ISSN (ONLINE) : 2045-8711
ISSN (PRINT) : 2045-869X

INTERNATIONAL JOURNAL OF INNOVATIVE TECHNOLOGY & CREATIVE ENGINEERING

January 2024
Vol - 14 No. 1
@IJITCE Publication

UK: Managing Editor
International Journal of Innovative Technology and Creative Engineering
1a park lane,
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UK

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International Journal of Innovative Technology and Creative Engineering
Dr. Arumugam
Department of Chemistry
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India: Editor
International Journal of Innovative Technology & Creative Engineering
36/4 12th Avenue,
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Ashok Nagar
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Email: editor@ijitce.co.uk

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IJITCE PUBLICATION

International Journal of Innovative Technology & Creative Engineering

Vol.14 No.01

January 2024

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Dear Researcher,

Greetings!

Articles in this issue discusses about study endeavours to recent trends in E-Banking.

We look forward many more new technologies in the next month.

Thanks,
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INTERNATIONAL JOURNAL OF INNOVATIVE TECHNOLOGY AND CREATIVE ENGINEERING (ISSN:2045-8711)
VOL.14 NO.01 JAN 2024

HYBRID DESIGN OF ADVANCED CROP RECOMMENDATION SYSTEM USING MACHINE LEARNING

Vidhya R
Computer Science and Engineering, Velalar College of Engineering and Technology, Erode District, Tamil Nadu, India.
Dr S Gokulraj
Computer Science and Engineering, Velalar College of Engineering and Technology, Erode District, Tamil Nadu, India.

Abstract:

Agriculture is the backbone of the Indian economy and a source of employment for millions of people across the globe. Agricultural aspects and parameters are employed to supply information that may be used to research greater approximately. Agricultural facts, Crop forecast, rotation, water requirements, fertilizer requirements and safety problems may be resolved. Due to the varying climatic conditions in the environment, a green technique of selling crop cultivation and assisting farmers with their manufacture and management is essential. Tamil Nadu, being a coastal state, has agricultural unpredictability, which reduces productivity. Increasing production should be possible with more people and land area, however it cannot be attained. Machine Learning Techniques use data to create a well-defined model that assists us in making predictions. Crop forecast, rotation, water requirements, fertilizer requirements and crop protection area challenges that may be resolved.Because of the environment's changeable climatic elements, an effective approach to aid crop cultivation and assist farmers in their production and management is required. This might help aspiring farmers improve their farming practices. With the use of data mining, a farmer may be presented with a system of suggestions to assist the min crop production.

Crops are recommended for implementation based on climatic parameters and quantity. Data analytics lays the path for the development of valuable extractions from agricultural databases. Crop data has been evaluated and crop suggestions have been made based on productivity and season. We have used different datasets on these models to get a better accuracy.

Keywords- Data set, K Nearest Neighbor (KNN), Data Preprocessing, Multiple Linear Regressions (MLR).

I. INTRODUCTION

Tamil Nadu, India's seventh-largest state, has the sixth-largest population. It is the world's largest producer of agricultural products. Tamil Nadu has major source of income is agriculture. Agriculture has a positive tone in this hypothetical planet. The Cauvery River is the primary source of water. The Cauvery delta areas are known as Tamil Nadu rice bowl. The main crop farmed in Tamil Nadu is rice. Other crops planted include paddy, sugarcane, cotton, coconut and peanuts. Bio-fertilizers are effectively manufactured. Several places farming is the most common source of income. Agriculture has a significant influence on a country's economy. Agriculture cultivation is deteriorating due to changes in natural elements. Agriculture is directly affected by environmental elements such as sunshine, humidity, soil type, rainfall, maximum and minimum temperatures, climate, fertilizers, pesticides and so on. Knowledge of correct harvesting of crops is in demand to flourish in Agriculture.

Farmers confront substantial challenges such as crop management, predicted crop yield and crop productive output. Farmers or cultivators want adequate crop cultivation assistances incemany young people are interested in agriculture these days. The impact of the IT industry on analyzing real-world problems is increasing. Data in the agricultural industry is growing by the day.

II. LITERATURE REVIEW

2.1 DATA MINING AND WIRELESS SENSOR NETWORK FOR AGRICULTURE PEST/DISEASE PREDICTIONS

In this study, A. K. Tripathy et al. claim that data-driven precision agricultural features, notably pest/disease control, need dynamic crop-weather data. An experiment was carried out in a semiarid environment to better understand crop-weather-pest/disease relationships by utilizing wireless sensory and field-level surveillance data on the closely connected and interdependent pest (Thrips) - disease (Bud Necrosis) dynamics of groundnut crop. Data mining techniques were utilized to transform the data into valuable information/ knowledge/relationships/trends, as well as the linkage of the crop-weather-pest/disease continuum. These dynamics, derived from data mining approaches and taught using mathematical models, were validated using surveillance data. Data from the Kharif (monsoon) and Rabi (post-monsoon) seasons might be utilized to construct areal-time to near-real-time decision support system for pest/disease forecasts.

