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Survey on Crop Price Prediction and Recommendation Using Machine Learning and Weather Forecasting

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Abstract: ***This document is a model and instructions for using a new farming method called "Farming with Machine Learning". Using regression algorithms and decision trees, farmers can be provided with clear information to make informed decisions. The main purpose of this document is to support farmers by providing powerful tools to unravel the complexities of farming, improve crop selection and improve well-managed management.***
Project ideas include creating a website that integrates with technology to provide farmers with a better farming experience. Based on extensive data analysis and recommendations from key meetings, this document provides guidelines for ushering in a new era of good agriculture and solving good problems.
Index Terms: Machine Learning, Web Development, Data sets

I. INTRODUCTION

Agriculture is the mainstay of the Indian economy and contributes to the country's gross domestic product while providing livelihoods to millions of people. However, although farmers play an important role, they still face many problems that hinder their success and limit the development of the economy.

Unpredictable weather conditions that cause erratic rainfall and extreme temperatures pose a threat to agriculture and often result in crop failure, business and financial losses for farmers. In addition, low education levels lead to further challenges as many farmers lack the knowledge and resources needed to use modern agricultural practices and technologies. In addition, the use of advanced technology faces problems due to the high cost of purchasing and using new equipment and language problems affecting access to information.

Together, these factors inhibit farmers' ability to implement new agricultural practices. In these challenges, AgriVenture acts as a beacon of hope by providing innovative solutions to meet the needs of Indian farmers. By integrating technologies such as neural networks and real-time weather data through the use of programming interfaces (APIs), AgriVenture provides farmers with predictability and intelligence.

The AgriVenture website provides farmers with access to valuable resources and tools designed to improve agriculture. The website was developed using the MERN framework (such as MySQL, Express.js, React.js and Node.js) to provide farmers with an intuitive and user-friendly platform to point and use.

A key feature of the AgriVenture platform is the crop price prediction, which uses advanced techniques to predict market trends and help farmers to improve profits. AgriVenture enables farmers to maximize profits and reduce risks in the agricultural industry by providing real-time updates on products.

In addition, AgriVenture also provides crop recommendations that use machine learning algorithms to recommend optimal crops based on region, season and previous crops. AgriVenture aims to improve agriculture and promote permaculture practices by guiding farmers in crop selection.

Additionally, AgriVenture has integrated weather forecast APIs into its platform to provide farmers with accurate and timely information about weather conditions and future climate.

Their ability to influence crop yields. AgriVenture helps reduce and protect agriculture by helping farmers manage climate-related risks. AgriVenture enables farmers to maximize profits and reduce risks in the agricultural industry by providing real-time updates on products.

II. COMPARATIVE ANALYSIS OF EXISTING LITERATURE PAPERS

Table 1: Literature Survey Comparison

Sr. No	Title and Authors	Conference/Journal Name and Publication Year	Topic Reviewed/ Algorithms or methodology used	Advantages and disadvantages
1.	Crop Yield Prediction using Machine Learning and Deep Learning Techniques Kavita Jhajharia, Pratistha Mathur, Et-al.[1]	International Conference on Machine Learning and Data Engineering	The paper explores the application of machine learning and deep learning models for crop yield prediction in the agricultural sector. It investigates the effectiveness of various models, including Random Forest, Support Vector Machine, Lasso Regression, Gradient Descent, and Long Short-Term Memory, to predict crop yields based on diverse parameters.	Advantages: • Improved Precision: Machine learning models enhanced prediction precision. • Data Type Versatility: Adaptable to various data types. Disadvantages: • Data Limitations: Challenge to obtain high-quality datasets. • Model Complexity: Complex models make interpretation difficult.
2.	A Methodology for Crop Price Prediction Using Machine Learning M.Gunasekaran, G.Thapaswini, Et-al.[11]	2022 IEEE 2nd International Conference on Mobile Networks and Wireless Communications (ICMNWC)	Paper predicts crop prices using decision tree, neuro-evolutionary algorithms, XGBoost, Neural Nets, Clustering, Logistic Regression, CNN, and RNN techniques, considering various agricultural factors.	Advantages: • Machine learning models enhance accuracy in crop price predictions by considering various factors influencing agriculture. Disadvantages: • Accuracy is highly dependent on the quality and quantity of data available. Insufficient or inaccurate data can affect predictions.
3.	Suitable Crop Prediction based on affecting parameters using Naïve Bayes Classification Machine Learning Technique. Latha Banda, Aarushi Rai, Ankit Kansal, Et-al.[3]	Presented at the 2023 International Conference on Disruptive Technologies (ICDT).	The paper focuses on predicting suitable crops for Indian farmers based on various parameters like climate, location, and season. It employs the Naïve Bayes Classification Machine Learning algorithm. Data is collected from government websites and pre-processed. Web scraping is used to obtain real-time weather data for predictions.	Advantages: • Provides farmers with crop recommendations, • Helps in reducing crop failures by suggesting crops suitable for specific conditions. Disadvantages: • Relies on real-time internet connectivity for fetching weather data
4.	Crop Recommendation Application using Ensemble Classifiers Belide Kusumasri, Sanjay Satyavada, Et-al.[6]	2023 2nd Edition of IEEE Delhi Section Flagship Conference (DELCON)	The paper presents a smart crop recommendation system for Indian farmers, utilizing machine learning and ensemble techniques to predict crops based on environmental factors like temperature, rainfall, soil nutrients, and pH, employing algorithms like Random Forest, KNN, Decision Tree, and Gaussian Naive Bayes.	Advantages: • Ensemble learning, using multiple algorithms, achieves 99.31% crop recommendation accuracy, aiding farmers' decisions. • Utilizes real-time data from sensors Disadvantages: • limited to regions or areas where meteorological information are available,

