A Mini Project Report

On

SUGGESTING PROPER CROP USING FIELD TYPES

Submitted to JNTU HYDERABAD
In partial Fulfillment of the requirements for the Award of Degree of

BACHELOR OF TECHNOLOGY
IN
COMPUTER SCIENCE AND ENGINEERING

Submitted By

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2022-2023

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CERTIFICATE

This is to certify that the project entitled **"Suggesting proper crop using field types"** is a bonafide work carried out by

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in partial fulfillment of the requirement for the award of the degree of **BACHELOR OF TECHNOLOGY** in **COMPUTER SCIENCE AND ENGINEERING** from CMR Engineering College, affiliated to JNTU, Hyderabad, under our guidance and supervision.

The results presented in this project have been verified and are found to be satisfactory. The results embodied in this project have not been submitted to any other university for the award of any other degree or diploma.

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CSE, CMREC	CSE, CMREC	CSE, CMREC	

DECLARATION

This is to certify that the work reported in the present project entitled **"Suggesting proper crop using field types"** is a record of bonafide work done by us in the Department of Computer Science and Engineering, CMR Engineering College, JNTU Hyderabad. The reports are based on the project work done entirely by us and not copied from any other source. We submit our project for further development by any interested students who share similar interests to improve the project in the future.

The results embodied in this project report have not been submitted to any other University or Institute for the award of any degree or diploma to the best of our knowledge and belief.

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ACKNOWLEDGMENT

We are extremely grateful to **Dr. A. Srinivasula Reddy**, Principal and **Dr. Sheo Kumar**, HOD, **Department of CSE, CMR Engineering College** for their constant support**.**

We are extremely thankful to **Mrs.S.Anitha,** Assistant Professor, Internal Guide, Department of CSE, for his/her constant guidance, encouragement, and moral support throughout the project.

We will be failing in duty if I do not acknowledge with grateful thanks to the authors of the references and otherliteratures referred in this Project.

We thank **S Kiran Kumar** Mini Project Coordinator for his constant support in carrying out the project activitiesand reviews.

We express my thanks to all staff members and friends for all the help and co-ordination extended in bringingout this project successfully in time.

Finally, we are very much thankful to my parents who guided me for every step.

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ABSTRACT

Agriculture and its allied sectors are undoubtedly the largest providers of livelihoods in rural India. The agriculture sector is also a significant contributor factor to the country's Gross Domestic Product (GDP). Blessing to the country is the overwhelming size of the agricultural sector. However, regrettable is the yield per hectare of crops in comparison to international standards. This is one of the possible causes for a higher suicide rate among marginal farmers in India.

This paper proposes a viable and user-friendly yield prediction system for the farmers. So, we have designed the system using machine learning algorithms for betterment of farmers. Our system will suggest the best suitable crop for particular land based on content and weather parameters. And also, the system provides information about the required content and quantity of fertilizers, required seeds for cultivation. The proposed system provides connectivity to farmers via a mobile application. GPS helps to identify the user location. The user provides the area & soil type as input.

Machine learning algorithms allow choosing the most profitable crop list or predicting the crop yield for a user-selected crop. To predict the crop yield, selected Machine Learning algorithms such as Support Vector Machine (SVM), Artificial Neural Network (ANN), Random Forest (RF), Multivariate Linear Regression (MLR), and K-Nearest Neighbour (KNN) are used. Among them, the Random Forest showed the best results with 95% accuracy. Additionally, the system also suggests the best time to use the fertilizers to boost up the yield.

LIST OF FIGURES

1. INTRODUCTION

1.1. INTRODUCTION TO PROJECT

Agriculture has an extensive history in India. Recently, India is ranked second in the farm output worldwide. Agriculture-related industries such as forestry and fisheries contributed for 16.6% of 2009 GDP and around 50% of the total workforce. Agriculture's monetary contribution to India's GDP is decreasing. The crop yield is the significant factor contributing in agricultural monetary. The crop yield depends on multiple factors such as climatic, geographic, organic, and financial elements. It is difficult for farmers to decide when and which crops to plant because of fluctuating market prices. Citing to Wikipedia figures India's suicide rate ranges from 1.4-1.8% per 100,000 populations, over the last 10 years. Farmers are unaware of which crop to grow, and what is the right time and place to start due to uncertainty in climatic conditions. The usage of various fertilizers is also uncertain due to changes in seasonal climatic conditions and basic assets such as soil, water, and air. In this scenario, the crop yield rate is steadily declining. The solution to the problem is to provide a smart user-friendly recommender system to the farmers.

The crop yield prediction is a significant problem in the agriculture sector. Every farmer tries to know crop yield and whether it meets their expectations, thereby evaluating the previous experience of the farmer on the specific crop predict the yield. Agriculture yields rely primarily on weather conditions, pests, and preparation of harvesting operations. Accurate information on crop history is critical for making decisions on agriculture risk management.

In this paper, we have proposed a model that addresses these issues. The novelty of the proposed system is to guide the farmers to maximize the crop yield as well as suggest the most profitable crop for the specific region. The proposed model provides crop selection based on economic and environmental conditions, and benefit to maximize the crop yield that will subsequently help to meet the increasing demand for the country's food supplies. The proposed model predicts the crop yield by studying factors such as rainfall, temperature, area, season, soil type etc. The system also helps to determine the best time to use fertilizers. The existing system which recommends crop yield is either hardware based being costly to maintain, or not easily accessible. The proposed system suggests a mobile-based application that precisely predicts the most profitable crop by predicting the crop yield. The use of GPS helps to identify the user location. The user provides an area under cultivation and soil type as inputs. According to the requirement, the model predicts the crop yield for a specific crop. The model also recommends the most profitable crop and suggests the right time to use the fertilizers.

The major contributions of the paper are enlisted below:

1. Prediction of the crop yield for specific regions by executing various Machine Learning algorithms, with a comparison of error rate and accuracy.
2. A user-friendly mobile application to recommend the most profitable crop.
3. A GPS based location identifier to retrieve the rainfall estimation at the given area.
4. A recommender system to suggest the right time for using fertilizers.

The organization of the rest of the paper is as follows. Section II discusses the background work of researchers in the field of agriculture and yield prediction. Section III presents the proposed model for yield prediction and recommends which crop for cultivation. The model also suggests the best suitable time for the use of fertilizers. Section IV discusses the results and Section V concludes the paper.

1.2. Introduction and objectives

Agriculture, as we all know, is the foundation of the Indian economy. Agriculture is an important occupation in India. More than 60% of the country's land is used for agriculture, which feeds 1.3 billion people. Agriculture is the cultivation of plants and animals. In India, agriculture gave rise to civilization. We need soil to cultivate crops. As a result, soil is a critical factor in agriculture. Soil health is essential for good food production. It provides the roots with essential nutrients, water, oxygen, and support. Soil is the foundation of the food system, as well as the location of all plants used in food production. In India, several soil varieties are available. They are alluvial soil (cotton, rice), black soil (sugarcane, sunflower), red soil (corn, ragi), laterite soil (pulses, tea, coffee), and so on. Many studies have been conducted to improve agricultural planning. The crop can be recommended using a machine learning technique. Machine learning is an subfield of artificial intelligence that describes a machine's ability to mimic intelligent human behavior. Artificial intelligence systems are employed in the same way as humans do to automate complex tasks. Machine learning begins with data, such as financial transactions, individuals, or photos. The information is collected and processed to be utilized as training data for the machine learning system. If the data is more then the software shows better results. After that, the developer select a ML model to use, input the data, and train the system to find patterns or make predictions on its own.

Farmers are no longer able to choose the best suitable crop based on soil characteristics and features. So, are commendation system has been developed that employs machine learningalgorithms to recommend the crop that can be harvested in that particular soil. There are several machine learning algorithms available are used in this system., including KNN, Decision Tree, and Random Forest, Naive Bayes and Gradient Boosting to recommend the crop.

1.3. Purpose of the Project

Agriculture is an important industry in India. It is essential for the survival and growth of the Indian economy. India is a large producer of a variety of agricultural products. Soil is an important factor in crop cultivation.

1.4. Existing system & Disadvantages

- One of the early works developed a dedicated website to assess the impact of weather parameters on crop production in the identified districts of Madhya Pradesh. The districts were selected on the basis of the region covered by the crop. Based on these criteria, the first five top districts with a maximum crop area were chosen. The basis of the crops selected for the study was on prevailing crops in the selected districts. The crops picked included maize, soybean, wheat and paddy, for which the yield for a continuous period of 20 years of knowledge, were tabulated. The accuracy of the established model ranged from 76% to 90% for the chosen crops with an average accuracy of 82%.
- Another important work checks the soil quality and predicts the crop yield along with a suitable recommendation of fertilizers. The Ph value and the location from the user were inputs used in this model. AnAPI was used to predict the weather, temperature for the current place. The system used both supervised as well as unsupervised ML algorithms and compares the results of the two.
- A classifier that uses a greedy strategy to predict the crop yield was proposed in. A decision tree classifier that uses an attribute has been shown to yield better results. An ensemble model proposed suggests integrating the effects of different models, which has been shown to be typically better than the individual models. Random forests ensemble classification uses multiple decision tree models to predict the crop yield. The data are split up into two sets, such as training data and test data, with a ratio of 67% and 33%, with which the mean and standard deviation are calculated. This work also incorporates the clustering of similar crops to get the most accurate results.

