A Project Report on

Agro-grow Intelligent Crop & Fertilizer Recommendation System

Submitted in partial fulfillment of the requirements for the award of the degree of

Bachelor of Engineering

in

Computer Science

by

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Under the Guidance of

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Approval Sheet

This Project Report entitled ***"Agro-grow Intelligent Crop & Fertilizer Recommendation System"*** Submitted by ***"Manasi Jadhav"(18102072),***is approved for the partial fulfillment of the requirement for the award of the degree of ***Bachelor of Engineering*** in ***Computer Engineering*** from ***University of Mumbai***.

(Prof.Amol Kalugade)
Guide

Prof.Sachin Malve
Head of Department of Computer Engineering

Place:A.P.Shah Institute of Technology, Thane
Date:04/11/21

CERTIFICATE

This is to certify that the project entitled ***"Agro-grow Intelligent Crop & Fertilizer Recommendation System"*** submitted by ***"Manasi Jadhav"(18102072)*** for the partial fulfillment of the requirement for award of a degree ***Bachelor of Engineering*** in ***Computer Engineering***,to the University of Mumbai,is a bonafide work carried out during academic year 2021-2022.

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Student ID1: 18102072

Declaration

We declare that this written submission represents our ideas in our own words and where others' ideas or words have been included, We have adequately cited and referenced the original sources. We also declare that We have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in our submission. We understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

(Signature)

(Manasi Jadhav 18102072)

Date: 04/11/21

Chapter 1

Introduction

Agriculture is one of the major sources of livelihood for about 58 percentage of our nation's population . As per the 2016-17, Economic survey the average monthly income of a farmer in 17 states is Rs.1700/- which results in farmer suicides, diversion of agricultural land for non-agricultural purpose. Besides, 48 percent of farmers don't want their next generation to take care of their agriculture instead want to settle down in urban areas. The reason behind this is that the farmers often take wrong decision about the crop selection for example selecting a crop that won't give much yield for the particular soil, planting in the wrong season, and so on. The farmer might have purchased the land from others so without previous experience the decision might have been taken. Wrong crop selection will always result in less yield. If the family is fully dependent on this income then it's very difficult to survive. Both availability and accessibility of correct and up to date information hinder potential researchers from working on developing country case studies. With resources in our reach, a system has been proposed to address this problem by providing predictive insights on crop sustainability and recommendations based on machine learning models trained considering essential environmental and economic parameters. Maharashtra underwent several fluctuations last year with respect to the retail price of onions. The price increased from Rs. 26 per kilo in the first half of the year to a whopping Rs. 50 per kilo in August . Observing the shoot in the price, many of the farmers in the state decided to grow onions on their farm, in the hope of making exorbitant profits. While this resulted in abundant supply in certain regions of Maharashtra, many other regions suffered failed crop output due to unfavorable conditions for growing onions. A subsequent shortage again in the following months had harsh ramifications on the lives of common man, as middleclass households could no longer afford onion- a frequently used commodity in their kitchen. This example just goes on to show that a farmer's decision about which crop to grow is generally clouded by his intuition and other irrelevant factors like making instant profits, lack of awareness about market demand, overestimating a soil's potential to support a particular crop, and so on. A very misguided decision on the part of the farmer could place a significant strain on his family's financial condition. Perhaps this could be one of the many reasons contributing to the countless suicide cases of farmers that we hear from media on a daily basis. In a country like India, where agriculture and related sector contributes to approximately 20.4 per cent of its Gross Value Added (GVA) , such an erroneous judgment would have negative implications on not just the farmer's family, but the entire economy of a region. For this reason, we have identified a farmer's dilemma about which crop to grow during a particular season, as a very grave one. The need of the hour is to design a system that could provide predictive

insights to the Indian farmers, thereby helping them make an informed decision about which crop to grow. With this in mind, we propose AgroGrow- an intelligent system that would consider environmental parameters (temperature, rainfall) and soil characteristics (pH value, soil type) before recommending the most suitable crop to the user. Along with that we will also provide organic fertilizer recommendation based on what the soil lacks or has excess of.

Chapter 2

Project Concept

The project is basically divided into two parts :

Subsystem1: The user has to input in all the details of the soil and the system will predict the best crop to grow based on that data.

