



Crop Recommendation System Using Machine Learning

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Abstract- Agriculture is one of the oldest and best professions in India. In today's technology-centric world, farmers face many problems when using traditional farming methods. Precision farming is a modern method compared to traditional cultivation methods. Area, precipitation, temperature, area, etc. We estimate the appropriate crop to help farmers estimate the crop before cutting as they have planted the final crop. This method can provide a better understanding and help farmers.

In this article, we used various techniques such as ridge regression and classifiers. We use different data from these models to get better accuracy.

1. INTRODUCTION

It is well known that agriculture is the backbone of the Indian economy. Agriculture is an important industry in India. More than 60 percent of the country's land is used for agriculture and feeds 1.3 billion people.

Agriculture is the cultivation of plants and animals. Agriculture in India was born for prosperity. We need air to grow crops. Therefore, soil is an important part of agriculture. Weather knowledge is essential for good food production.

It provides the necessary nutrients, water, oxygen and support to the roots. Soil is the source of food and the home of all plants used in food production. Many soil types are available in India. Alluvial soil (cotton, rice), black soil (sugarcane, sunflower), red soil (corn, ragi), red soil (beans, tea, coffee) etc. Much research has been done to improve agricultural planning. Crops can be suggested using machine learning techniques.

Machine learning may be a subfield of artificial intelligence that depicts the capacity of machines to imitate the behavior of brilliant individuals. AI systems are used in the same way that humans handle complex tasks. Machine learning starts with data such as financial transactions, contacts or images.

Collect and process data used to generate machine learning data.

The more information, the better the software displays. Next, the developer chooses the machine learning model to use, feeds it with data, and trains the system to find patterns or make predictions on its own.

2. Literature Survey

Agricultural crop recommendation system frameworks are accessible within the showcase which consider different parameters like climate at the time the edit is to be planted, soil sort, geology of the locale, temperature and rainfall in the region, market prices of the crop, crop duration, etc. Research has been carried out in this field and the following papers have been referred for the purpose of research and study.

Reference [1], this article introduces a method called Crop Selection Method (CSM) to solve the crop selection problem and maximize the yield of seasonal crops if it is the largest economy in the country. The plan can increase the yield of crops.

In Reference [2], This paper has proposed a system which will assist the farmer to choose the right crop by providing the intuition which cannot be tracked. It decreases the chances of crop failure and increases productivity. Helps farmers by preventing losses. For efficient yield forecasting prediction real time monthly weather data is taken.

In Reference [3], This paper has proposed a paper in which the proper prediction of crops is informed to the agriculturists based on real time by considering the various parameters like production and season. Different Data Mining techniques and Big Data techniques are followed by the system for precise prediction of crops. Then personalized and relevant recommendations are given by the system to the farmers which results in yielding good volume production.

Reference [4] is a farmer recommendation system that specifies location search module, data analysis and storage module, crop database, geodatabase. Time Location Similarity identifies locations similar to user's locations and checks for similar crops between these locations.

In Reference [5], This article proposes and implements a recommended cropping strategy that can be easily implemented by farmers in India. The system will help farmers decide which crops to plant based on various environmental and geographical conditions. We also used a service called Rainfall Predictor, which predicts precipitation for the next 12 months.

In Reference [6], This article presents a proposal with CHAID, K-Nearest Neighbors and Naive Bayes as students to propose crops for a given area with high accuracy and efficiency, using common modeling and majority voting techniques using random trees.

3. Dataset

For the system, we use various datasets that are downloaded to government websites and Kaggle. The


Dataset includes: Crop prices dataset for all major crop data in each state, brief description of the dataset:

Yield dataset: This dataset contains the results of 16 crops grown in each province in kilograms per hectare. A yield of 0 means crops are not growing in the state.

Data Preprocessing

This step involves replacing the null and 0 values of production with -1 so that it does not affect the overall forecast.

Additionally, we need to encode the dataset so that it can be input into the neural network.

