Educational Administration: Theory and Practice
2024, 30(5), 11050-11054
ISSN:2148-2403
https://kuey.net/

Research Article

Crop Prediction Using Machine Learning

Mukul Saini[1*], Ritik Arya[2], Harsh Dev[3], Md. Shahid[4]

[1*,2,3,4]Computer Science Department Meerut Institute Of Engineering And Technology, Meerut 250001
mukul.saini.cse.2020@miet.ac.in, ritik.arya.cse.2020@miet.ac.in, harsh.dev.cse.2020@miet.ac.in, md.shahid@miet.ac.in

Citation: Mukul Saini, et al (2024), Crop Prediction Using Machine Learning, *Educational Administration: Theory and Practice*, *30*(5), 11050-11054
Doi: 10.53555/kuey.v30i5.4883

ARTICLE INFO

ABSTRACT

As is well known, the majority of people in India work in agriculture, making it the country with the second-highest population in the world. Farmers are planting the same crops over and over again without experimenting with other varieties, and they are dousing crops in fertilizer in arbitrary amounts without understanding the amount and composition of deficiencies. Thus, this has a directly affects the yield of crops in crop output Furthermore to acidify soil and destroying the top layer. Therefore, we used machine learning techniques to construct the system with the benefit of farmers in mind. Our technology will recommend the most appropriate crop for the land based on weather and content characteristics. Additionally, the system offers details on the necessary amount and composition of fertilizers as well as the seeds needed for growing.
Therefore, producers may grow a new crop variety, perhaps raise their profit margin, and prevent soil contamination by using our technology.

Keywords: Rainfall prediction, SVM, crop recommendation, machine learning, crop prediction, decision tree

Introduction

In India, one of the major professions is farming. That is the most expansive economic sector and is essential to the success of the country as a whole. In order to meet the requirements of 1.3 billion individuals, agriculture occupies about 60% of the country's total land area[1]. Therefore, using modern Technology used in agriculture is essential. This will steer farmers in our country toward profit. Previous agricultural forecasts and yield projections were made using farmers' prior expertise in a specific region. Their knowledge of soil nutrients is inadequate nutrients in the dirt, like potassium, phosphorus, and nitrogen, hence they will only select the previous crop from their neighbourhood or the more popular crop in the area. Crop rotation is not recommended in the current situation because necessary, or insufficient fertilizer application results in lower yields, soil pollution (also known as soil acidification), significant harm to the soil's top layer[2]. We used machine learning to create the system with the welfare of farmers in mind, taking into consideration all of these issues[3]. The field of agriculture will never be the same thanks to machine learning (ML). With the advent of large data and high-performance computers, machine learning—a branch of artificial intelligence—has emerged to provide new opportunities for data-intensive research in the interdisciplinary subject of agrotechnology. In the field of agriculture, for instance, machine learning is neither a hidden method nor a magic trick. It is a set of carefully crafted models that, depending on soil composition and meteorological factors like pH, temperature, humidity, and rainfall, collect specific data and apply certain algorithms to get desired results. They come from L C Farm Mandy, the government website, and the weather agency. The farmers or sensors feed the system with the required data, such as temperature, humidity, and PH. To find patterns in the input data and treat it according to input parameters, machine learning prediction algorithms like Support Vector Machine (SVM) and Decision tree are used to the data. The algorithm recommends a crop and the amount of fertilizer to be added for the crop that is expected[4].

Literature Review:

To increase farmer profits Regarding the standard of the farming sector, Rohit Kumar describes methods for predicting agricultural production and suggests a good crop[5][6]. Making use of the Hadoop algorithm and

platform, a significant volume of data—also known as big data—including meteorological and soil data was obtained for the purpose of predicting agricultural production in this article. To improve crop quality, one may therefore predict which crop is appropriate in a given scenario using repository data. Rahul Kumar uses a machine learning technique to explain agricultural yield and rain-fall forecast. In this work, many methods for machine learning are discussed for forecasting rainfall and agricultural production[7]. The effectiveness of various methods for machine learning, like decision trees, SVM, liner regression, KNN method, is also mentioned. They determine that SVM has the best rainfall prediction effectiveness in that methodology. Rahul Saini explains the many machine learning methods used to increase productivity in agriculture. They have examined a number of artificial intelligence techniques in this publication, such as machine learning algorithms and large-scale data analysis for precision agriculture[8]. Neural networks, ensemble-based models, KNN, etc. are used to describe the crop recommender system.