Subsystem2: For the fertilizer recommendation ,the user will input the soil data and the type of crop they want to grow and the application will then predict what the soil lacks or has excess of and will recommend improvements to be made to the soil.

2.1 Abstract

- Agriculture plays a vital role in the socioeconomic fabric of India.
- Failure of farmers to decide on the best-suited crop for the land using traditional and non-scientific methods is a serious issue for a country where approximately 58 percent of the population is involved in farming.
- Sometimes farmers were failed to choose the right crops based on the soil conditions, sowing season, and geographical location. This results in suicide, quitting the agriculture field, moving towards urban areas for livelihood.
- To overcome this issue, this research work has proposed a system to assist the farmers in crop selection by considering all the factors like sowing season, soil, and geographical location.
- Furthermore, precision agriculture is being implemented with a modern agricultural technology and it is evolving in developing countries that concentrates on site-specific crop management.

2.2 Objectives

- The objective of this project is to develop a model that will help the farmers to decide which crop will be best suitable for their soil and based on other conditions ,that will result in maximum yield for their harvest.

- The other objective is to propose a system which will give them fertilizer recommendation based on the soil nutrient conditions like what the soil lacks or has excess of and accordingly recommend organic ways to enhance the quality of the soil based on the crops they want to grow.

2.3 Literature Review

- **Intelligent Crop Recommendation System using Machine Learning Priyadharshini A ,Aayush Kumar Swapneel.** In the proposed system the environmental parameters such as rainfall, temperature, and geographical location in terms of the state along with soil characteristics such as soil type, pH value, and nutrients concentration are being considered to recommend a suitable crop to the user. In addition to this, if the right crop is selected by the farmer then they will get the prediction about the yield also. The objective is to, 1. Build a robust model to give a correct and accurate prediction of crop sustainability in a given state for the particular soil type and climatic conditions. 2. Provide recommendation of the best suitable crops in the area so that the farmer does not incur any loss. 3. Provide profit analysis of various crops based on the previous year's data.

- **Crop Recommendation System for Precision Agriculture S.Pudumalar*, E.Ramanujam*, R.Harine Rajashree, C.Kavya, T.Kiruthika, J.Nisha.** This paper, proposes a recommendation system through an ensemble model with majority voting technique using Random tree, CHAID, K-Nearest Neighbor and Naive Bayes as learners to recommend a crop for the site specific parameters with high accuracy and efficiency.

- **Crop Selection Method to Maximize Crop Yield Rate using Machine Learning Technique Authors: Rakesh Kumar, M.P. Singh, Prabhat Kumar and J.P. Singh**This paper proposed a method named Crop Selection Method (CSM) to solve crop selection problem, and maximize net yield rate of crop over season and subsequently achieves maximum economic growth of the country. The proposed method may improve net yield rate of crops.

2.4 Problem Definition

- Failure of farmers to decide on the best suited crop for his land using traditional and non-scientific methods is a serious issue for a country where approximately 50 percent of the population is involved in farming.Both availability and accessibility of correct and up to date information hinders potential researchers from working on developing country case studies.With resources within our reach we have proposed a system which can address this problem by providing predictive insights on crop sustainability and recommendations based on machine learning models trained considering essential environmental and economic parameters.

- Agriculture is a major contributor to the Indian economy. The mainstream Indian population depends either explicitly or implicitly on agriculture for their livelihood. It is, thus, irrefutable that agriculture plays a vital role in the country. A vast majority of the Indian farmers believe in depending on their intuition to decide which crop to sow in a particular season. They find comfort in simply following the ancestral farming patterns and norms without realizing the fact that crop output is circumstantial, depending heavily on the present-day weather and soil conditions. However, a single farmer cannot be expected to take into account all the innumerable factors that contribute to crop growth before reaching a consensus about which one to grow. A single misguided or imprudent decision by the farmer can have undesirable ramifications on both himself as well as the agricultural economy of the region. In this paper, we present an intelligent system, called Agro-Grow , which intends to assist the Indian farmers in making an informed decision about which crop to grow depending on the sowing season, his farm's geographical location, soil characteristics as well as environmental factors such as temperature and rainfall. And also give fertilizer recommendations based on the soil nutrients that the soil lacks or has excess of.

2.5 Scope

- Precision Agriculture: For small farms, precision agriculture may include subsurface drip irrigation for precise water and fertilizer application, weed removal, harvesting and other cultural operations.

