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AI-Assisted Farming for Crop Recommendation Farm Yield Prediction Application

Introduction

This is a Software model on AI-assisted farming for crop recommendation and yield prediction using machine learning solutions.

Overview

To help farmers in minimizing the risks involved in agriculture, we propose to create an application that recommends farmers about the best crops to be cultivated based on climatic parameters, nutrients and also predicts the yield and revenue that would be generated for the cultivated land.

Digital Farming and Precision Agriculture allow precise utilization of inputs like seed, water, pesticides, and fertilizers at the right time to the crop for maximizing productivity, quality, and yields. Most of the farmers practice traditional farming patterns to decide crops to be cultivated in a field. Thus, the solution to this Challenge can be a crop recommendation system that helps farmers to decide the right crop to sow in their field and forecast the yield & revenue.

Survey

Existing problem

Can you imagine an industry that involves more risk than agriculture? Usually, people say "You reap what you sow", but what they forget to add is "only if you're lucky." When the weather strikes or crops get affected by the disease, farmers can hardly talk about yields or when a global pandemic hits, all of a sudden it gets harder to manage various processes because most are not digital.

At the same time, the global population is growing and urbanization is continuing. Disposable income is rising, and consumption habits are also changing. Hence, farmers are under a lot of pressure to meet the increasing demand and they need a way to increase productivity. Thirty years from now,

there will be more to feed, and since the amount of fertile soil is limited, there will also be a need to move beyond traditional farming.

We need to look for ways to help farmers minimize their risks, or at least make them more manageable. Implementing artificial intelligence in agriculture on a global scale is one of the most promising opportunities.

Proposed solution

Making an application that recommends farmers about the crops that can be best cultivated in their agricultural land based on climatic parameters and nutrient features and also predict the yield and revenue that would be generated for the cultivated land. The proposed solution is implemented by making use of IBM services (Watson studio / Auto ai/ build machine learning model) which can be integrated into an interactive GUI-based web Interface.

1. A Machine Learning model that predicts the amount of yield produced and also recommends suitable crops using IBM capabilities.
2. recommends crops using IBM capabilities
3. Integrate the model with UI(User interface)
4. Presenting data in an interactive web application.

Technological Approach

- AI can potentially change the way we see agriculture, enabling farmers to achieve more results with less effort while bringing many other benefits like the ones mentioned below.
- With the help of AI, it’s possible to automate harvesting and even predict the best time for it.
- AI can simplify crop selection and help farmers identify what sort of crop will be most profitable.
- Predictive analytics can be a real game-changer. Farmers can collect and process significantly more data and do it faster with AI than they would otherwise. Analyzing market demand, forecasting prices, and determining the optimal time for sowing and harvesting are key challenges farmers can solve with AI.

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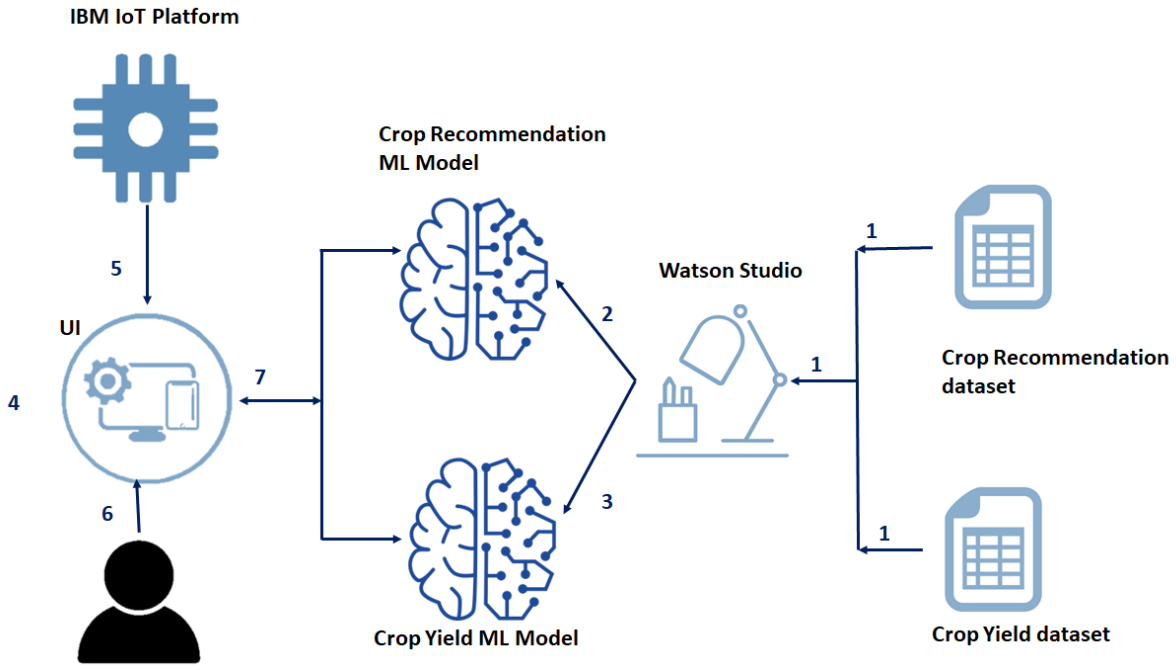
Software Designing:

A solution model has been created using Django Web Application Framework and Watson Studio. The web App with a Machine learning model can provide the Solution prediction accurately.