2.2 ANALYSING SOIL DATA USING DATA MINING CLASSIFICATION TECHNIQUES

In this work, V. Rajeswar et al, suggest that soil is an important vital component in agriculture. The approach aims to forecast soil type using data mining classification algorithms. Methods/Analysis: Data mining classification algorithms such as JRip, J48, and Naive Bayes are used to forecast soil type. These classifier algorithms are used to extract knowledge from soil data, and two categories of soil are taken into account: red and black soil. Findings: This study summarizes Data Mining and agricultural Data Mining. The JRip model can give more accurate findings from this data, and the forecast's Kappa Statistics have been enhanced. Application/Improvement: To address Big Data challenges, effective solutions that use Data Mining to improve the accuracy of categorization of large soil data sets may be developed.

2.3 THE IMPACT OF DATA ANALYTICS IN CROP MANAGEMENT BASED ON WEATHER CONDITIONS

Agriculture, according to A.Swarupa Rani et al., is the most important application field, particularly in developing nations like India. Data mining is critical for making decisions on a variety of agricultural challenges. The purpose of data mining is to extract information from current data sets and turn it into a unique human-readable format for future usage. Crop management in a certain agricultural region is dependent on the region's climatic circumstances since climate has a large influence on
crop yield. Real-time weather data can assist in optimal crop management. The use of information and communications technology allows for the automation of extracting significant data in an effort to obtain knowledge and trends, allowing for the elimination of manual tasks and easier data extraction directly from electronic sources, transfer to a secure electronic system of documentation, and reduction of production costs, higher yield, and higher market price. It was also discovered how data mining may be used to assess and anticipate beneficial patterns from massive amounts of constantly changing climate data.

2.4 SPIKING NEURAL NETWORKS FOR CROP YIELD ESTIMATION BASEDON SPATIO TEMPORAL ANALYSIS OF IMAGE TIME SERIES

In this study, Pritam Bose et al. suggest This research introduces spiking neural networks (SNNs) for distant sensing spatio temporal analysis of picture time series that take use of extremely parallel and low-power neuromorphic hardware platforms. The creation of the first SNN computational model for crop yield estimate using normalized difference vegetation

index image time series in this study exemplifies this approach. It describes the construction and testing of a methodological framework that uses the spatial accumulation of time series of Moderate Resolution Imaging spectro radiometer 250-m resolution data and historical crop yield data to train an SNN to forecast crop yield in real time. There search also includes an examination of the optimal amount of characteristics required to maximize the out comes from our experimental data set. The suggested method was used to estimate the production of winter wheat (Triticumaestivum. L) in Shandong province, one of China's primary winter wheat-growing regions.

III. DATASET

Precision agriculture is in trend nowadays. It helps the farmers to get informed decision about the farming strategy. For the system, we are using various datasets all downloaded for government website and Kaggle.

1) Datasets Include: Cost of cultivation per dataset for major crops in each state Yield dataset, A brief description of the datasets.
2) Yield Dataset: This dataset contains yield for 16 major crops grown across all the states in kg per hectare. Yield of 0 indicates that the crop is not cultivated in the respective state.
3) Data Preprocessing: This step includes replacing the null and 0 values for yield by -1 so that it does not effect the overall prediction. Further we had to encode the dataset so that it could be fed into the neural network.

```
In [20]: crop_df=crop_df.dropna().reset_index(drop=True)
         crop_df
```

Out[20]:

	State_Name	District_Name	Crop_Year	Season	Crop	Area	Production
0	Andaman and Nicobar Islands	NICOBARS	2000	Kharif	Arecanut	1254.0	2000.0
1	Andaman and Nicobar Islands	NICOBARS	2000	Kharif	Other Kharif pulses	2.0	1.0
2	Andaman and Nicobar Islands	NICOBARS	2000	Kharif	Rice	102.0	321.0
3	Andaman and Nicobar Islands	NICOBARS	2000	Whole Year	Banana	176.0	641.0
4	Andaman and Nicobar Islands	NICOBARS	2000	Whole Year	Cashewnut	720.0	165.0
...	...	...	...	...	...	...	...
242356	West Bengal	PURULIA	2014	Summer	Rice	306.0	801.0
242357	West Bengal	PURULIA	2014	Summer	Sesamum	627.0	463.0
242358	West Bengal	PURULIA	2014	Whole Year	Sugarcane	324.0	16250.0
242359	West Bengal	PURULIA	2014	Winter	Rice	279151.0	597899.0
242360	West Bengal	PURULIA	2014	Winter	Sesamum	175.0	88.0

242361 rows × 7 columns

Fig: Data Set Collection

IV. SYSTEM ARCHITECTURE

Farmers confront substantial challenge such as crop management, predicted crop yield, and crop productive output. Farmers or cultivators want adequate crop cultivation assistances incemany young people are interested in agriculture these days. The impact of the IT industry on analyzing real-world problems is increasing. Data in the agricultural industry is growing by the day. With the growth of the Internet of Things, there are ways to capture massive amounts of data in the sector of agriculture. There is a need for a system that can clearly assess agricultural data and extract or use important information from the spreading data. It is necessary to understand and how to extract insights from data.