- Robots: drones have also been introduced in Japan and the U.S. for mapping the farms, identifying diseases. Most robotic machines and drones are compact and thus suitable for small farms.

- India has small farms, therefore, are ideal for the large-scale application of precision agriculture. Precision farming in many developing countries including India has numerous opportunities for farmers to identify better high yielding location specific crops and infact a farmer turns in to a breeder to produce better and higher yielding varieties using PA

2.6 Technology Stack

- Python 3.6
- Jupyter notebook
- Scikit learn- for ML
- Seaborn — For data visualization
- Pandas — For handling structured data
- NumPy — For linear algebra and mathematics
- Matplotlib
- Pytorch
- Keras
- Flask

2.7 Benefits for environment and society.

- Modern agriculture's huge reliance upon a few crops invites challenges, given changes in climate and the potential for harvest failures. New farming endeavors promise to battle the opposing problems of both malnutrition and obesity.
- To create better crop diversity for human health and food security, farmers are working to create markets for new crops. More environmentally friendly farming techniques offset climate challenges and protect local ecological systems while securing the food and water supply.
- Sustainable farming methods create better food diversity, preserve water with more efficient facilities and drought-tolerant crops, and encourage better livestock health. Farmers represent a front line to defend against the risks of climate change.
- The proposed system helps the farmers to choose the right crop by providing insights that ordinary farmers don't keep track of thereby decreasing the chances of crop failure and increasing productivity.
- It also prevents them from incurring losses.This helps the farmers from incurring losses and increase the crop yield and there by creating a positive impact on the economy of the nation.