IBM Watson Desktop, IBM Cloud, IBM Auto AI, IBM Watson Studio, Android, python Django web development framework, sqlite3, sklearn.

Flowchart:



Advantages:

1. Increased yield.
2. Cost estimation can be done.
3. Predicted output has high accuracy.
4. Precautionary measures can be taken earlier.

Disadvantages:

1. Sudden changes affect data forecasts.
2. Predictions may vary at times of Natural Calamities.

Applications:

1. Used in food industries.
2. Used in warehouse management.
3. Machine learning techniques allow accurate results of prediction.
4. Compared to traditional demand forecasting methods, machine learning accelerates data processing speed.

Conclusion:

Therefore, our project can be used to predict the yield produced and the crop recommended.

Future Scope:

The scope of this project is to determine the crop yield of an area by making use of datasets with features that are considered to be vital for the production and sustenance of crops such as temperature, moisture, rainfall, nutrients present in the soil, and also based on the production of the crops in previous years. The yield can be precisely calculated with the help of various regression models available in Watson studio, Watson Assistant, and various other IBM services.

The growing demand for Machine Learning (ML) and Artificial Intelligence (AI) in almost every industry is compelling employees across the globe to learn new skills in Data Science. It is said that AI and ML are expected to impact and transform our lives in ways beyond imagination similar to the internet.

Fortunately for demand planners, ML can now help further improve the forecast from *40% of actual to 70% of actual*.

Machine Learning can predict future weather patterns at the local level and identify how it connects to local demand patterns. **Machine Learning** can also determine if a lag exists between the weather changes and the demand of products on a real-time basis. The life cycle of a product plays a critical role in demand **forecasting**.

Bibliography:

1)Data Collected from:

- ➢ Crop Recommendation dataset :

https://github.com/https://www.kaggle.com/siddharthss/crop-recommendation-dataset

- Crop Yield Dataset:

  https://github.com/shreyzo/Crop-yield-and-profitability-prediction/blob/main/datafile.csv

2)Storage: https://www.cloud.ibm.com

3)Machine learning:

- https://en.wikipedia.org/wiki/Machine_learning
- https://www.ibm.com/in-en/analytics/machine-learning

4)Watson Studio: https://www.ibm.com/in-en/cloud/watson-studio

5)Django: https://www.djangoproject.com/

Appendix:-

Github repository-
https://github.com/smartinternz02/SBSPS-Challenge-5361-AI-Assisted-Farming-for-Crop-Recommendation-Farm-Yield-Prediction-Application

Google Drive Link-
https://drive.google.com/drive/folders/17NnI1mDtg06x5paGCJ7IuG7l8b5_Jkoh?usp=sharing

Video Demonstration -
https://drive.google.com/file/d/1DOcjk7dwhFX1uXUxwQbsmTjE_zJw7z1h/view?usp=sharing

Presentation -
https://docs.google.com/presentation/d/1gcCXJCXY1d6lALK0ZjNQ9dAZhQAxdxWN/edit?usp=sharing&ouid=100801092551792705034&rtpof=true&sd=true

ScreenShots
https://drive.google.com/drive/folders/1F5RJvLozvANo292_nan8a4Stf0KYfclj?usp=sharing

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Team Members:-

- *Venkata Gunasekhar V*
- *Tamil Mani P*

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Daily Update Report

Analysing Project:-

Project analysis has been done.
Contents from different websites have been read and understood.

Data Collection:-

1)Data Collected from:

- Crop Recommendation dataset :

  https://github.com/https://www.kaggle.com/siddharthss/crop-recommendation-dataset

- Crop Yield Dataset:

  https://github.com/shreyzo/Crop-yield-and-profitability-prediction/blob/main/datafile.csv

The data has been cleaned and used for prediction.

ML Model:-

Name	Prediction Column	Depending Column
Yield Prediction	Production	State Name, District Name, Season, Crop, Area
Crop Prediction	Recommended Crop	N - ratio of Nitrogen content in soil, P - ratio of Phosphorus content in soil, K - ratio of Potassium content in soil, temperature - temperature in degree Celsius, humidity - relative humidity in %, ph - ph value of the soil, rainfall - rainfall in mm