Disadvantages :

1. An existing model doesn't predict the crop yield for the data sets of the given region.
2. The data sets are not cleaned and pre processed. The null values are not replaced with mean values.

1.5. Proposed system with Features

- In the proposed system, the system has proposed a model that addresses these issues. The novelty of the proposed system is to guide the farmers to maximize the crop yield as well as suggest the most profitable crop for the specific region. The proposed model provides crop selection based on economic and environmental conditions, and benefit to maximize the crop yield that will subsequently help to meet the increasing demand for the country's food supplies. The proposed model predicts the crop yield by studying factors such as rainfall, temperature, area, season, soil type etc.
- The system also helps to determine the best time to use fertilizers. The existing system which recommends crop yield is either hardware-based being costly to maintain, or not easily accessible. The proposed system suggests a mobile-based application that precisely predicts the most profitable crop by predicting the crop yield.
- The use of GPS helps to identify the user location. The user provides an area under cultivation and soil type as inputs. According to the requirement, the model predicts the crop yield for a specific crop. The model also recommends the most profitable crop and suggests the right time to use the fertilizers.

Advantages:

1. Prediction of the crop yield for specific regions by executing various Machine Learning algorithms, with a comparison of error rate and accuracy.
2. A user-friendly website to recommend the most profitable crop.
3. A GPS based location identifier to retrieve the rainfall estimation at the given area. A recommender system to suggest the right time for using fertilizers.

2. LITERATURE SURVEY

A study of machine learning algorithms was conducted in a research paper by Rashi Agarwal. This system would help farmers make educated decisions about which crops to grow based on a variety of environmental and geographical factors. They employed decision trees, KNNs, Random Forests, and neural networks. The neural network had the highest accuracy of all of them. Priyadharshini A conducted a study on machine learning algorithms in her research article. This technology reduces crop failure and decreases productivity by supporting farmers in choosing the proper crop and provide the data that regular farmers do not maintain. A variety of machine learning algorithms were applied. The neural network was the most accurate of the bunch. Shilpa Mangesh Pande in her research article, she presents a farmer-friendly and realistic production forecasting system The suggested technology is connected to farmers via a mobile application. The user's location is determined with the help of GPS. All of the algorithms are compared in terms of crop yield forecast accuracy. The RF algorithm showed to bethe best for the provided data set, with a 95% accuracy. Mayank Champaneri conducted research on crop yield prediction using a data mining technique. They used a random forest classifier because it can perform classification and regression tasks. The user-friendly website built that can be used by anyone to predict crop yield for their choice of crop by giving climate data for that area.

3. SOFTWARE REQUIREMENT ANALYSIS

3.1. SDLC:

The **Systems Development Life Cycle (SDLC)** or Software Development Life Cycle in systems engineering, information systems and software engineering, is the process of creating or altering systems, and the models and methodologies use to develop these systems.

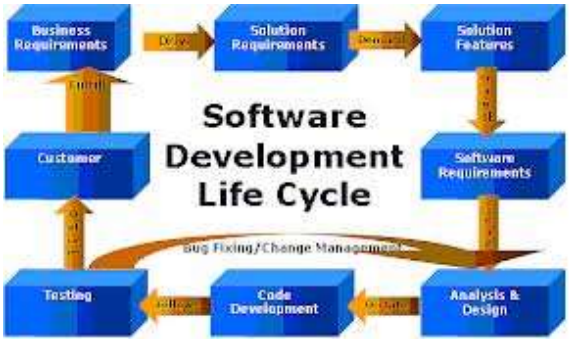


Figure 3.1(a): Software Development Life Cycle

Requirement Analysis and Design:

Analysis gathers the requirements for the system. This stage includes a detailed study of the business needs of the organization. Options for changing the business process may be considered. Design focuses on high level design like, what programs are needed and how are they going to interact, low-level design (how the individual programs are going to work), interface design (what are the interfaces going to look like) and data design (what data will be required). During these phases, the software's overall structure is defined. Analysis and Design are very crucial in the whole development cycle. Any glitch in the design phase could be very expensive to solve in the later stage of the software development. Much care is taken during this phase. The logical system of the product is developed in this phase.

Implementation:

In this phase the designs are translated into code. Computer programs are written using a conventional programming language or an application generator. Programming tools like Compilers, Interpreters, Debuggers are used to generate the code. Different high level programming languages like C, C++, Pascal, Java, .Net are used for coding. With respect to the type of application, the right programming language is chosen.

Testing:

In this phase the system is tested. Normally programs are written as a series of individual modules, these subject to separate and detailed test. The system is then tested as a whole. The separate modules are brought together and tested as a complete system. The system is tested to ensure that interfaces between modules work (integration testing), the system works on the intended platform and with the expected volume of data (volume testing) and that the system does what the user requires (acceptance/beta testing).

Maintenance:

Inevitably the system will need maintenance. Software will definitely undergo change once it is delivered to the customer. There are many reasons for the change. Change could happen because of some unexpected input values into the system. In addition, the changes in the system could directly affect the software operations. The software should be developed to accommodate changes that could happen during the post implementation period.

SDLC methodologies:

This document play a vital role in the development of life cycle (SDLC) as it describes the complete requirement of the system. It means for use by developers and will be the basic during testing phase. Any changes made to the requirements in the future will have to go through formal change approval process.

SPIRAL MODEL:

It was defined by Barry Boehm in his 1988 article, "A spiral Model of Software Development and Enhancement. This model was not the first model to discuss iterative development, but it was the first model to explain why the iteration models.

As originally envisioned, the iterations were typically 6 months to 2 years long. Each phase starts with a design goal and ends with a client reviewing the progress thus far. Analysis and engineering efforts are applied at each phase of the project, with an eye toward the end goal of the project.

The following diagram shows how a spiral model acts like:

Figure 3.1(b): Spiral Model

The steps for Spiral Model can be generalized as follows:

- The new system requirements are defined in as much details as possible. This usually involves interviewing a number of users representing all the external or internal users and other aspects of the existing system.
- A preliminary design is created for the new system.
- A first prototype of the new system is constructed from the preliminary design. This is usually a scaled-down system, and represents an approximation of the characteristics of the final product.
- A second prototype is evolved by a fourfold procedure:
    1. Evaluating the first prototype in terms of its strengths, weakness, and risks.
    2. Defining the requirements of the second prototype.

3. Planning an designing the second prototype.
4. Constructing and testing the second prototype.

- At the customer option, the entire project can be aborted if the risk is deemed too great. Risk factors might involved development cost overruns, operating-cost miscalculation, or any other factor that could, in the customer's judgment, result in a less-than-satisfactory final product.
- The existing prototype is evaluated in the same manner as was the previous prototype, and if necessary, another prototype is developed from it according to the fourfold procedure outlined above.
- The preceding steps are iterated until the customer is satisfied that the refined prototype represents the final product desired.
- The final system is constructed, based on the refined prototype.
- The final system is thoroughly evaluated and tested. Routine maintenance is carried on a continuing basis to prevent large scale failures and to minimize down time.

3.2. Modules and their functionalities

Service Provider:

In this module, the Service Provider has to login by using valid user name and password. After login successful he can do some operations such as Browse Agriculture Data Sets and Train & Test, View Trained and Tested Accuracy in Bar Chart, View Trained and Tested Accuracy Results, View All Crop Yield and Production Prediction, View All Crop Recommendations, Download Predicted Data Sets, View All Remote Users, View Crop Yield Prediction Per Acre Results.

View and Authorize Users:

In this module, the admin can view the list of users who all registered. In this, the admin can view the user's details such as, user name, email, address and admin authorizes the users.

Remote User :

In this module, there are n numbers of users are present. User should register before doing any operations. Once user registers, their details will be stored to the database. After registration successful, he has to login by using authorized user name and password. Once Login is successful user will do some operations like predict crop yield and production, predict crop recommendation, view your profile.

3.2.1. Functional Requirements

In the example below, the requirement numbering has a scheme - BR_LR_0## (BR for Business Requirement, LR for Labor Relations). For small projects simply BR-## would suffice. Keep in mind that if no prefix is used, the traceability matrix may be difficult to create (e.g., no differentiation between '02' as a business requirement vs. a test case)

The following table is an example format for requirements. Choose whatever format works best for your project.

Req#	Requirement	Comments	Priority	Date Rvwd	SME Reviewed / Approved
BR_LR_05	The system should associate a supervisor indicator with each job class.	Business Process = "Maintenance	3	7/13/04	Bob Dylan, Mick Jagger
BR_LR_08	The system should handle any number of fees (existing and new) associated with unions.	Business Process = "Changing Dues in the System" An example of a new fee is an initiation fee.	2	7/13/04	Bob Dylan, Mick Jagger
BR_LR_10	The system should capture and maintain job class status (i.e., active or inactive)	Business Process = "Maintenance" Some job classes are old and are no longer used. However, they still need to be maintained for legal, contract and historical purposes.	2	7/13/04	Bob Dylan, Mick Jagger
BR_LR_16	The system should assign the Supervisor Code based on the value in the Job Class table and additional criteria as specified by the clients.	April 2005 – New requirement. It is one of three new requirements from BR_LR_03.	2		

3.2.2. Non Functional Requirements

In systems engineering and requirements engineering, a non-functional requirement is a requirement that specifies criteria that can be used to judge the operation of a system, rather than specific behaviors. They are contrasted with functional requirements that define specific behavior or functions. Non-functional requirements add tremendous value to business analysis. It is commonly misunderstood by a lot of people. It is important for business stakeholders, and Clients to clearly explain the requirements and their expectations in measurable terms. If the non-functional requirements are not measurable then they should be revised or rewritten to gain better clarity. For example, User stories help in mitigating the gap between developers and the user community in Agile Methodology.