Chapter 3

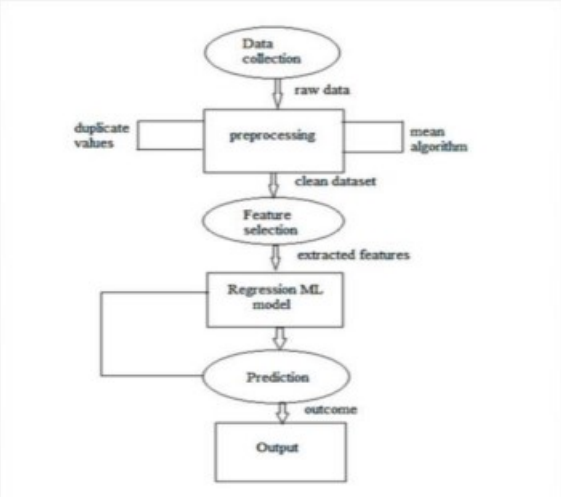
Project Design

3.1 Proposed System

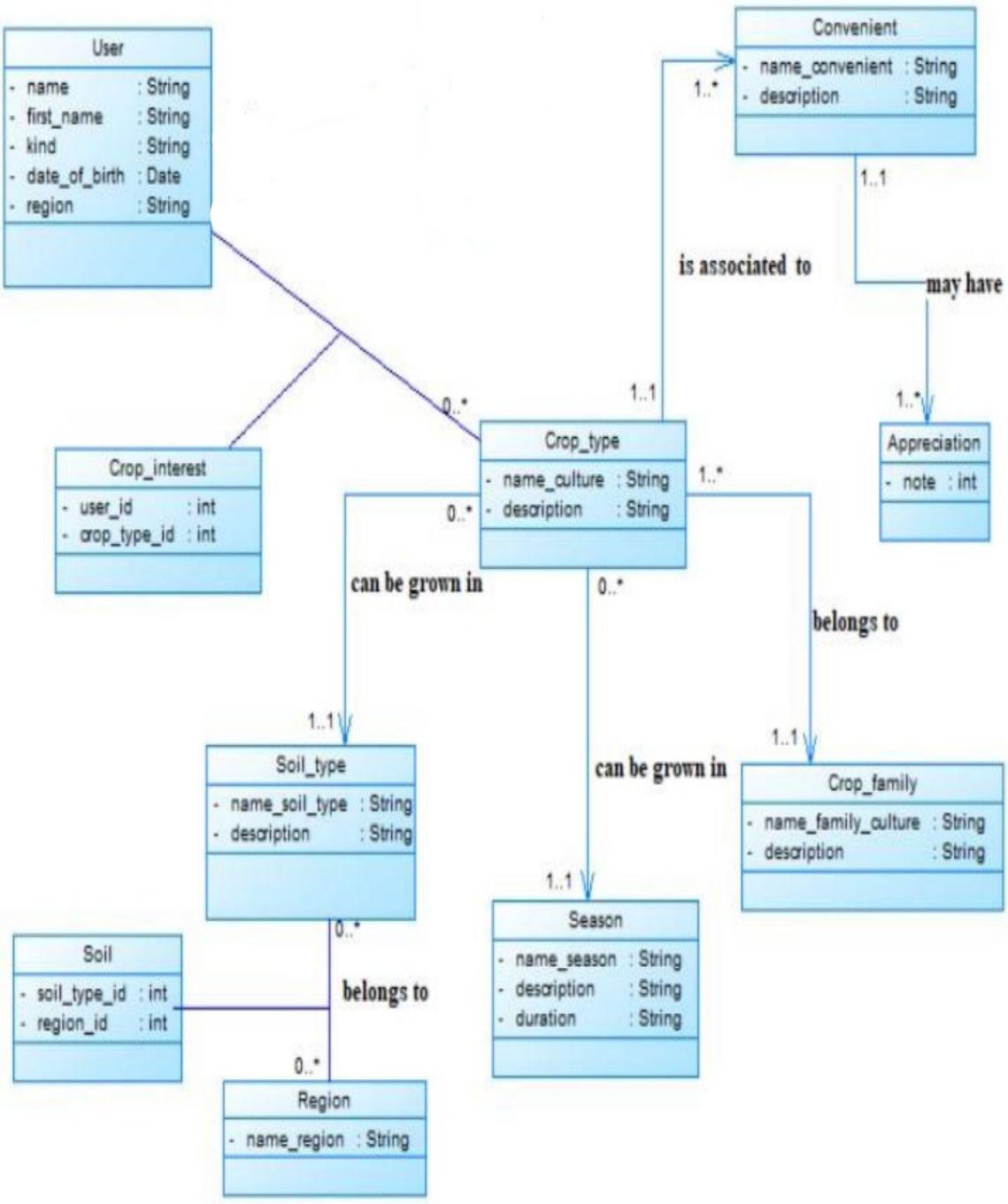
- We propose an Intelligent Crop Recommendation system- which takes into consideration all the appropriate parameters, including temperature, rainfall, location and soil condition, to predict crop suitability.

- This system is fundamentally concerned with performing the primary function of Agro Consultant, which is, providing crop recommendations and organic fertilizers recommendation to farmers based on what their soil lacks or has excess of and also depending on the type of crop they want to grow.

3.2 Design(Flow Of Modules)



3.3 Class Diagram



3.4 Module 1

Algorithms used for training the model.

- Decision-Tree
- Naïve-Bayes
- SVM
- Logistic Regression
- Random Forest
- XG-Boost

3.5 Refrences

- Techniques and Soil Attribute Prediction", International Journal of ComputerScience Issues, Volume 9, Issue 3,2012. [5] S. R. Rajeswari, ParthKhunteta, Subham Kumar, Amrit Raj Singh, Vaibhav Pandey, "Smart Farming Prediction using Machine Learning", International Journal of Innovative Technology and Exploring Engineering, 2019, Volume-08, Issue07.

6 Z. Doshi, S. Nadkarni, R. Agrawal, and N. Shah, "AgroConsultant: Intelligent Crop Recommendation System Using Machine Learning Algorithms", Fourth International Conference on Computing Communication Control and Automation (ICCUBEA), Pune,India, 2018, pp. 1-6, DOI: 10.1109/ICCUBEA.2018.8697349.

- 3 rd IEEE International Conference on Computational Systems and Information Technology for Sustainable Solutions 2018 ISBN: 978-1-5386-6078-2 © 2018 IEEE 114 Improving Crop Productivity Through A Crop Recommendation System Using Ensembling Technique.

Chapter 4

Planning for Next Semester

- Build the front-end of the project Using HTML,CSS,Javascript,Bootstrap.
- Integrate the front-end and backend of the project using Flask.

4.1 Citations

- Proceedings of the Fifth International Conference on Computing Methodologies and Communication (ICCMC 2021) IEEE Xplore Part Number: CFP21K25-ART
- 2018 Fourth International Conference on Computing Communication Control and Automation (ICCUBEA)