ML deployment model details:-

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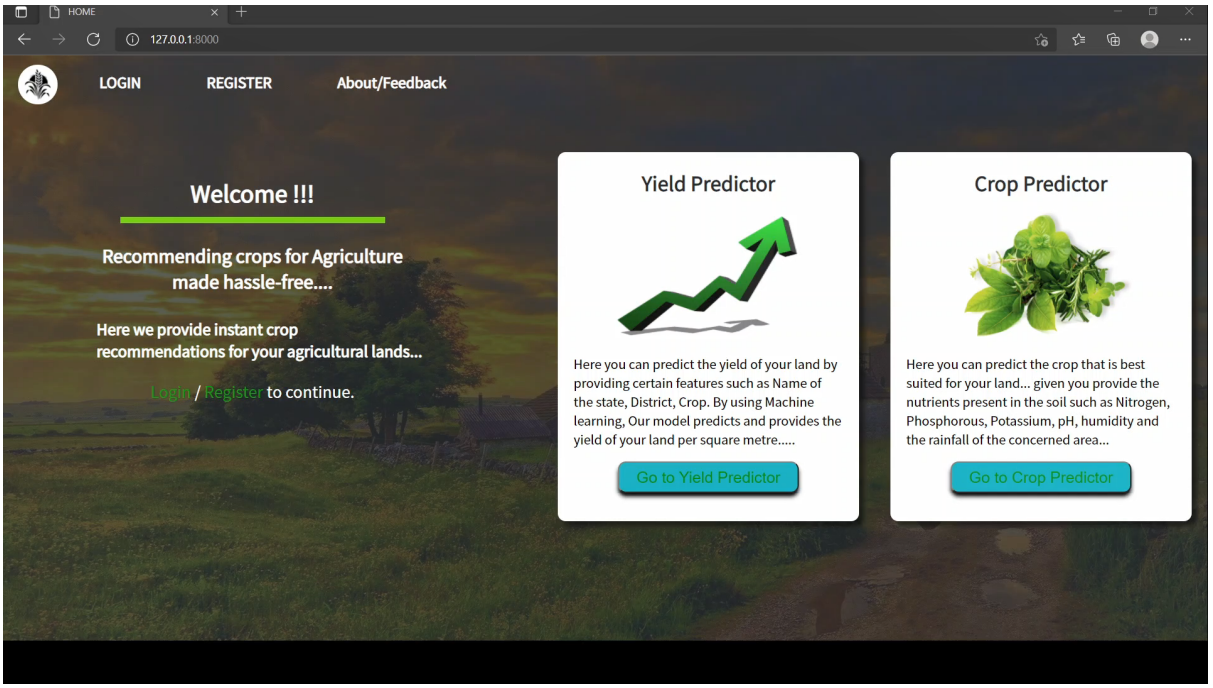
1. Yield Predictor: The source code was made using the Auto ai model in Watson studio and the created model was saved in a file for the usage in machine learning model the algorithm that was used is snapml.
2. Crop Predictor: The source code was made using the Auto ai model in Watson studio and the created model was saved in a file for the usage in machine learning model the algorithm that was used is lightgbm.