Usability:

Prioritize the important functions of the system based on usage patterns. Frequently used functions should be tested for usability, as should complex and critical functions. Be sure to create a requirement for this.

Reliability:

Reliability defines the trust in the system that is developed after using it for a period of time. It defines the likeability of the software to work without failure for a given time period. The number of bugs in the code, hardware failures, and problems can reduce the reliability of the software. Your goal should be a long MTBF (mean time between failures). It is defined as the average period of time the system runs before failing. Create a requirement that data created in the system will be retained for a number of years without the data being changed by the system. It's a good idea to also include requirements that make it easier to monitor system performance.

Performance:

What should system response times be, as measured from any point, under what circumstances? Are there specific peak times when the load on the system will be unusually high?

Think of stress periods, for example, at the end of the month or in conjunction with payroll disbursement.

Supportability:

Maintainability requirements may cover diverse levels of documentation, such as system documentation, as well as test documentation, e.g. which test cases and test plans will accompany the system.

3.3. Feasibility analysis :

An important outcome of preliminary investigation is the determination that the system request is feasible. This is possible only if it is feasible within limited resource and time. The different feasibilities that have to be analyzed are

- **Operational Feasibility**
- **Economic Feasibility**
- **Technical Feasibility**

3.1.1. Operational Feasibility :

Operational Feasibility deals with the study of prospects of the system to be developed. This system operationally eliminates all the tensions of the Admin and helps him in effectively tracking the project progress. This kind of automation will surely reduce the time and energy, which previously consumed in manual work. Based on the study, the system is proved to be operationally feasible.

3.1.2. Economic Feasibility :

Economic Feasibility or Cost-benefit is an assessment of the economic justification for a computer based project. As hardware was installed from the beginning & for lots of purposes thus the cost on project of hardware is low. Since the system is a network based, any number of employees connected to the LAN within that organization can use this tool from at anytime. The Virtual Private Network is to be developed using the existing resources of the organization. So the project is economically feasible.

3.1.3. Technical Feasibility :

According to Roger S. Pressman, Technical Feasibility is the assessment of the technical resources of the organization. The organization needs IBM compatible machines with a graphical web browser connected to the Internet and Intranet. The system is developed for platform Independent environment. Java Server Pages, JavaScript, HTML, SQL server and WebLogic Server are used to develop the system. The technical feasibility has been carried out. The system is technically feasible for development and can be developed with the existing facility.

4. SYSTEM DESIGN AND DEVELOPMENT

4.1. Input design

Input Design plays a vital role in the life cycle of software development, it requires very careful attention of developers. The input design is to feed data to the application as accurate as possible. So inputs are supposed to be designed effectively so that the errors occurring while feeding are minimized. According to Software Engineering Concepts, the input forms or screens are designed to provide to have a validation control over the input limit, range and other related validations.

This system has input screens in almost all the modules. Error messages are developed to alert the user whenever he commits some mistakes and guides him in the right way so that invalid entries are not made. Let us see deeply about this under module design.

Input design is the process of converting the user created input into a computer-based format. The goal of the input design is to make the data entry logical and free from errors. The error is in the input are controlled by the input design. The application has been developed in user-friendly manner. The forms have been designed in such a way during the processing the cursor is placed in the position where must be entered. The user is also provided with in an option to select an appropriate input from various alternatives related to the field in certain cases.

Validations are required for each data entered. Whenever a user enters an erroneous data, error message is displayed and the user can move on to the subsequent pages after completing all the entries in the current page.

4.2. Output design

The Output from the computer is required to mainly create an efficient method of communication within the company primarily among the project leader and his team members, in other words, the administrator and the clients. The output of VPN is the system which allows the project leader to manage his clients in terms of creating new clients and assigning new projects to them, maintaining a record of the project validity and providing folder level access to each client on the user side depending on the projects allotted to him. After completion of a project, a new project may be assigned to the client. User authentication procedures are maintained at the initial stages itself. A new user may be created by the administrator himself or a user can himself register as a new user but the task of assigning projects and validating a new user rests with the administrator only.

The application starts running when it is executed for the first time. The server has to be started and then the internet explorer in used as the browser. The project will run on the local area network so the server machine will serve as the administrator while the other connected systems can act as the clients. The developed system is highly user friendly and can be easily understood by anyone using it even for the first time.

5. SOFTWARE & HARDWARE REQUIREMENTS

5.1. Software requirements

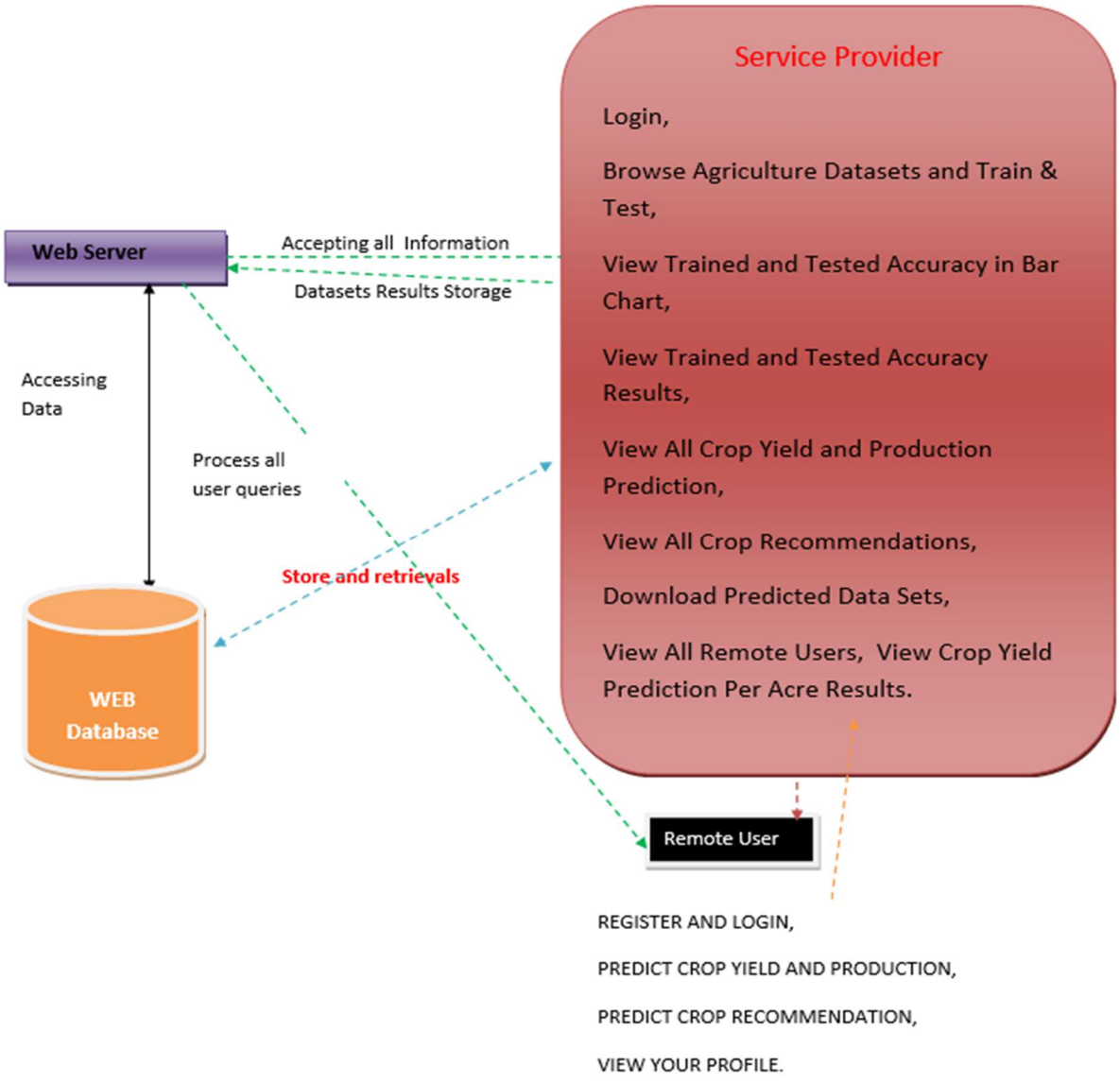
- Operating System : Windows XP.
- Platform : PYTHON TECHNOLOGY
- Tool : Spyder, Python 3.5
- Front End : Anaconda
- Back End : python anaconda script