Proposed work plan :

The proposed method will use meteorological and soil composition data to determine which crop would be best for a specific piece of land.
factors such dirt pH, temperature, humidity, and rainfall.

SYSTEM FLOWCHART :

Figure 1

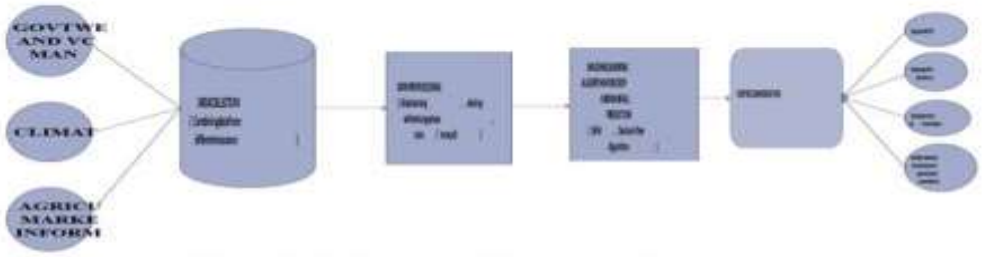

Figure 1. Architecture of the proposed system.

The Architecture of the proposed system consists of various blocks as shown in the fig (1) as follows

2.2 Data Gathering:

Data collection is the most efficient approach to collect and examine information from a variety of sources, like VC Form Mandy, APMC, and government websites. These characteristics have to be present in this dataset: i) pH of the soil ii) Climate (temperature, humidity, and rainfall), iv) Crop data, and vi) NPK levels are among the elements that crop prediction will take into account. We gather rainfall data from prior years in order to anticipate the yearly rainfall.

Data preprocessing:

after the acquisition of datasets from several sources. There are several ways to go about data preparation; it starts with reading the gathered dataset and goes all the way to data cleaning. Some duplicated qualities were found in the datasets during data cleaning, but such traits were not taken into account for crop prediction[9][10]. Therefore, we need to eliminate unwanted traits and datasets with missing values in order to increase accuracy. It is necessary to either eliminate or replace up these missing values with unwanted nan values. Next, state the model's objective. After data cleaning, the dataset will be split into training and test sets using the skill learn library.

Machine Learning Algorithm for Prediction: -

Machine learning prediction algorithms have greatly improved based on taught data. optimized estimation that must yield a plausible conclusion. The application predictive analytics is the use of data, statistical algorithms, and machine learning techniques to estimate the likelihood of future events based on historical data[11]. Rather than focusing exclusively on what has already happened, the goal is to offer the most accurate projection of what is likely to happen in the future. In our system, we used a supervised machine learning approach, which has two subcategories: regression and classification. The classification algorithm will work best with our setup. Predicting rainfall using the SVM software. Crop forecasting with the decision tree technique[12].

Rainfall Prediction:

The procedure begins with loading an external dataset that includes rainfall data from prior years. Next, as mentioned in the Data Pre-processing section, loaded dataset pre-processing occurs. Following the pre-processing of the data, we use an SVM classifier with an RBF kernel to train the model. Next, In the training set, the classifier is fitted.