Extensive work has been done, and many ML algorithms have been applied in the agriculture sector.

The biggest challenge in agriculture is to increase farm production and offer it to the end-user with the best possible price and quality. It is also observed that at least 50% of the farm produce gets wasted, and it never reaches the end-user. The proposed model suggests the methods for minimizing farm produce wastage. One of the recent works, S. Pavani et.al. presented a model where the crop yield is predicted using KNN algorithms by making the clusters. It has been shown that KNN clustering proved much better than SVM or regression.

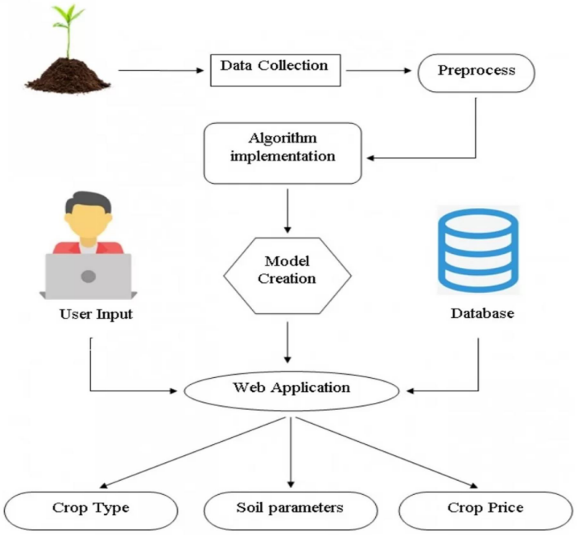


Fig: System Architecture

V. PROPOSED SYSTEM

The system prepared predict major crops yield in a particular district in Tamil Nadu. The client on their first login has to register themselves on the Web application created by flask. The login details are stored in SQLite database. Once the user login into the system they gets all the access for predicting crop yield and using the input such as location, nitrogen, phosphorous, potassium and pH values depends on their forming land environment. We can also find the primary nutrients of soil by given the input as crop name. It passes the various inputs to the controller which uses the Random Forest for classification.

We recommend to the former how much fertilizer required in ratio based on soil parameters and the crop price using machine learning techniques. Machine Learning (ML) approaches are currently being employed in a variety of disciplines to provide practical and effective solutions. To forecast agricultural yield, multiple ML methods based on classification, clustering, and neural networks can be utilized. In this work, we propose a method based on K-Nearest Neighbors (KNN) algorithm which detects the weather quality and predicts the suitable crop for cultivation.

VI. NEURAL NETWORK

A neural network is a set of algorithms that attempts to recognize underlying relationships in a batch of data using a method that mimics how the human brain works. Because neural networks can modify input, they can produce the best possible outcome without requiring the output criteria to be redesigned.

A neural network is analogous to the neural network in the human brain. In a neural network, a "neuron" is a mathematical function that collects and categorizes data using a specified design. The two statistical procedures that the network closely resembles are the curve fitting and regression analysis.

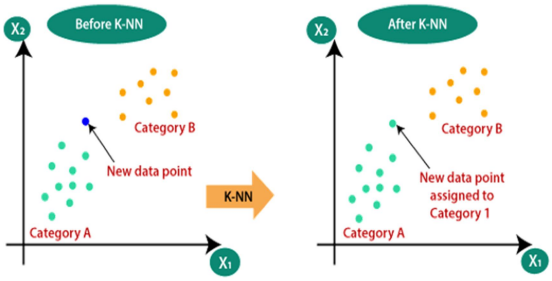


Fig: KNN Algorithm

Our system uses crop and meteorological data as inputs. In addition, our method suggests the fertilizer based on the crop predicted.

We have used popular algorithms: Linear regression, Logistic regression and Neural network and KNN. All the algorithms are based on supervised learning. Our overall system is divided into three modules:

Advantages of Proposed System

1) The proposed model predicts the crop yield for the data sets of the given region. Integrating agriculture and ML will contribute to more enhancements in the agriculture sector by increasing the yields and optimizing the resources involved. The data from previous years are the key elements in forecasting current performance.

2) The proposed system uses recommender system to suggest the right time for using fertilizers.

3) The methods in the proposed system includes increasing the yield of crops, real-time analysis of crops, selecting efficient parameters, making smarter decisions and getting better yield.