5.2. Hardware requirements

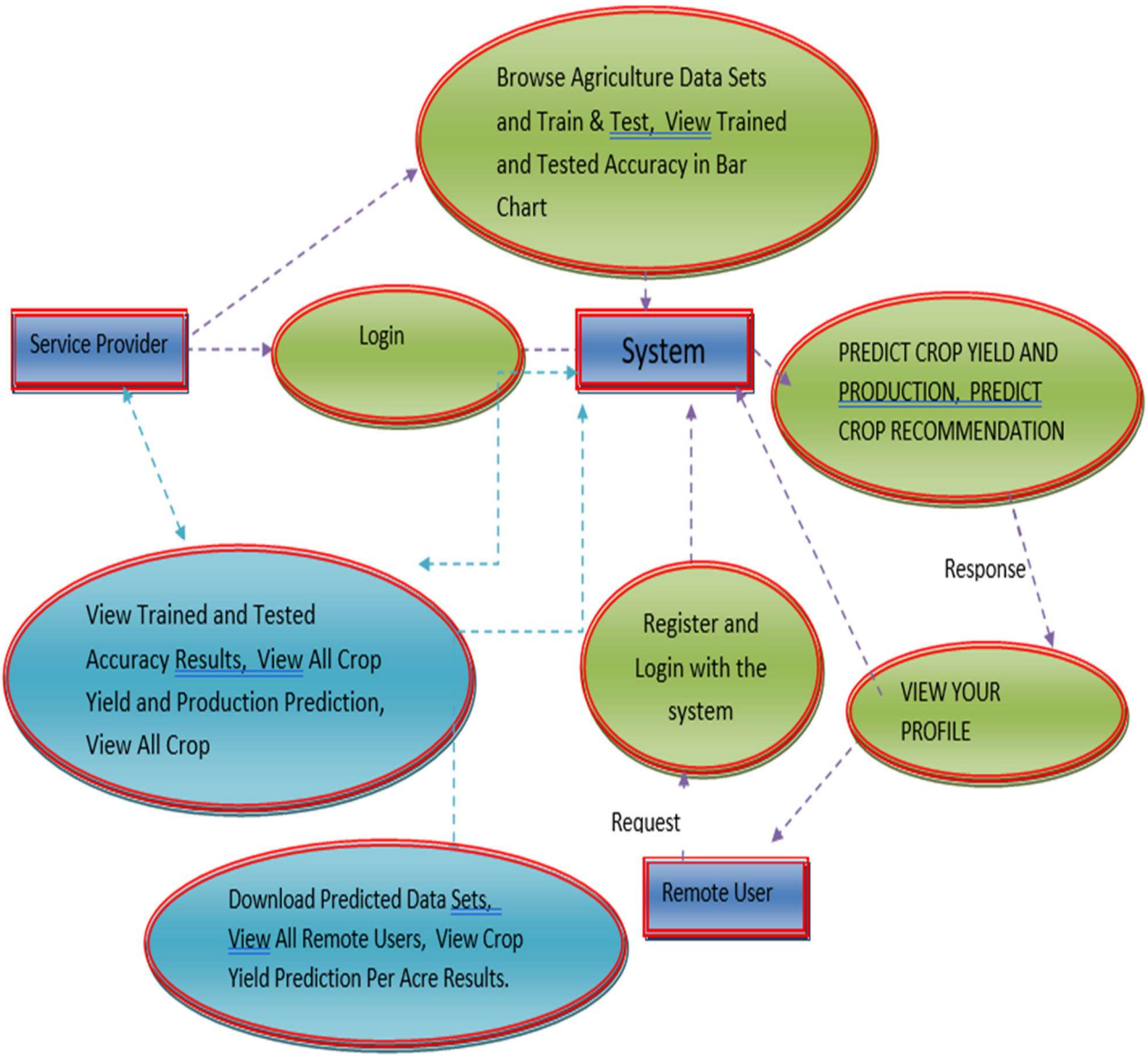
- System: Pentium IV 2.4 GHz.
- Hard Disk : 40 GB.
- Monitor : 15 inch VGA Color.
- Mouse : Logitech Mouse.
- Ram : 512 MB
- Keyboard : Standard Keyboard