The flow chart of rainfall prediction

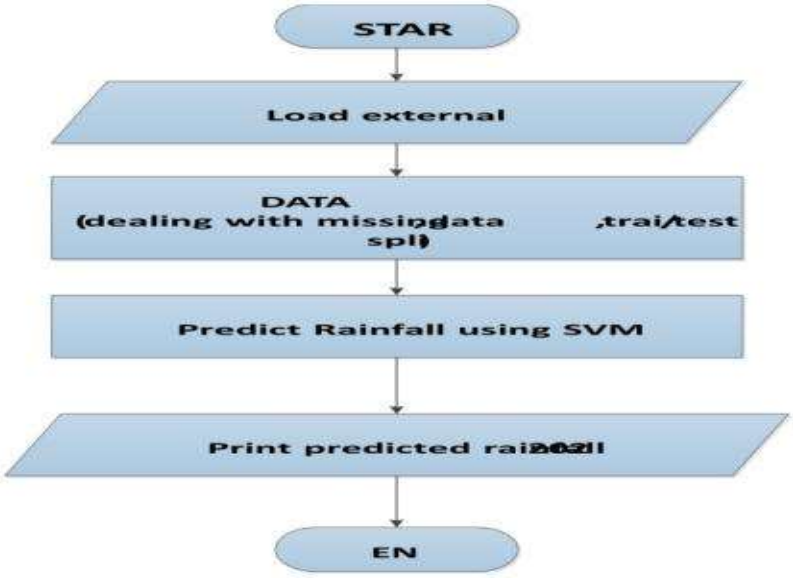

Figure 2. Flow chart for rainfall prediction.

Next, The training set is fitted with the classifier. Equation (1) expresses In mathematical terms, the radial basis function is (1, 2) = (− || 1 −^2||2) (1) Where X1 and X2's distance from Euclid is equal to gamma. Finally, when the model has been fitted and tested, it will be able to forecast the proper yearly rainfall. One of the crop prediction system's input parameters is the anticipated rainfall.

3.4. Crop Recommendation:

The optimal crop to grow will be recommended by the algorithm depending on meteorological data, projected rainfall, and soil contents. This approach furthermore furnishes information regarding the necessary fertilizers, such as The chart displays the amounts of nitrogen (N), phosphorus (P), and potassium (K) in kilograms per hectare, as well as the quantity of seed required per acre for the recommended crops. Other features of this system include the ability to show the current market price and the estimated yield for the suggested crop, expressed in quintals per acre. All of those facts will assist farmers in selecting the crop that will yield the highest profit[13].

B. Crop Prediction:

The process of crop prediction begins with the import of external agricultural datasets. Following the reading of the dataset, Pre-processing will be done in stages, as explained in the data section pre-processing. Train the decision tree classifier. models on the training set once the data has been beforehand processed. To predict the crop, we consider many parameters such as the pH of the soil, temperature, humidity, and the amount of rainfall that is expected. These are the input parameters for the system, which can be entered manually or acquired by the sensors. There will be an added list with the input parameter values and the anticipated rainfall. The decision tree algorithm will predict the crop based on list data[14][15].

. Figure (3) displays the proposed system's overall flow chart. ...

Figure 4. Overall output with GUI

We evaluated the system using a variety of data sets that were gathered from individual farmers on the state of their respective properties. Conditions of the land include variations in pH, humidity, and NPK levels. For 2020, a steady yearly rainfall is anticipated [16][17][18][19].

RESULT OUTCOME:

The suggested method suggests the most advantageous crop for 3.1. Data Gathering: - The best method for collecting and evaluating data is through data collection, which can be done from several sources, such as official websites, VC Form Mandy, or APMC, as seen in fig. 2. Data gathering takes into account elements including soil PH, temperature, humidity, and yearly rainfall. Among these factors, the system itself predicts yearly rainfall using the SVM algorithm and data from prior years; the user must provide the remaining parameters. The system shows a suitable crop, the number of seeds needed per acre, and the market price in the output column.

Required parameter for crop prediction			Predicted Crop	Entered Soil nutrients(Kg/ha)			Required nutrients for Crop (Kg/ha)			Required seed for cultivation (Kg/acre)	Approximated yield (quintal/acre)	Market price (Rs /quintal)
pH (0-14)	Temperature (°c)	Humidity (%)		N	P	K	N	P	K			
6.6	28	88	GROUNDNUT	80	16	173	40	24	-113	45	3-4	4000-5000
7.96	27	79	WATERMELON	80	16.95	613.0	200	83.5	-513	0.3	180-220	800-1200
2.6	23	80	SUGARCANE	80	4.5	245.0	200	145.5	-95	1000-1500	400-600	1000-2500
7.04	25	89	ONION	80	56.5	442.0	60	9.5	-412	350	80-100	800-1200
9	29	82	GREEN GRAM	316.68	22.2	163	-291.32	27.5	-138	6-8	2-3	700-1000

Figure 5. Tested output results

CONCLUSION :

We must gather the necessary information With just GPS locations, we may predict crops by accessing the government's rain prediction system and inputting the GPS coordinates of a plot of land. We may also develop a model to stop food surpluses and shortages.