UI Model(screenshots):-

Home page-



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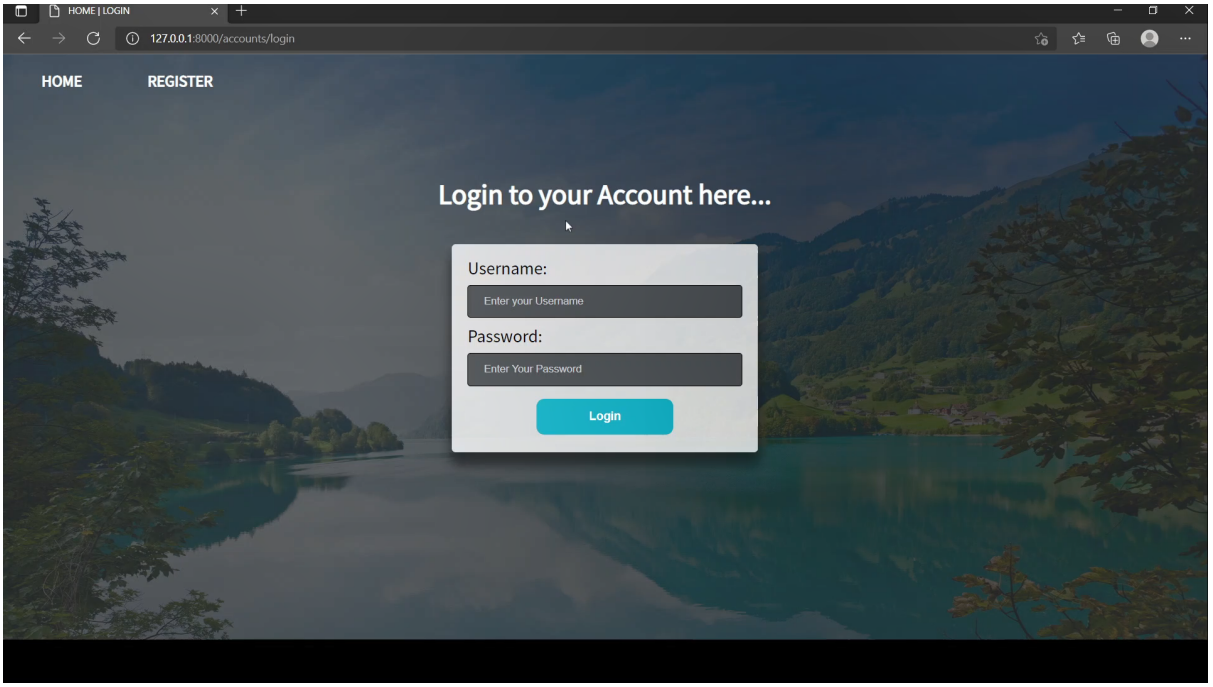
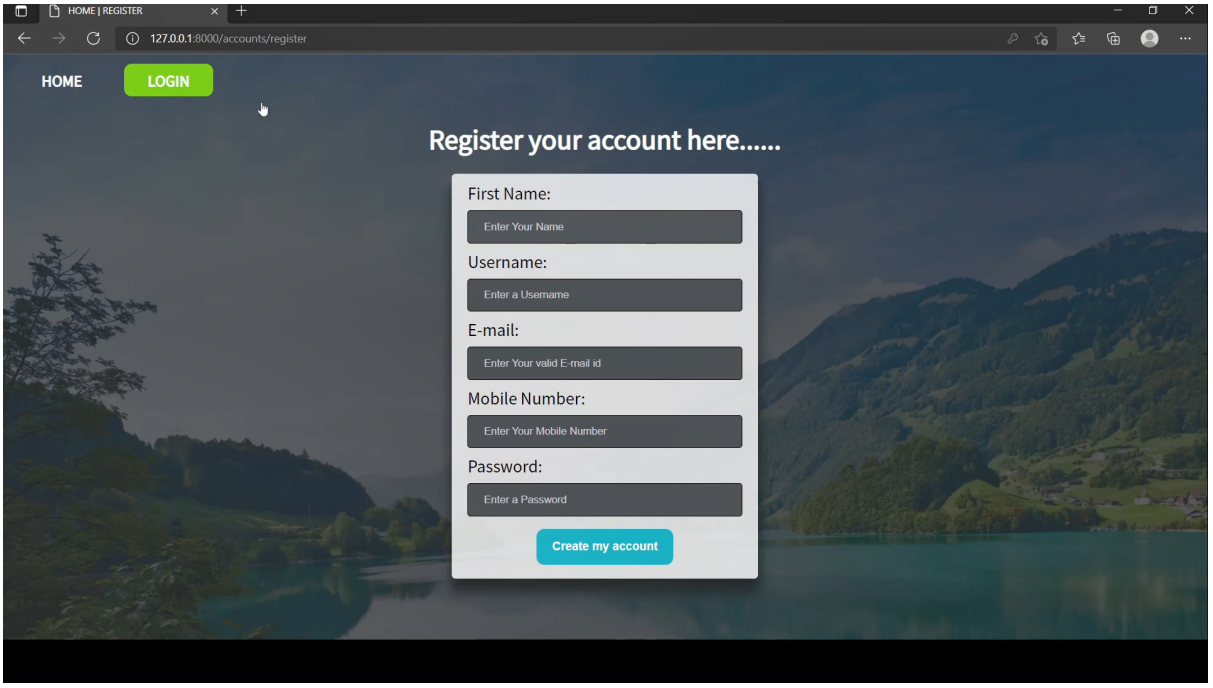
Login page-