6. SOFTWARE DESIGN

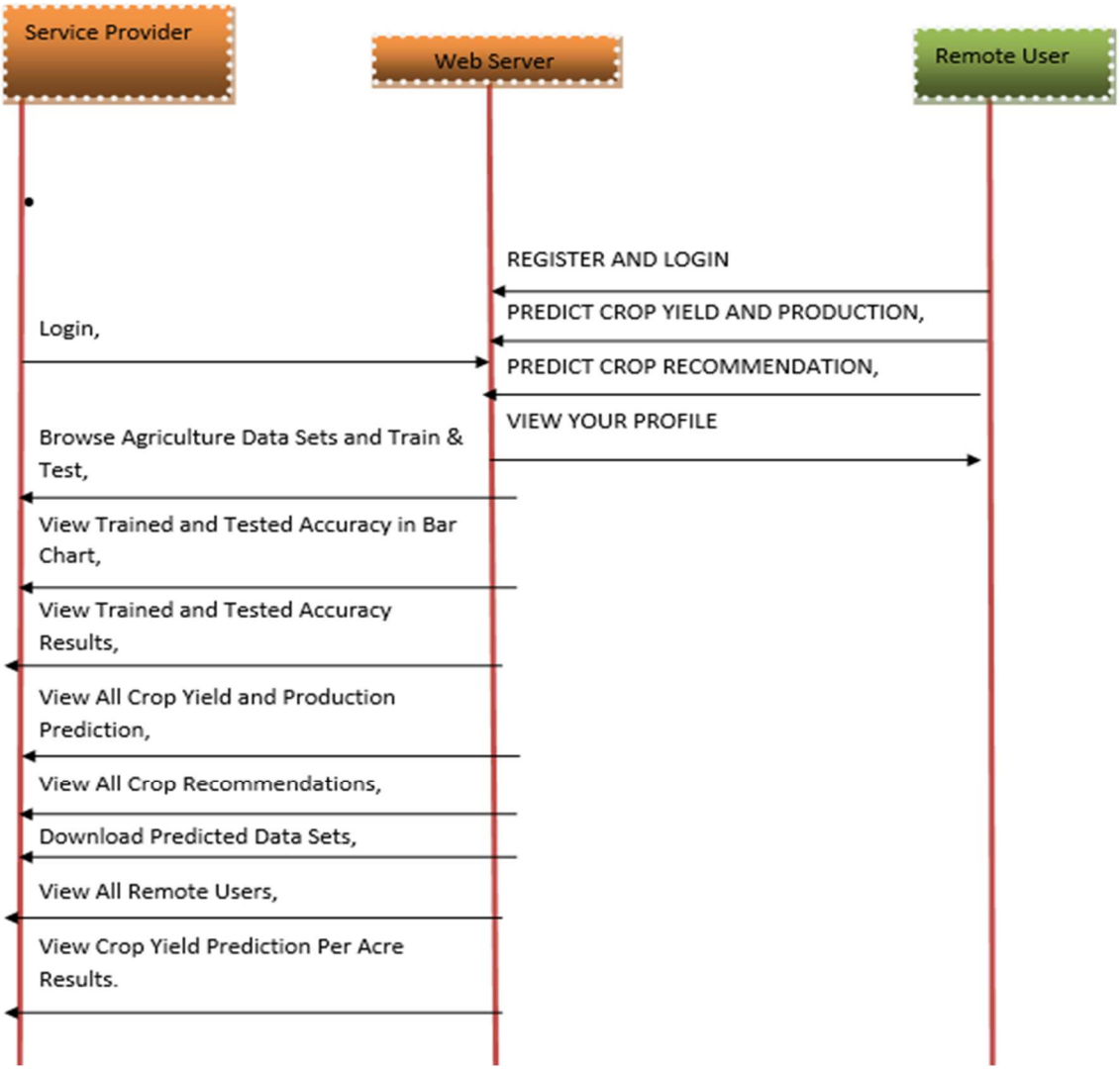
6.1 System Architecture



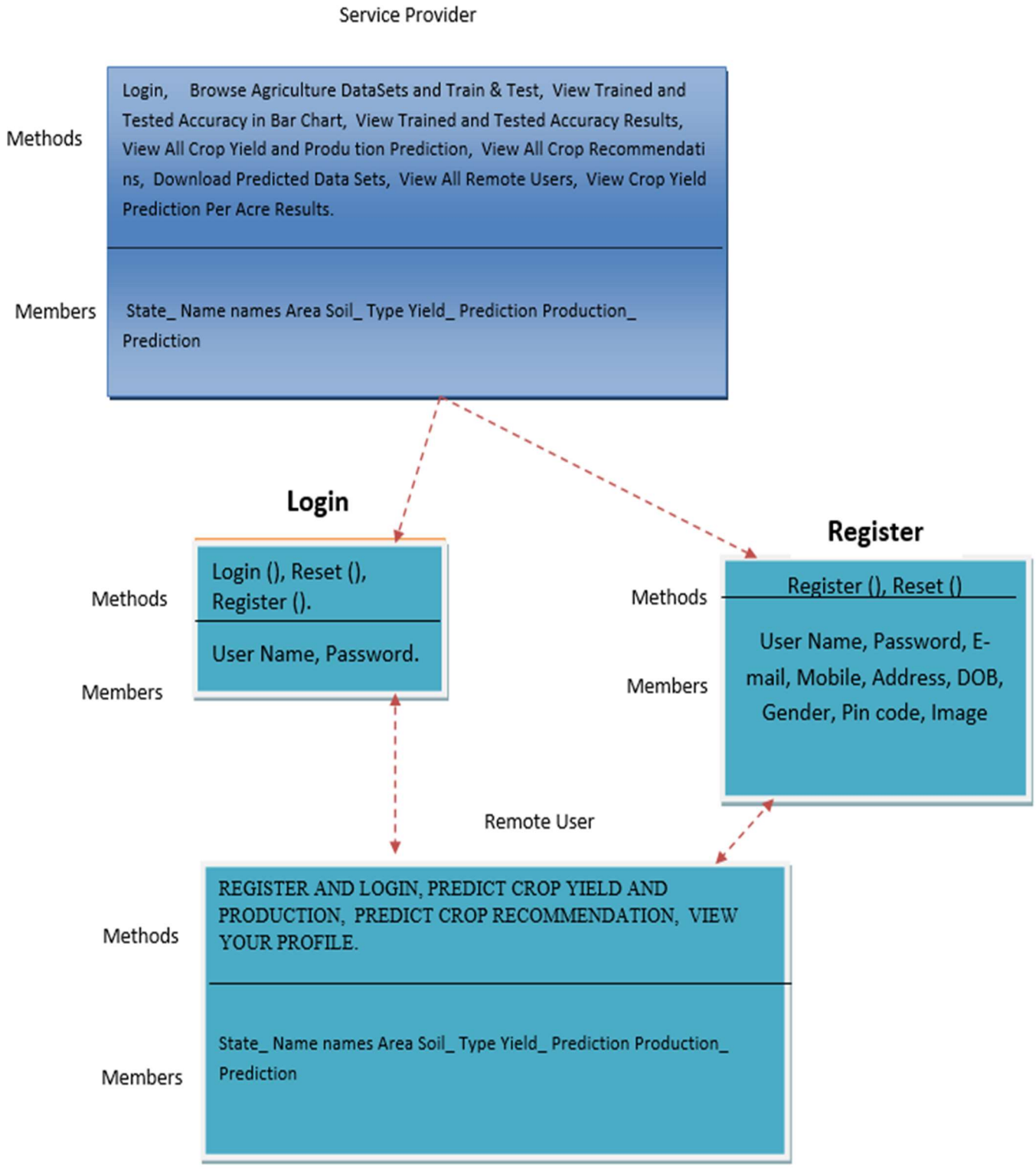
6.2 Data Flow Diagram



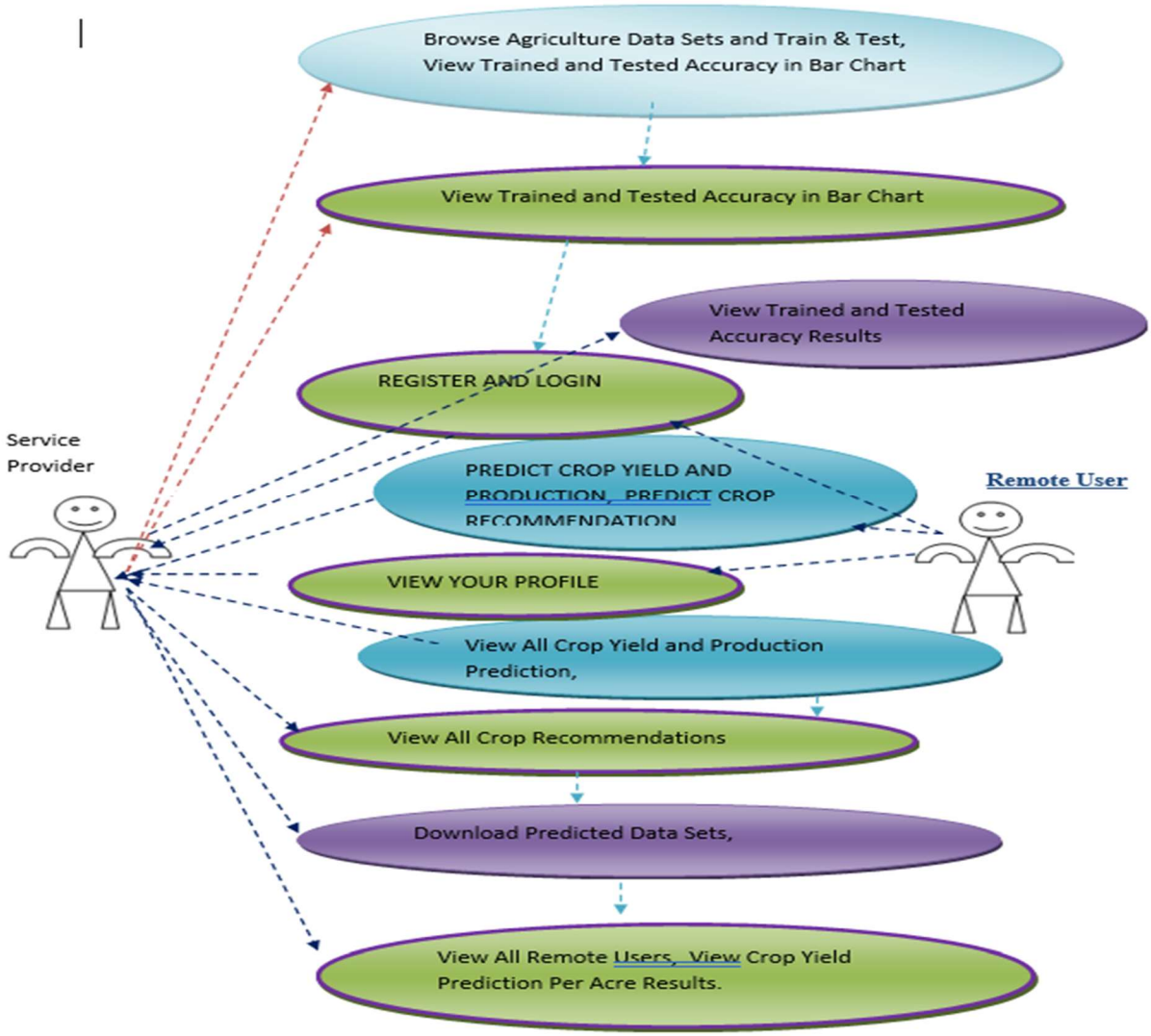
6.3 Sequence Diagram



6.4 Class diagrams



6.5 Use Case Diagram



7. CODING AND IMPLEMENTATION

7.1. Sample Code

Service Provider Login :

```
<linkhref="//maxcdn.bootstrapcdn.com/bootstrap/4.0.0/css/bootstrap.min.css"rel="stylesheet"id="bootstrap-css">

{% load static %}

<!DOCTYPE html>

<html lang="en">

        <title>Login</title>

                <meta charset="utf-8">

                <meta name="viewport" content="width=device-width, initial-scale=1, shrink-to-fit=no">

        <head>

<link rel="icon" href="images/icon.png" type="image/x-icon" />

<link href="https://fonts.googleapis.com/css?family=Lobster" rel="stylesheet">

<link href="https://fonts.googleapis.com/css?family=Righteous" rel="stylesheet">

<link href="https://fonts.googleapis.com/css?family=Fredoka+One" rel="stylesheet">

<style>

        body {background: url("{% static 'back.jpg' %}");

        background-color:#eee;}

        .container-fluid {padding:50px;}

        .container{background-color:white;padding:50px;   }

        #title{font-family: 'Fredoka One', cursive;}
```

```
text-uppercase{font-family: 'Righteous', cursive;}

style1 {color: #FF0000;font-weight: bold;}

.style2 {font-family: 'Righteous', cursive;color: #FF0000;font-weight: bold;

}

.text-main{color: #eee;}

    </style>

        </head>

        <body>

        <div class="container-fluid">

                <div>

                <h2 class="text-center style1" id="title">Suggesting proper crop using field types</h2>

                 <p class="text-center">

                <span><small  class="text-main">Suggesting proper crop using field types, Machine Learning, RandomForest, Suggesting Crops Using Field Types, Artificial Neural Networks(ANN), Support Vector Machine (SVM), K-Nearest Neighbours(KNN), Multivariate Linear Regression (MLR), Fertilize

</small></span> </p>

        <hr>

        <div class="row">

        <div class="col-md-2">

        </div>

          <div class="col-md-5">

                <form method="POST" role="form">

                        {% csrf_token %}<fieldset>
```

```
                    {% load static %}
<img src="{% static '/login.jpg' %}" alt="My image">
        <p class="style2"> Login Service Provider: </p>
                <div class="form-group">
                <input type="text" name="username"   placeholder="User Name" required>
</div>
<div class="form-group">
        input type="password" name="password"   placeholder="Password" required>
</div>
<div>
<input type="submit" name="submit1"  class="btn btn-md" value="Login">
</div>
 </fieldset><br><br>button class="btn btn-lg "><a href="{% url 'login' %}">User Login</a></button>
</form></div></div>
      </div>
</body>
</html>
```