 Home Upload Preview Weather Forecast Production Prediction Crop Prediction Log-Out							
	State Name	District Name	Crop Year	Season	Crop	Area	Production
0	Uttar Pradesh	GAUTAM BUDDHA NAGAR	2014	Kharif	Rice	22522	62701.0
1	Uttar Pradesh	GAUTAM BUDDHA NAGAR	2014	Kharif	Sugarcane	1798	131612.0
2	Uttar Pradesh	GAUTAM BUDDHA NAGAR	2014	Kharif	Urad	12	6.0
3	Uttar Pradesh	GAUTAM BUDDHA NAGAR	2014	Rabi	Barley	1021	3065.0
4	Uttar Pradesh	GAUTAM BUDDHA NAGAR	2014	Rabi	Masoor	7	4.0
5	Uttar Pradesh	GAUTAM BUDDHA NAGAR	2014	Rabi	Peas & beans (Pulses)	41	31.0
6	Uttar Pradesh	GAUTAM BUDDHA NAGAR	2014	Rabi	Potato	165	3366.0
7	Uttar Pradesh	GAUTAM BUDDHA NAGAR	2014	Rabi	Rapeseed & Mustard	336	326.0
8	Uttar Pradesh	GAUTAM BUDDHA NAGAR	2014	Rabi	Wheat	40032	85909.0
9	Uttar Pradesh	GAUTAM BUDDHA NAGAR	2014	Summer	Moong(Green Gram)	251	194.0
10	Uttar Pradesh	GAUTAM BUDDHA NAGAR	2014	Summer	Onion	4	61.0
11	Uttar Pradesh	GAUTAM BUDDHA NAGAR	2014	Summer	Urad	78	42.0
12	Uttar Pradesh	HAZIABAD	1997	Kharif	Arhar/Tur.	2071	1457.0
13	Uttar Pradesh	HAZIABAD	1997	Kharif	Bajra	1376	1927.0
14	Uttar Pradesh	HAZIABAD	1997	Kharif	Jowar	282	224.0
15	Uttar Pradesh	HAZIABAD	1997	Kharif	Maize	13719	24626.0
16	Uttar Pradesh	HAZIABAD	1997	Kharif	Moong(Green Gram)	19	8.0
17	Uttar Pradesh	HAZIABAD	1997	Kharif	Oilseeds total	3078	3487.0
18	Uttar Pradesh	HAZIABAD	1997	Kharif	Onion	57	563.0
19	Uttar Pradesh	HAZIABAD	1997	Kharif	Rice	13719	31372.0
20	Uttar Pradesh	HAZIABAD	1997	Kharif	Small millets	3	2.0
21	Uttar Pradesh	HAZIABAD	1997	Kharif	Total foodgrain	105397	307337.0
22	Uttar Pradesh	HAZIABAD	1997	Kharif	Urad	195	81.0
23	Uttar Pradesh	HAZIABAD	1997	Rabi	Barley	1601	5021.0
24	Uttar Pradesh	HAZIABAD	1997	Rabi	Gram	178	155.0
25	Uttar Pradesh	HAZIABAD	1997	Rabi	Masoor	393	333.0