REFERENCES:

1. Prof. D.S. Zingade , Omkar buchade, Nilesh Mehta ,Shubham Ghodekar ,Chandan Mehta “Crop Prediction System using Machine Learning”.
2. Ashwani Kumar Kushwaha, Sweta bhattachrya “crop yield prediction using agro algorithm in hatoop”.
3. Girish L, Gangadhar S, Bharath T R, Balaji K S, Abhishek K T “Crop Yield and Rainfall Prediction in Tumakuru District using Machine Learning”.
4. Rahul Katarya, Ashutosh Raturi, Abhinav Mehndiratta, Abhinav Thapper “Impact of Machine Learning Techniques in Precision Agriculture”.
5. Pijush Samui, Venkata Ravibabu Mandla, Arun Krishna and Tarun Teja “Prediction of Rainfall Using Support Vector Machine and Relevance Vector Machine”.
6. Hossain, M.A., & Ali, M.A. (2018). "Crop Yield Prediction Using Machine Learning Techniques: A Review." Journal of Agricultural Informatics.

7. Faiz, M., & Daniel, A. K. (2022). Threats and challenges for security measures on the internet of things. Law, State and Telecommunications Review, 14(1), 71-97.
8. Mall, P. K., Narayan, V., Pramanik, S., Srivastava, S., Faiz, M., Sriramulu, S., & Kumar, M. N. (2023). FuzzyNet-Based Modelling Smart Traffic System in Smart Cities Using Deep Learning Models. In S. Pramanik & K. Sagayam (Eds.), Handbook of Research on Data-Driven Mathematical Modeling in Smart Cities (pp. 76-95). IGI Global. https://doi.org/10.4018/978-1-6684-6408-3.ch005
9. Choudhary, S., Narayan, V., Faiz, M., & Pramanik, S. (2022). Fuzzy approach-based stable energy-efficient AODV routing protocol in mobile ad hoc networks. In Software Defined Networking for Ad Hoc Networks (pp. 125-139). Cham: Springer International Publishing.
10. [10] M. Faiz and A. K. Daniel, "Fuzzy Cloud Ranking Model based on QoS and Trust," 2020 Fourth International Conference on I-SMAC (IoT in Social, Mobile, Analytics and Cloud) (I-SMAC), Palladam, India, 2020, pp. 1051-1057, doi: 10.1109/I-SMAC49090.2020.9243414.
11. Faiz, M., & Daniel, A. K. (2021, December). Multi-criteria based cloud service selection model using fuzzy logic for QoS. In International Conference on Advanced Network Technologies and Intelligent Computing (pp. 153-167). Cham: Springer International Publishing.
12. Narayan, V., Daniel, A. K., & Chaturvedi, P. (2023). E-FEERP: Enhanced fuzzy based energy efficient routing protocol for wireless sensor network. Wireless Personal Communications.
13. Narayan, V., & Daniel, A. K. (2022). CHHP: coverage optimization and hole healing protocol using sleep and wake-up concept for wireless sensor network. International Journal of System Assurance Engineering and Management, 13(Suppl 1), 546-556.
14. Narayan, V., & Daniel, A. K. (2022). Energy Efficient Protocol for Lifetime Prediction of Wireless Sensor Network using Multivariate Polynomial Regression Model.
15. Narayan, V., & Daniel, A. K. (2021, October). IOT based sensor monitoring system for smart complex and shopping malls. In International conference on mobile networks and management (pp. 344-354). Cham: Springer International Publishing.
16. Narayan, Vipul, et al. "A comparison between nonlinear mapping and high-resolution image." Computational Intelligence in the Industry 4.0. CRC Press, 2024. 153-160.
17. Sandhu, Ramandeep, et al. "Enhancement in performance of cloud computing task scheduling using optimization strategies." Cluster Computing (2024): 1-24.
18. kumar Mall, Pawan, et al. "Self-Attentive CNN+ BERT: An Approach for Analysis of Sentiment on Movie Reviews Using Word Embedding." International Journal of Intelligent Systems and Applications in Engineering 12.12s (2024): 612-623.
19. Narayan, Vipul, et al. "7 Extracting business methodology: using artificial intelligence-based method." Semantic Intelligent Computing and Applications 16 (2023): 123.