Registration page-



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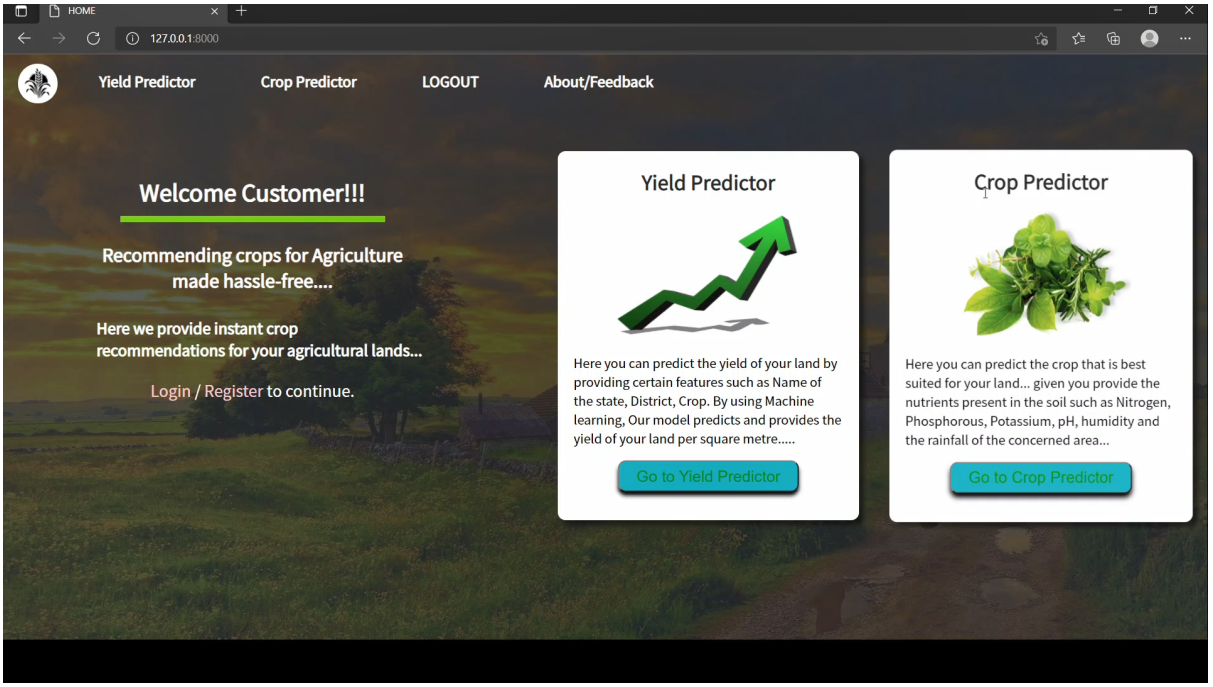
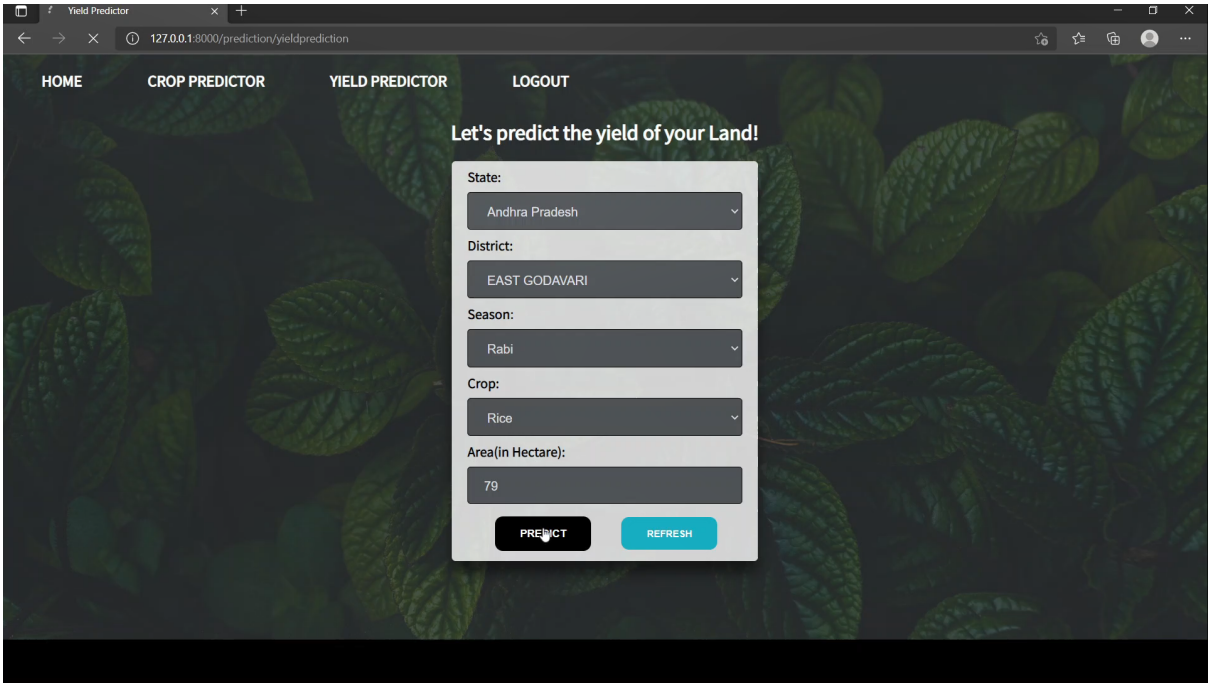
After Login-