5.	Farming Guru: Machine Learning Based Innovation for Smart Farming Nita Jaybhaye, Purva Tatiya, Et-al.[5]	Fourth International Conference on Smart Systems and Inventive Technology (ICSSIT-2022)	The paper introduces the "Farming Guru" app, an innovative smart farming tool with features like weather monitoring, machine learning-based crop analysis, and budget management. This app empowers farmers with insights for informed decision-making and improved agricultural practices.	Advantages: • Provides farmers with crucial data and tools, empowering them. • Helps farmers manage finances by offering budget calculators and tool rental Disadvantages: • Relies heavily on the accuracy of data inputs. • Incorrect information could lead to misguided decisions in farming practices.
6.	Crop Recommendation System Using Machine Learning. S. Bharghavi, Dr, Srinivasan Bagannathan, Et-al.[12]	International Journal of Engineering Research and Technology (IJERT)	The paper reviews the use of machine learning algorithms, including Random Forest, SVM, KNN, and others, for predicting crop yields in Indian agriculture. It also discusses the development of a mobile application that assists farmers in making crop selection decisions and offers fertilizer recommendations based on location and weather data. This technology aims to address challenges like market fluctuations and climate uncertainties in Indian farming.	Advantages: • Enhanced crop yield predictions for better farming decisions. • User-friendly mobile app with real-time guidance for farmers. Disadvantages: • Accuracy influenced by data quality and weather variability. • Adoption challenges in traditional farming communities.
7.	Crop Yield Estimation in India Using Machine Learning. Kavita, Ms, Pratistha Mathur, Et-al. [7]	IEEE 5th International Conference on Computing Communication and Automation (ICCCA)	This paper discusses the application of machine learning techniques for estimating crop yields in India. The authors likely explore the use of data-driven methods to predict agricultural output. This research could provide insights into the potential of technology to enhance agricultural practices and resource management in India.	Advantages: • Improved accuracy and efficiency in crop yield prediction with potential resource savings. Disadvantages: • Dependency on data availability and the need for technical resources and expertise.
8.	Crop Yield Forecasting Using Data Mining. Kamath, Pallavi, Pallavi Patil, Et-al.[8]	International Conference on Computing System and its Applications (ICCSA- 2021)	This paper explores the application of data mining techniques for crop yield forecasting. This research likely focuses on leveraging data-driven approaches to predict agricultural output, which can be valuable for effective crop management and planning. The study has the potential to contribute to more accurate and informed decision-making in agriculture.	Advantages: • Data mining techniques can enhance crop yield forecasting accuracy, aiding resource allocation and risk management. • Enhanced crop yield accuracy and automation. Disadvantages: • Implementation requires technical expertise and infrastructure, potentially limiting access for some farmers, especially in less technologically advanced areas. • Data quality and technical expertise challenges.