The test results show that our method accurately predicts the crop selection and yield which helps the farmers to great extent.

VII. CONCLUSION AND RESULTS

In this project, we applied KNN models of the algorithm of machine learning to the project and after applying the algorithm on the dataset we get the accuracy of 65.05%. Now we are applying the project on various algorithm such as ANN (artificial neural network), SVM (support vector machine). To

increase the efficiency of the project and accuracy in this project we take the datasets from the various government websites such as - https://data.gov.in/ and KAGGLE and apply various parameters and algorithm's to get the maximum accuracy. The maximum accuracy we attain after applying algorithm's is 65.05%. This is the accuracy we achieved after applying the KNN algorithm.

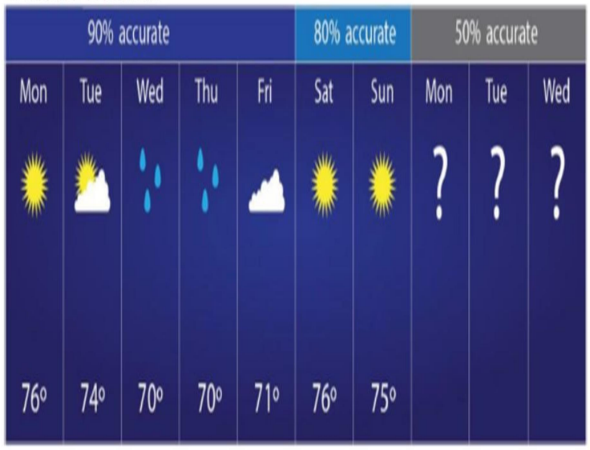
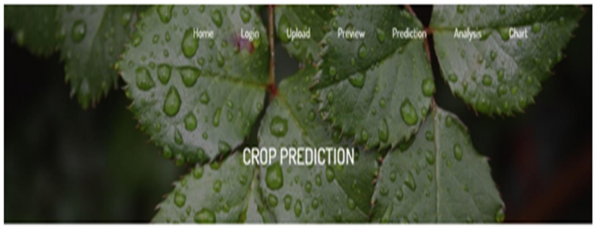


Fig: Weather Forecast



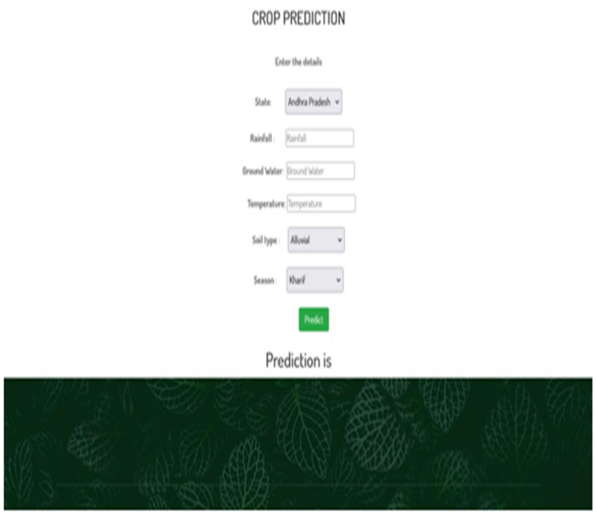


Fig: Crop Recommender System

Output for Production analysis

```
In [53]: state_name=input("Enter State_Name: ")
         state_code = getStateCode(state_name)
         validateCode(state_code)

         district_name=input("Enter District_Name: ")
         district_code = getDistrictCode(district_name)
         validateCode(district_code)

         crop_year= 2022 #float(input("Enter Crop_Year: "))

         season_name=input("Enter Season: ")
         season_code = getSessionCode(season_name)
         validateCode(season_code)

         crop_name=input("Enter Crop: ")
         crop_code = getCropCode(crop_name)
         validateCode(crop_code)
         crop_area=float(input("Enter Area: "))

         result=model.predict([[state_code, district_code, crop_year,season_code, crop_code,crop_area]])
         print('Production: ',result[0],'\n\n\n\n\n\n\n')

Enter State_Name: Uttar Pradesh
Enter District_Name: BIJNOR
Enter Season: Rabi
Enter Crop: Potato
Enter Area: 861
Production:  2487
```

Fig: Output for Production analysis

VIII. FUTURE WORK

1) The number of additional and other features can we added to the system.
2) At now currently, it take a necessary datasets as input from various government sites and KAGGLE and indicate a very appropriate crop to be cultivated.
3) But as in future, the automation property is added to the system as the response given to the feedback.
4) This can be updated to give the result with according to the humidity, water levels and temperature in the surrounding.
5) This can be updated such as that it will suggest the crop that give high production in that area and the crop will not harm the soil fertility and the environment due to some of it's chemical components.

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January 2024
Vol - 14 No. - 1
@ IJITCE Publication