Yield predictor-



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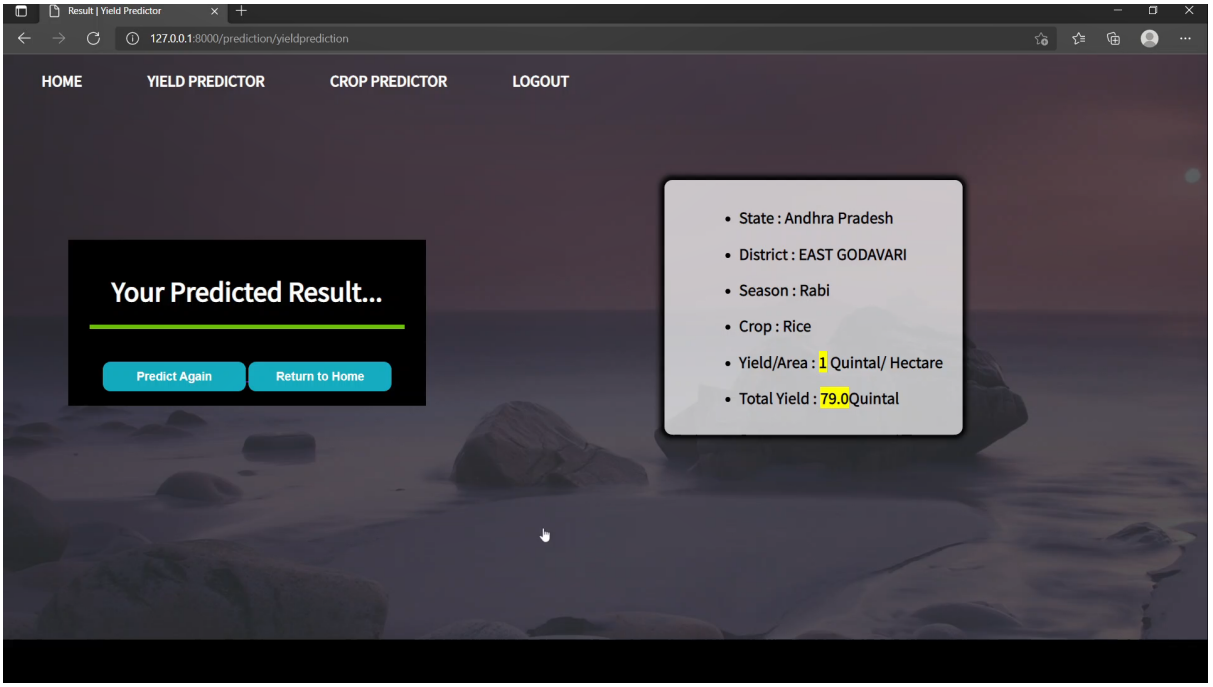
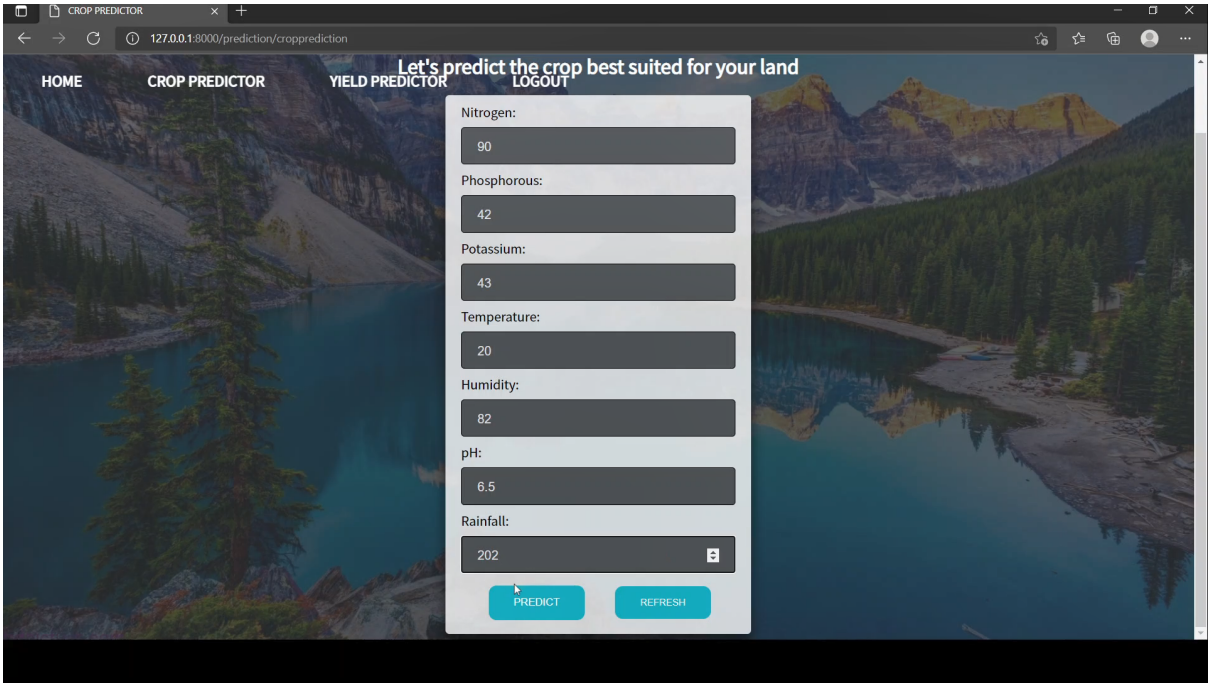
Yield Predictor result-