III. EXISTING SYSTEM

The current crop forecasting method in Rajasthan, India, has used various algorithms and models, but their results are questionable. Some focus on just five products and use techniques such as support vector machine (SVM), gradient descent, and short-term memory (LSTM) [1], but perhaps will not produce good results. Others use k nearest neighbour (KNN), SVM, and random forest algorithms [11], but their predictive capabilities may be limited. Additionally, some applications are limited to only 85% accuracy by focusing on small crops and using low-impact methods such as Naive Bayes, Vector Space Models (VSM), and Decision Trees [2]. Additionally, Gaussian Naive Bayes, logistic regression, and support vector machine have been used to recommend crops based on environmental factors [6], but their practical implications are still unclear.

A. Limitations of Existing Systems

1) Coverage limited to only a handful of crops, disregarding the diverse agricultural landscape of Rajasthan, India.
2) Lack of consideration for the broader regional variability in environmental conditions, potentially limiting the applicability of predictions.
3) Utilization of simplistic modelling approaches, potentially overlooking crucial factors influencing crop yields.
4) Questionable reliability and accuracy of predictions, raising doubts about the practical utility of these systems for stakeholders.

IV. PROPOSED SYSTEM

The system has been developed to integrate various machine learning technologies to improve agriculture in Maharashtra and focuses on crop price prediction, crop advice and weather forecasts. Using the power of machine learning algorithms, the system will provide farmers with better information about crop prices, helping them make informed decisions. Additionally, the system will analyze environmental information and provide recommendations for planting crops based on conditions such as soil quality and weather. Additionally, with the client's web design using the MERN (MySQL, Express.js, React.js, and Node.js) stack and Tailwind CSS for the UI, the system will become easily accessible and easy to use for farmers. Processing data from the MySQL database, the scope of the system will be limited to selected crops in the state of Maharashtra to provide effective and relevant results for urban farmers.

V. RESULT

The proposed system is evaluated using the dataset model, focusing on measurement accuracy with metrics such as confusion matrix and root mean square error (RMSE). These metrics play an important role in evaluating the performance of the forecasting model and identifying areas for improvement.

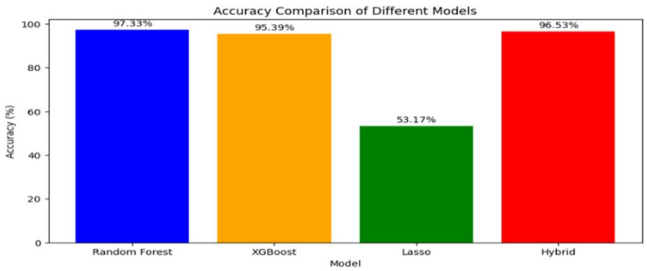

Figure 1 – Accuracy Comparison of Models

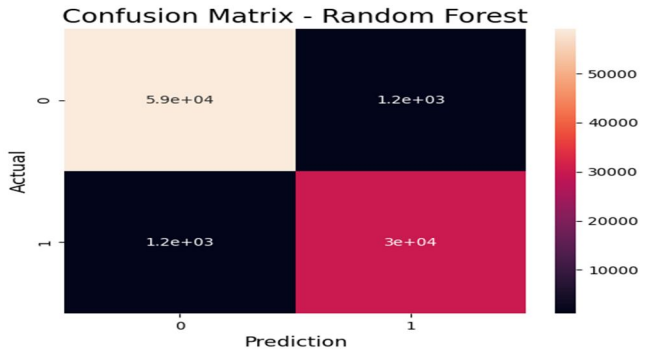

Figure 2 – Hybrid Model Confusion Matrix

VI. CONCLUSION AND FUTURE SCOPE

AgriVenture has become a major force in agricultural innovation, offering comprehensive services from crop price forecasting and weather forecasting. AgriVenture seamlessly integrates these resources to provide farmers with the necessary tools to make informed decisions, ultimately increasing yields and promoting permaculture practices. Additionally, AgriVenture empowers farmers to increase their income and solve agricultural problems with confidence by providing accurate cost estimates that support financial decisions, leading to better performance and increased income. With its innovative approach, AgriVenture has the potential to transform the agricultural landscape, empower farmers and bring prosperity to the future of agriculture.