Registration Program :

```
<link href="//maxcdn.bootstrapcdn.com/bootstrap/4.0.0/css/bootstrap.min.css" rel="stylesheet" id="bootstrap-css">

{% load static %}

<!DOCTYPE html>

<html lang="en">

<title>Register Your Details</title>

<meta charset="utf-8">

<meta name="viewport" content="width=device-width, initial-scale=1, shrink-to-fit=no">

<style type="text/css">

</style>

<head>

<link href="https://fonts.googleapis.com/css?family=Lobster" rel="stylesheet">

<link href="https://fonts.googleapis.com/css?family=Righteous" rel="stylesheet">

<link href="https://fonts.googleapis.com/css?family=Fredoka+One" rel="stylesheet">

<style>

body {background: url("{% static 'back.jpg' %}");

}

.container-fluid {padding:50px;}

.container{background-color:white;padding:50px;  }

#title{font-family: 'Fredoka One', cursive;

}

.text-uppercase{font-family: 'Righteous', cursive;}
```

```
.text-main{color: aliceblue;} </style>
</head>
<body>
    <div class="container-fluid">
    <div><h2 class="text-center style1" id="title">Suggesting proper crop using field types</h2>
      <p class="text-center">
    <span ><small  class="text-main">Suggesting proper crop using field types, Machine Learning, RandomForest, Suggesting Crops Using Field Types, Artificial Neural Networks(ANN), Support Vector Machine (SVM), K-Nearest Neighbours(KNN), Multivariate Linear Regression (MLR), Fertilizer
</small></span></p><hr>
    <div class="row">
    <div class="col-md-5">
    <form role="form" method="POST" >
        {% csrf_token %}
        <fieldset>
            {% load static %}<img src="{% static '/Register.jpg' %}" alt="My image"><br>
                <span class="style1">REGISTER YOUR DETAILS HERE !</span>
    <div class="form-group">
        <input type="text" name="username" id="username" placeholder="User Name" required></div>
<div class="form-group">
<input type="email" name="email" id="email"  placeholder="Email Address" required></div>
<div class="form-group">
```

```
<input type="password" name="password" id="password"  placeholder="Password" required></div>
<div class="form-group">
        <input type="number" name="phoneno" id="phoneno" placeholder="Mobile Number" required></div>
        <div class="form-group">
                <input type="text" name="country" id="country"  placeholder="Country" required></div>
                <div class="form-group">
                <input type="text" name="state" id="state"  placeholder="State" required>
                </div>
        <div class="form-group">
                <input type="text" name="city" id="city"  placeholder="City" required></div>
                <div class="form-check">
                <label class="form-check-label"></label>
                </div><div>
        <input type="submit" class="btn btn-lg btn-primary" name="submit"  value="sign_up" ></div>
</fieldset>
<div><br>  <button class="btn btn-lg "><a href="{% url 'login' %}">User Login</a></button>
  </div>
</form>
</div>
<div class="col-md-2">
        <div class="col-md-5"></div>
        </div></div></body></html>
```

Login Program :

```
<link href="//maxcdn.bootstrapcdn.com/bootstrap/4.0.0/css/bootstrap.min.css" rel="stylesheet" id="bootstrap-css">

{% load static %}

<!DOCTYPE html>

<html lang="en">

        <title>Login</title>

                <meta charset="utf-8">

                <meta name="viewport" content="width=device-width, initial-scale=1, shrink-to-fit=no">

        <head>

<link rel="icon" href="images/icon.png" type="image/x-icon" />

        <link href="https://fonts.googleapis.com/css?family=Lobster" rel="stylesheet">

                <link href="https://fonts.googleapis.com/css?family=Righteous" rel="stylesheet">

<link href="https://fonts.googleapis.com/css?family=Fredoka+One" rel="stylesheet">

                <style>

                        body {background: url("{% static 'back.jpg' %}");

                        }

                        .container-fluid {padding:50px;}

                        .container{background-color:white;padding:50px;   }

                        #title{font-family: 'Fredoka One', cursive;

}.text-uppercase{font-family: 'Righteous', cursive;}
```

```
                .style1 {color: #FF0000}
        .style4 {color: #FF0000; font-weight: bold; }
        .style5 {
            font-family: 'Righteous', cursive;
            color:darkturquoise;
            font-weight: bold;
}
.text-main{color:aliceblue;}
        </style>
            </head>
            <body>
            <div class="container-fluid">
            <div >
            <h2class="style1text-center"id="title"><strong>Suggesting proper crop using field types</strong></h2>
             <p class="text-center">
            <span ><small  class="text-main">Suggesting proper crop using field types, Machine Learning, RandomForest, Suggesting Crops Using Field Types, Artificial Neural Networks(ANN), Support Vector Machine (SVM), K-Nearest Neighbours(KNN), Multivariate Linear Regression (MLR), Fertilizer
 </small></span> </p><hr>
            <div class="row">
                    <div class="col-md-5">
                    <form role="form" method="POST" >
```

```
{% csrf_token %}

<p class="text-uppercase pull-center"> </p>

</fieldset></form>

</div>

<div class="col-md-5"> <form method="POST" role="form"{% csrf_token %}<fieldset>

{% load static %}

<img src="{% static '/login.jpg' %}" alt="My image">

<p class="style5"> Login Using Your Account: </p>
<div class="form-group">

<input type="text" name="username"   placeholder="User Name" required>

</div>

<div class="form-group">

<input type="password" name="password"   placeholder="Password" required>
</div>

<div><input type="submit" name="submit1"  class="btn btn-md" value="sign_in">
</div></br><p class="style5"> Login Using Your Account: </p>
<div>

<button class="btn btn-lg "><a href="{% url 'serviceproviderlogin' %}">SERVICE PROVIDER</a></button>

<button class="btn btn-lg "><a href="{% url 'Register1' %}">REGISTER</a></button>

</div>

</fieldset>

</form>
```

```
                </div>
                    </div>
                </div>
        </div>
        </body>
</html>
```

7.2 DATA DICTIONARY

Crop Yield Prediction, Machine Learning, Random Forest, Suggesting Crops Using Field Types, Artificial Neural Networks (ANN), Support Vector Machine (SVM), K-Nearest Neighbours (KNN), Multivariate Linear Regression (MLR), Fertilizer

SUGGESTING CROPS USING FIELD TYPES :

Crop Prediction :

State_Name

names

Area

Soil_Type

Yield_Prediction

Production_Prediction

Crop Recommendation :

State_Name

names

Area

Soil_Type

8. SYSTEM TESTING

8.1. TESTING STRATERGIES

A strategy for system testing integrates system test cases and design techniques into a well-planned series of steps that results in the successful construction of software. The testing strategy must co-operate test planning, test case design, test execution, and the resultant data collection and evaluation. A strategy for software testing must accommodate low-level tests that are necessary to verify that a small source code segment has been correctly implemented as well as high level tests that validate major system functions against user requirements. Software testing is a critical element of software quality assurance and represents the ultimate review of specification design and coding. Testing represents an interesting anomaly for the software. Thus, a series of testing are performed for the proposed system before the system is ready for user acceptance testing.

Types of testing:

- Unit Testing.
- Integration Testing.
- User Acceptance Testing.
- Output Testing.
- Validation Testing.

Unit Testing: Unit testing focuses verification effort on the smallest unit of Software design that is the module. Unit testing exercises specific paths in a module's control structure to ensure complete coverage and maximum error detection. This test focuses on each module individually, ensuring that it functions properly as a unit. Hence, the naming is Unit Testing.

During this testing, each module is tested individually and the module interfaces are verified for the consistency with design specification. All important processing path are tested for the expected results. All error handling paths are also tested.

Integration Testing

Integration testing addresses the issues associated with the dual problems of verification and program construction. After the software has been integrated a set of high order tests are conducted. The main objective in this testing process is to take unit tested modules and builds a program structure that has been dictated by design.

The following are the types of Integration Testing:

1.Top Down Integration

This method is an incremental approach to the construction of program structure. Modules are integrated by moving downward through the control hierarchy, beginning with the main program module. The module subordinates to the main program module are incorporated into the structure in either a depth first or breadth first manner.

In this method, the software is tested from main module and individual stubs are replaced when the test proceeds downwards.

2. Bottom-up Integration

This method begins the construction and testing with the modules at the lowest level in the program structure. Since the modules are integrated from the bottom up, processing required for modules subordinate to a given level is always available and the need for stubs is eliminated. The bottom up integration strategy may be implemented with the following steps:

- The low-level modules are combined into clusters into clusters that perform a specific Software sub-function.
- A driver (i.e.) the control program for testing is written to coordinate test case input and output.
- The cluster is tested.
- Drivers are removed and clusters are combined moving upward in the program structure .

The bottom up approaches tests each module individually and then each module is module is integrated with a main module and tested for functionality.

User Acceptance Testing

User Acceptance of a system is the key factor for the success of any system. The system under consideration is tested for user acceptance by constantly keeping in touch with the prospective system users at the time of developing and making changes wherever required. The system developed provides a friendly user interface that can easily be understood even by a person who is new to the system.

Output Testing

After performing the validation testing, the next step is output testing of the proposed system, since no system could be useful if it does not produce the required output in the specified format. Asking the users about the format required by them tests the outputs generated or displayed by the system under consideration. Hence the output format is considered in 2 ways – one is on screen and another in printed format.

Validation Checking

Validation checks are performed on the following fields.

Text Field:

The text field can contain only the number of characters lesser than or equal to its size. The text fields are alphanumeric in some tables and alphabetic in other tables. Incorrect entry always flashes and error message.

Numeric Field:

The numeric field can contain only numbers from 0 to 9. An entry of any character flashes an error messages. The individual modules are checked for accuracy and what it has to perform. Each module is subjected to test run along with sample data. The individually tested modules are integrated into a single system. Testing involves executing the real data information is used in the program the existence of any program defect is inferred from the output. The testing should be planned so that all the requirements are individually tested.

A successful test is one that gives out the defects for the inappropriate data and produces and output revealing the errors in the system.

Preparation of Test Data

Taking various kinds of test data does the above testing. Preparation of test data plays a vital role in the system testing. After preparing the test data the system under study is tested using that test data. While testing the system by using test data errors are again uncovered and corrected by using above testing steps and corrections are also noted for future use.

Using Live Test Data:

Live test data are those that are actually extracted from organization files. After a system is partially constructed, programmers or analysts often ask users to key in a set of data from their normal activities. Then, the systems person uses this data as a way to partially test the system. In other instances, programmers or analysts extract a set of live data from the files and have them entered themselves.

