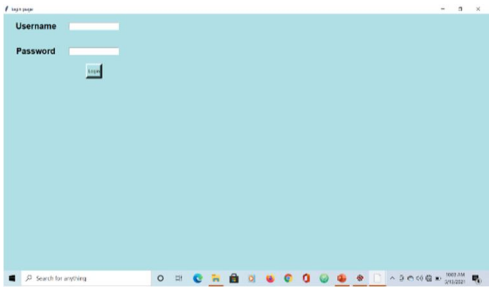


Fig. 5.2 Example of an Login Page

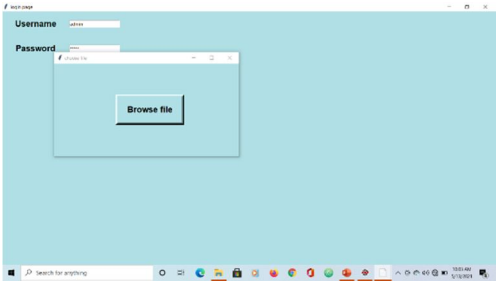


Fig. 5.3 Example of an

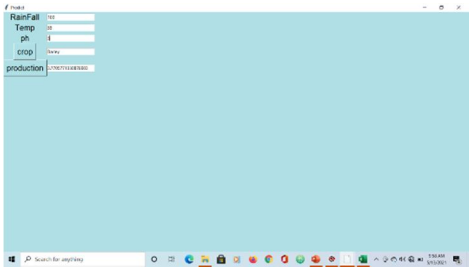


Fig. 5.4 Example of an Browsing Crop

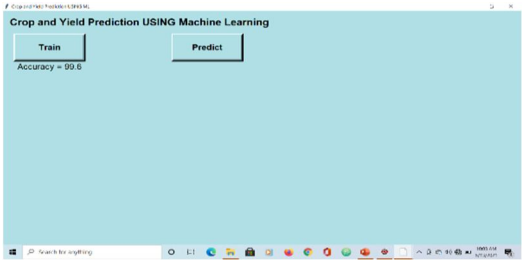


Fig. 5.5 Example of an Prediction crop

VI. CONCLUSION

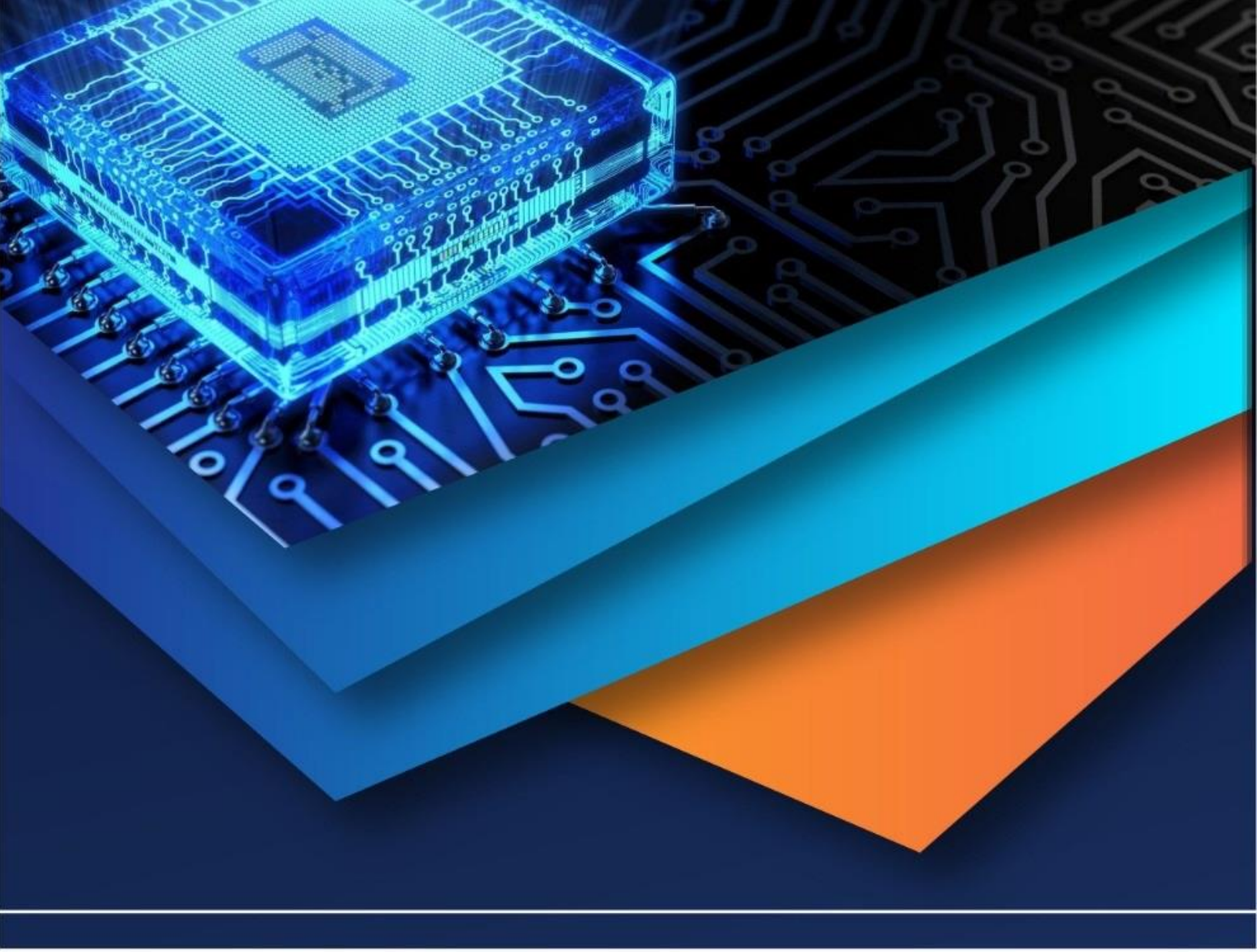
In countries like India and others, agriculture is a crucial sector. Preclinical agriculture must, however, place a strong emphasis on the use of technology in agricultural production. This study recommends a system that gives farmers an idea of output estimations based on meteorological factors and cultivable land. A farmer will use this information to decide whether it should grow a particular crop or pick a different one if yield projections are bad. This scientific attempt can still be improved upon. We might create a system that enables distributors and producers of agricultural goods to advise farmers. How farmers may chose the right crop to plant at the right time to maximise their profits. Structured dataset management is the purpose of the system.

VII. FUTURE SCOPE

Even though this system is fully functional, there is still room for future development. The application can be altered in a number of ways to improve user experience overall and output better results. This feeling included backing the automated playing of music. The system's future plans include designing a mechanism that could aid in the treatment of individuals who are experiencing psychological anguish, stress, severe depression, and trauma through music therapy. Due to the current system's poor camera resolution and performance in extremely low light levels, there is a chance to add some capabilities as a potential fix in the future.

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