By expanding its operations across the country, AgriVenture can spread its benefits across different agricultural regions in India, grow more crops and use safer methods. Additionally, developing data that includes comprehensive climate data should improve forecast models and provide deeper insights into crops and markets. Additionally, integrating import and export data into a database can improve forecast accuracy and help farmers and policymakers make better decisions again. Through these advances, the framework aims to drive change in agricultural research, promoting sustainability and re-employment in agriculture.

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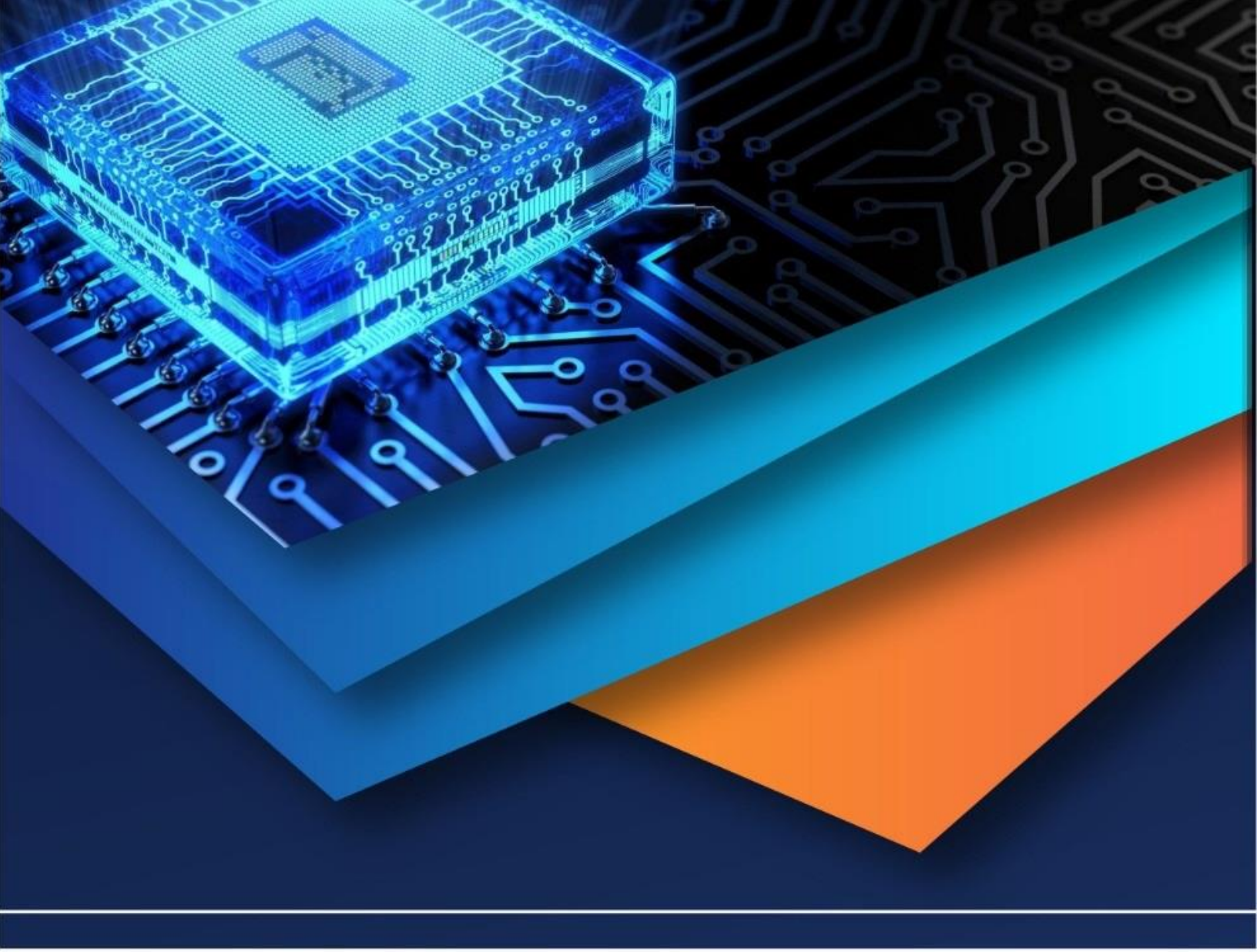

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