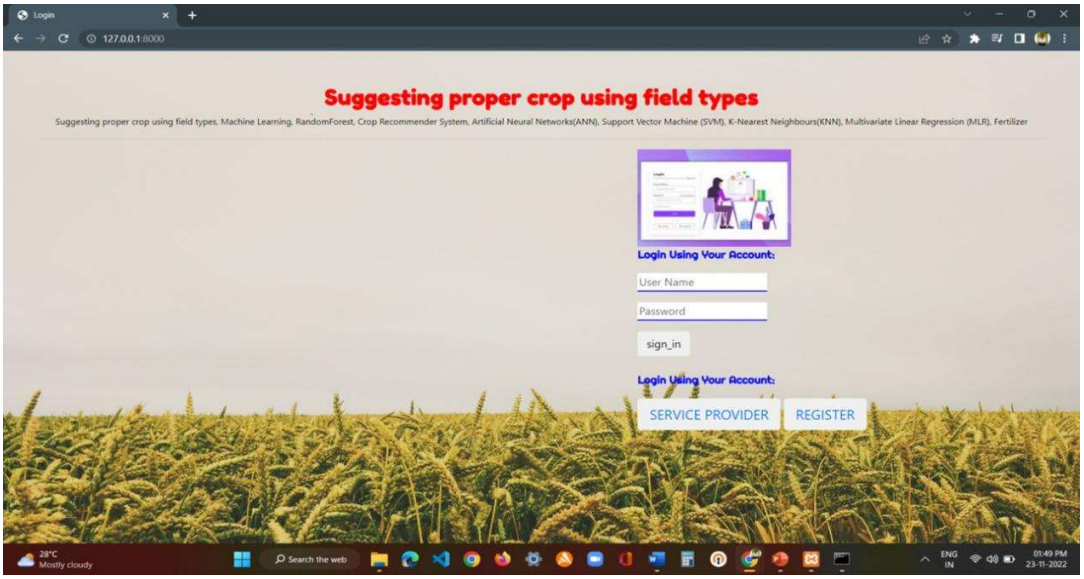
It is difficult to obtain live data in sufficient amounts to conduct extensive testing. And, although it is realistic data that will show how the system will perform for the typical processing requirement, assuming that the live data entered are in fact typical, such data generally will not test all combinations or formats that can enter the system. This bias toward typical values then does not provide a true systems test and in fact ignores the cases most likely to cause system failure.

8.2. TEST CASES:

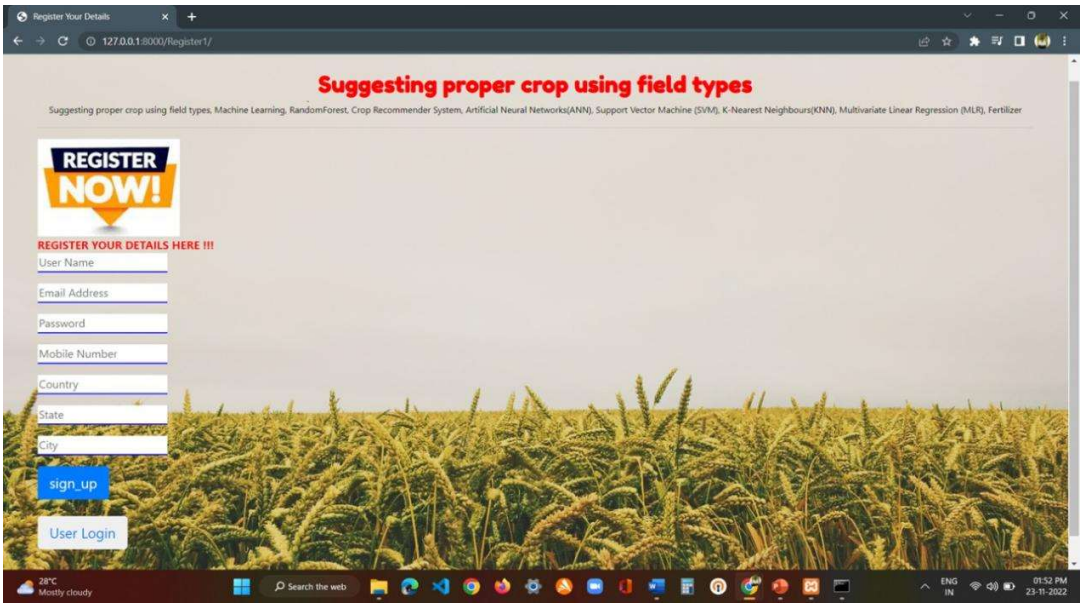
S.NO	Test Case	Excepted Result	Result	Remarks(IF Fails)
1.	User Register	If User registration successfully.	Pass	If already user email exist then it fails.
2.	User Login	If Username and password is correct then it will getting valid page.	Pass	Un Register Users will not logged in.
3.	User View User	Show our dataset	Pass	If Data set Not Available fail.
4.	View Fast History Results	The Four Alarm Score Should be Displayed.	Pass	The Four Alarm Score Not Displaying fail
5.	User Prediction	Display Review with true results	Pass	Results not True Fail
6.	Show Detection process	Display Detection process	Pass	Results Not True Fail
7.	Show Eye Blink Process	Display Eye Blink Process	Pass	If Results not Displayed Fail.
8.	Admin login	Admin can login with his login credential. If success he get his home page	Pass	Invalid login details will not allowed here
9.	Admin can activate the register users	Admin can activate the register user id	Pass	If user id not found then it won't login
10.	Results	For our Four models the accuracy and F1 Score	Pass	If Accuracy And F1 Score Not Displayed fail

9. OUTPUT SCREENS

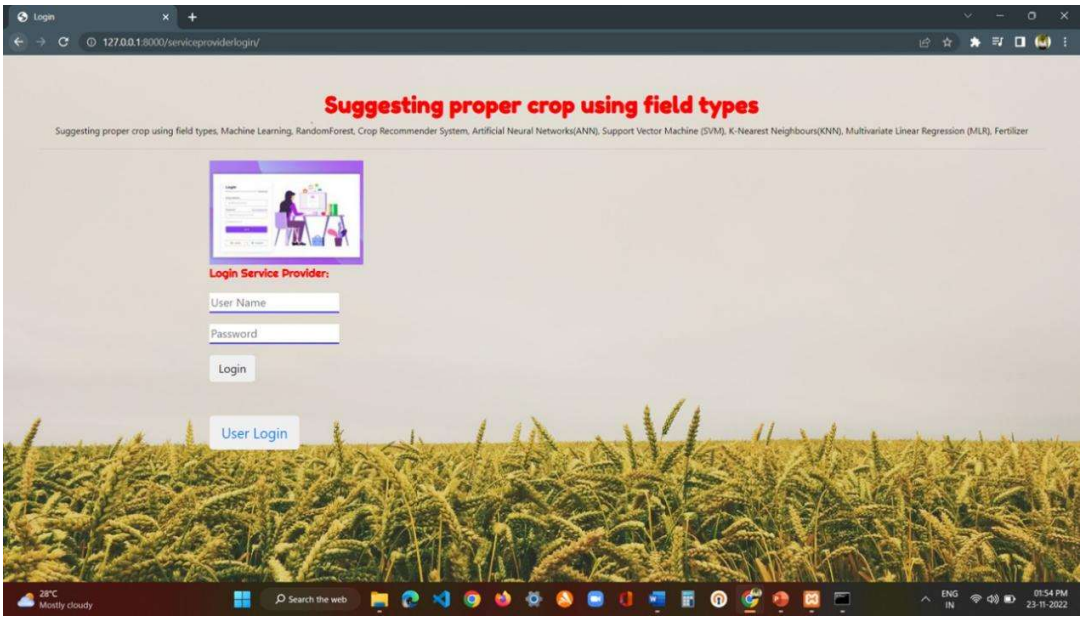
1. LOGIN PAGE :