Crop predictor-



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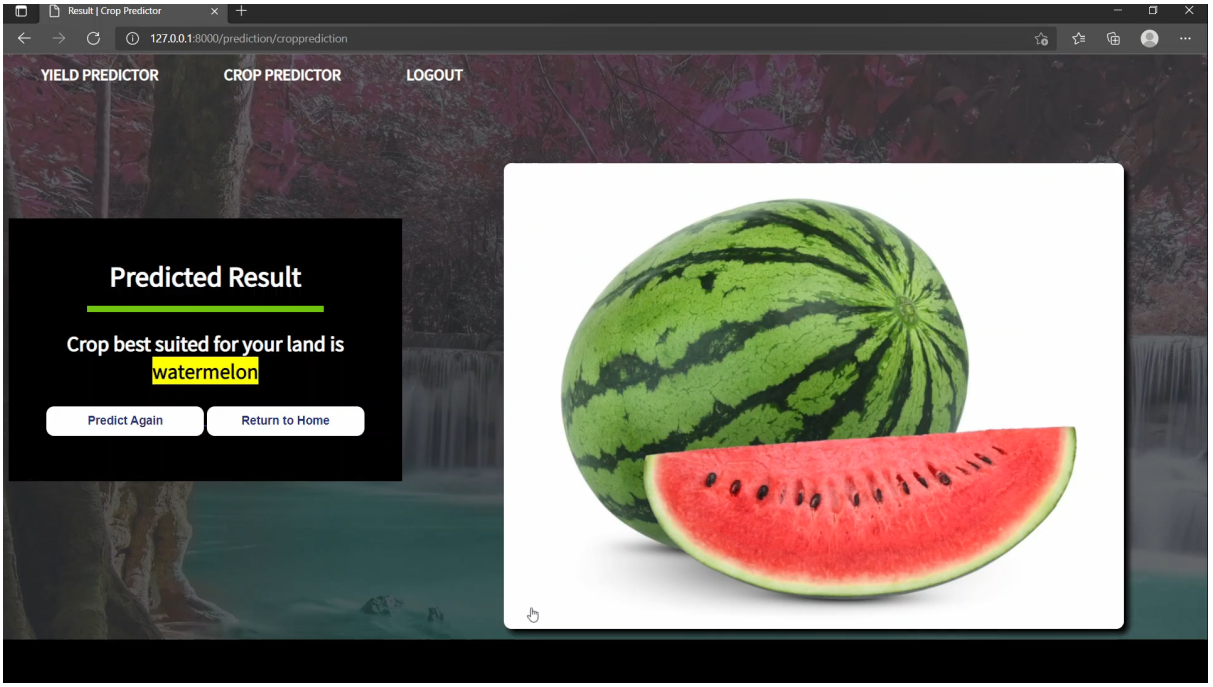
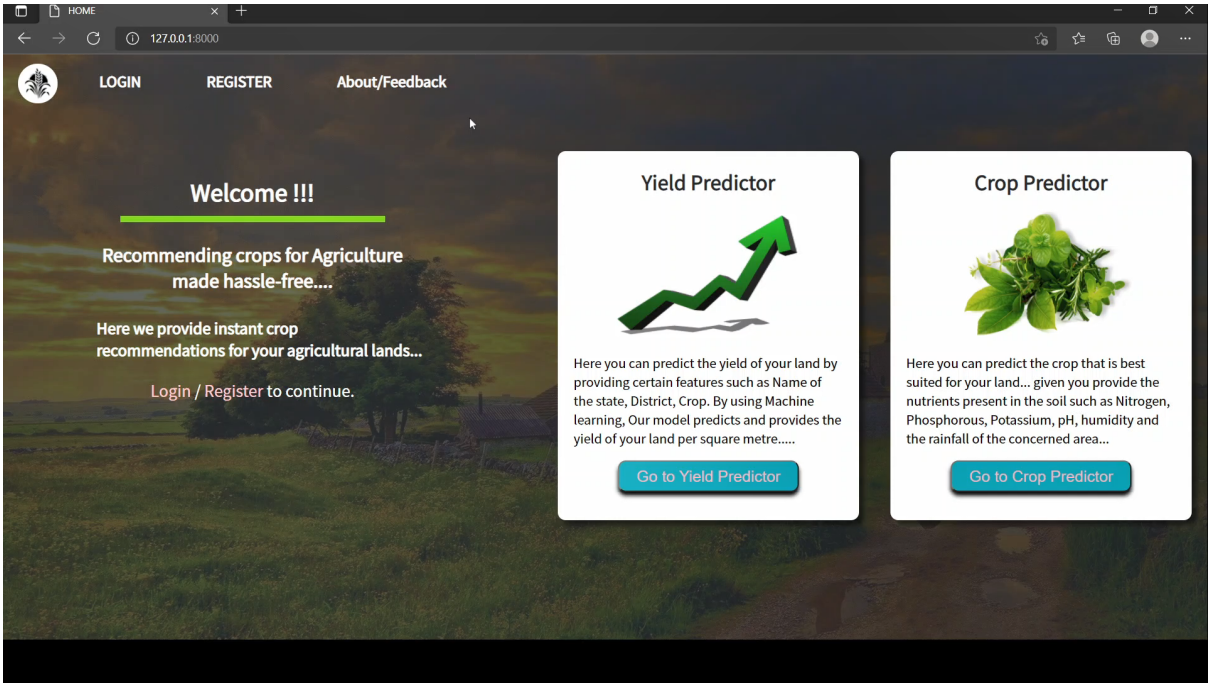
Crop Predictor result-