4. System Architecture

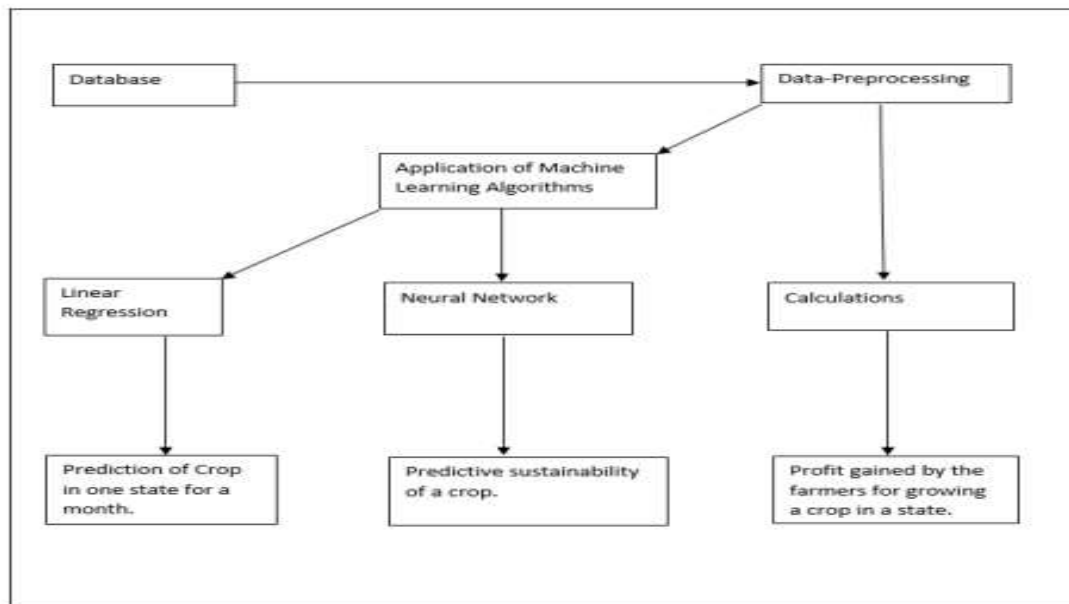


Fig 4.1 System Architecture

A framework engineering could be a conceptual show utilizing which we are able characterize the structure and conduct of that framework. It may be a formal representation of a framework. Depending on the setting, framework design can be utilized to allude to either a show to describe the framework or a strategy utilized to construct the framework. Building a proper system engineering makes a difference in examination of the venture, particularly within the early stages. Figure 4.1 portrays the framework design and is clarified within the taking after segment.

5. PROPOSED SYSTEM

- In this project we propose a system to solve the current problem. The novelty of the planning process is that it guides farmers to achieve maximum yields and recommend the most profitable crops for a given area.
- The proposed model enables product selection according to economy and environment, and helps to meet the country's food needs by choosing the most efficient products. The proposed model estimates crop yields by examining factors such as state, region, region, season, and more. The system also helps determine the best time to apply fertilizer.
- The user gives the province, district, season, crop and area as production.
- The user provides state, territory, season, and region as product recommendations. As requested, the model predicts yield for a given crop. The model also shows the most profitable crops and suggests the best time to apply fertilizer.
- The main goal is to get better crops that can grow throughout the season. The planning process will help reduce the problems farmers face in product selection and maximize yields.

ADVANTAGES OF PROPOSED SYSTEM:

- The proposed model predicts crop yield for an area of the dataset. The combination of agriculture and machine learning will lead to greater improvements in agriculture by increasing yields and improving related resources. Data from previous years are important in predicting current performance.
- The system requests the use of a recommendation to indicate the correct time to apply fertilizer.
- Techniques in the planning process include increasing the crop, analyzing the crop in real time, choosing the negative, making smarter decisions and achieving better results.

6. CONCLUSION

At the end of this project I will say that I learned a lot from many places to do this. I used many algorithms, techniques and tricks to complete this project. At the beginning of this project, we used the KNN model of the machine learning algorithm for the project, and after using the algorithm on the data, we achieved 65.05% accuracy.

Now we use this project for various algorithms like ANN (Artificial Neural Network), SVM (Support Vector Machine). To increase the efficiency and accuracy of this project - we collect data from various government websites such as <https://data.gov.in/> and KAGGLE and use various parameters and algorithms for the most accurate one. The maximum value we get after using the algorithm is 65.

05%. This is the truth we got after using the KNN algorithm. Finally, we found that our model was trained to help farmers choose the right crops, reduce crop failures and increase productivity by providing insights that ordinary farmers cannot follow. At the same time, it also helps things that protect them from damage. The system can be connected to the web and accessed by millions of farmers nationwide.

By creating our own training data and optimizing our architecture, we can overcome data conflicts and run on devices with low memory, storage and computational requirements. A further development is to combine the recommended cultivation with another subsystem; this is a yield estimate that can provide the predicted results if farmers plant the recommended crops.

7. Results and Performance Analysis

For the purpose of this Study we use popular algorithms: linear regression, logistic regression, Neural network and KNN. All the algorithms are based on supervised learning. Our Whole process is divided into three modules:

- Crop recommender
- Production analysis
- Whether forecast

Output of Crop Recommender :



Crop Prediction

Select State ▼

Select District ▼

Select Season ▼

Crop Year

Crop Area

Predict

Prediction is:

International Research Journal
IJNRD
Research Through Innovation

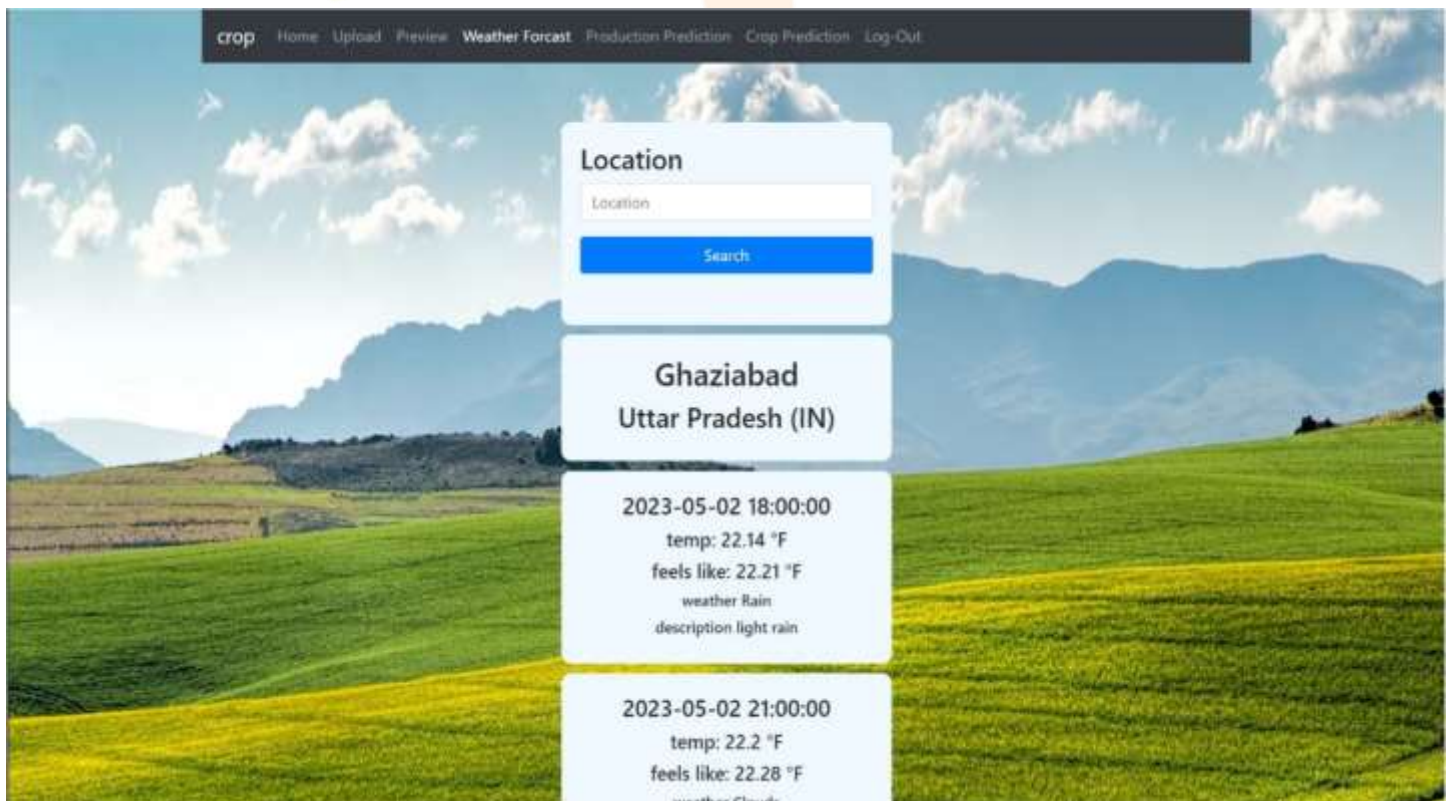
Output for Production analysis:-



The image shows a web form titled "Production Prediction" overlaid on a background of rolling green hills and mountains. The form contains several input fields and a button:

- Select State (dropdown menu)
- Select District (dropdown menu)
- Select Season (dropdown menu)
- Select Crop (dropdown menu)
- Crop Year (text input)
- Crop Area (text input)
- Predict (green button)
- Prediction is: Ton (text output)

Whether forecast:



The image shows a web form titled "Weather Forecast" overlaid on a background of rolling green hills and mountains. The form contains several input fields and a button:

- Location (text input)
- Search (blue button)
- Ghaziabad
Uttar Pradesh (IN)
- 2023-05-02 18:00:00
temp: 22.14 °F
feels like: 22.21 °F
weather Rain
description light rain
- 2023-05-02 21:00:00
temp: 22.2 °F
feels like: 22.28 °F
weather Clouds

8. FUTURE WORK

1. The Number of additional Jobs and other Jobs that we can add to the system.
2. It now uses appropriate information based on input from many various websites and KAGGLE and shows crops suitable for cultivation.
3. In the future, automatic function will be added to the system in the response given to the feedback.
4. This can be adjusted to benefit the surrounding soil, water level and temperature.
5. This can be adjusted, for example, it will show the crops that are beneficial in the area and will not harm the soil fertility and roundness of the crops due to some of their chemical composition.

9. CODE

We are trying to generate code in python language with different libraries according to the needs of the project. We are writing code on the Jupyter notebook in the Anaconda application.

We also use some CSS frameworks like HTML, Cascading Style Sheets and bootstrap with JavaScript to make front-end code.

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