After Logout-



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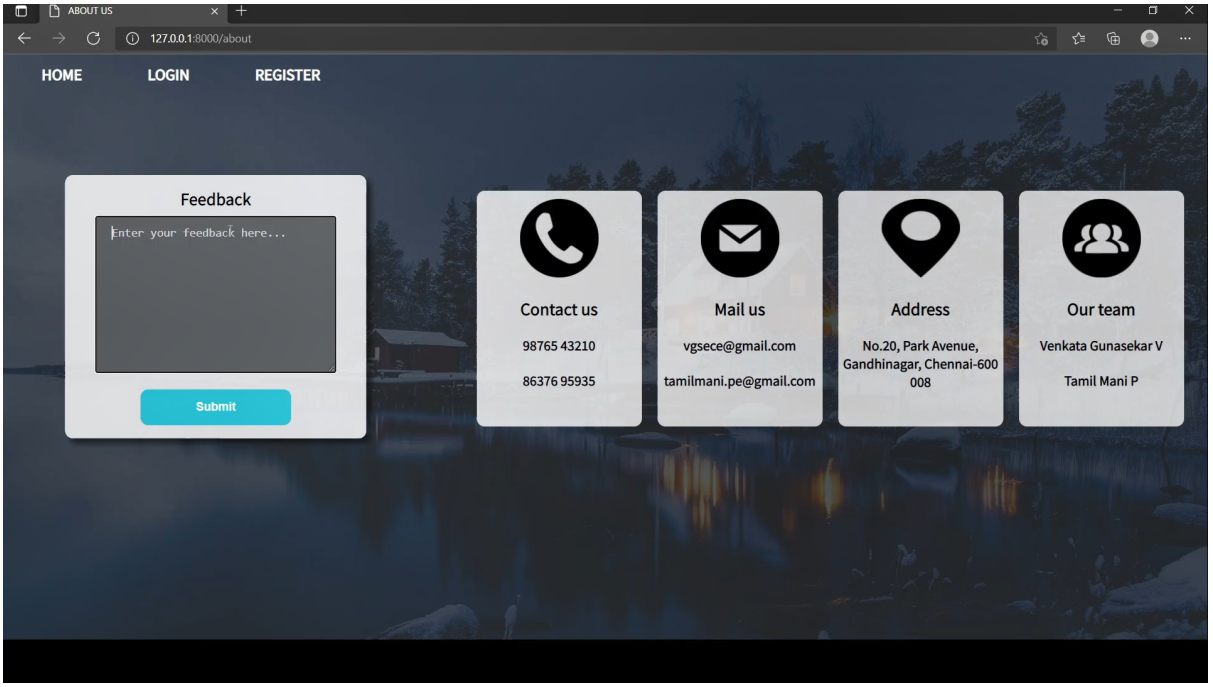
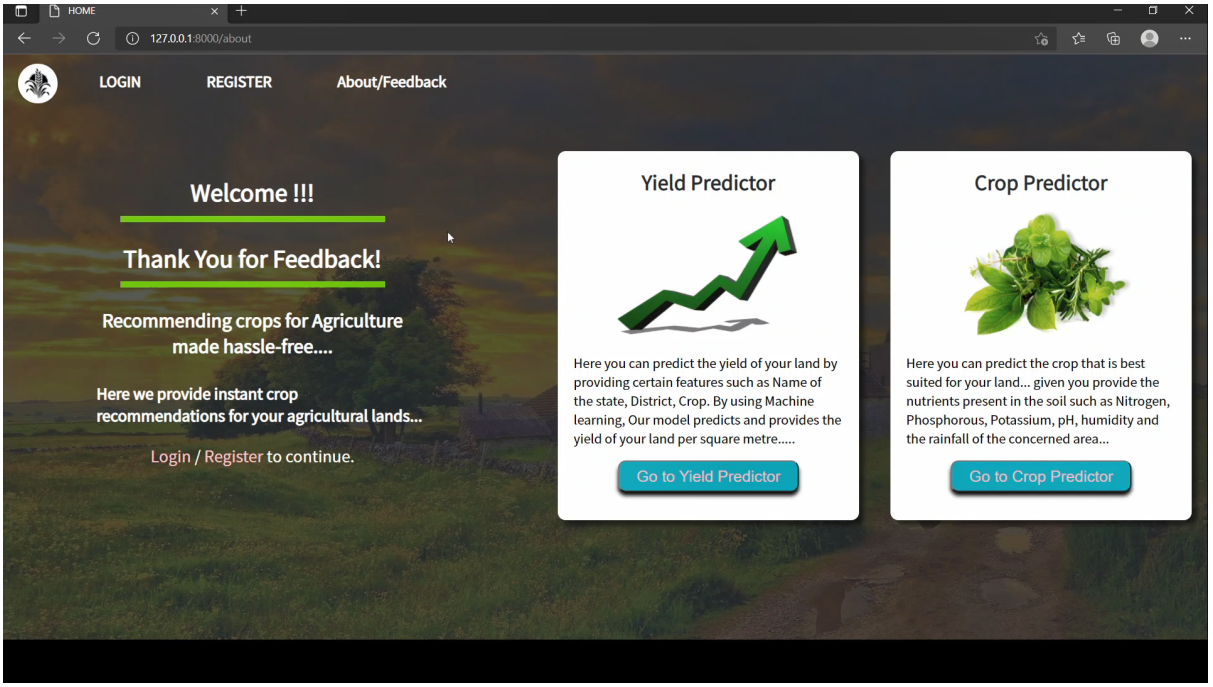
About and feedback-



After Giving Feedback-



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