2. REGISTER PAGE:

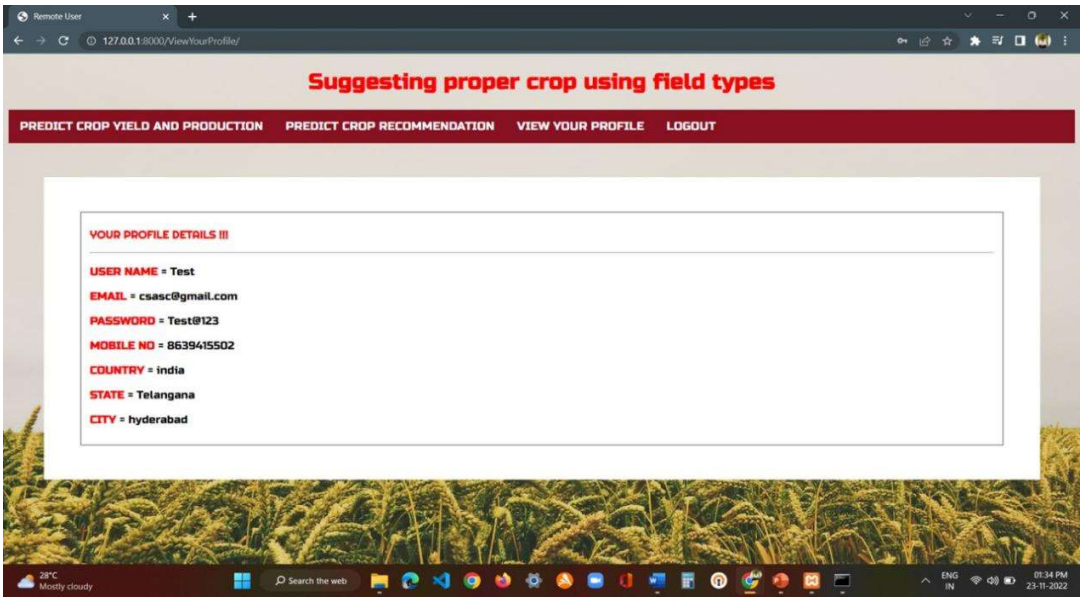


3. SERVICE PROVIDER PAGE:

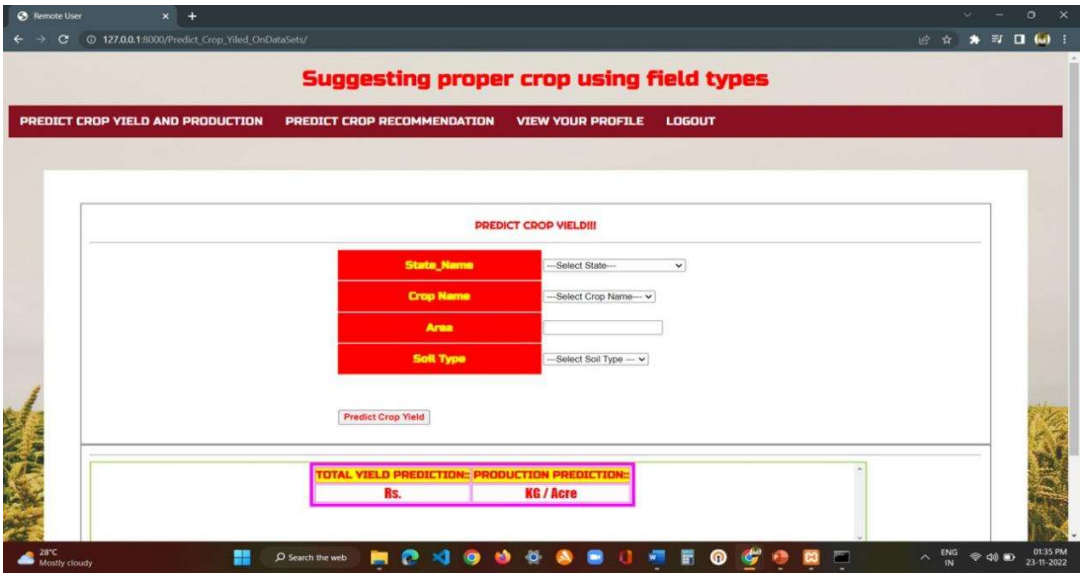


4.USER LOGIN:

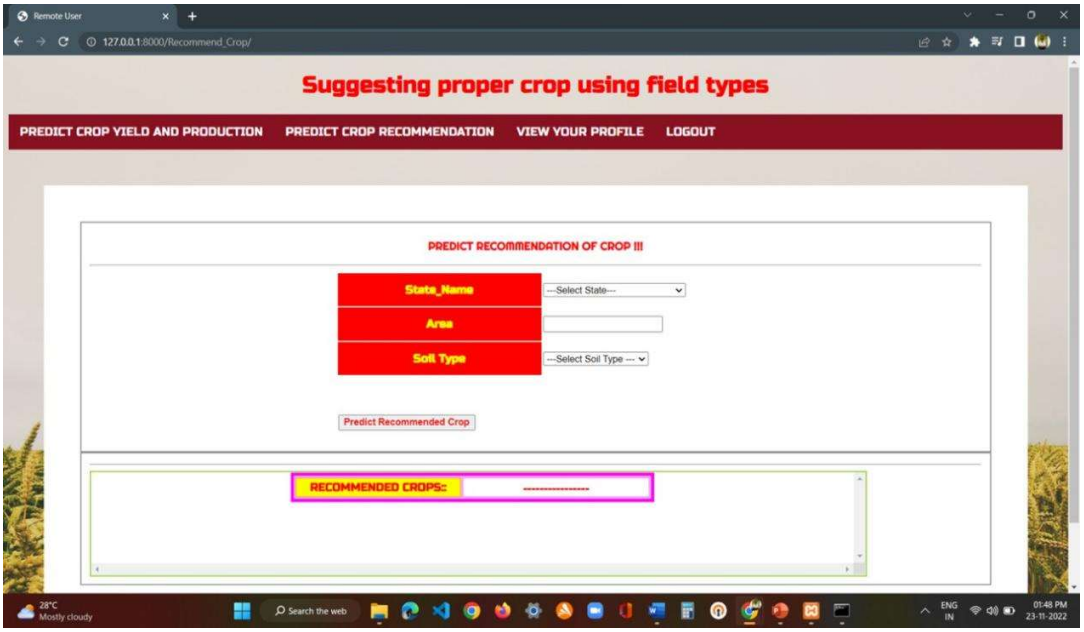
4.1. VIEW YOUR PROFILE:



4.2. PREDICT CROP YEILD AND PRODUCTION PAGE :

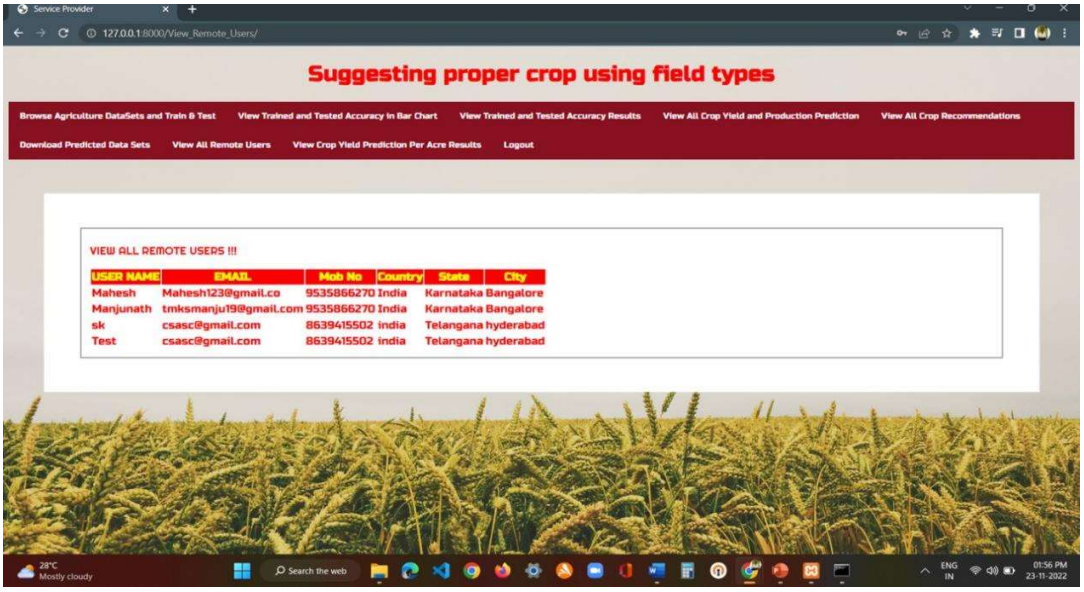


4.3. PREDICT CROP RECOMMENDATION :

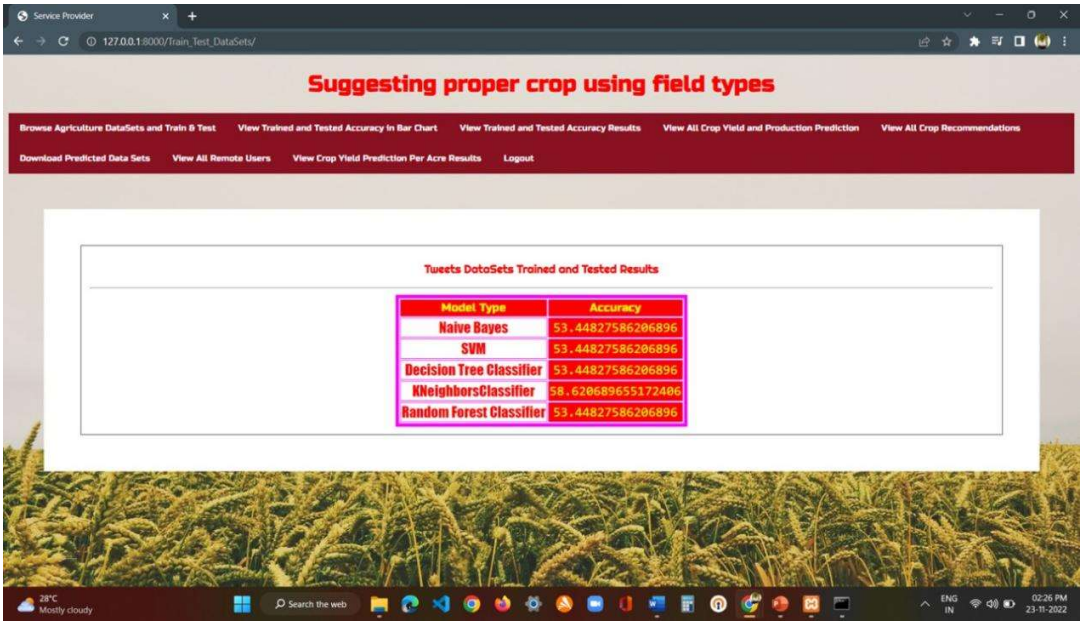


5. SERVICE PROVIDER :

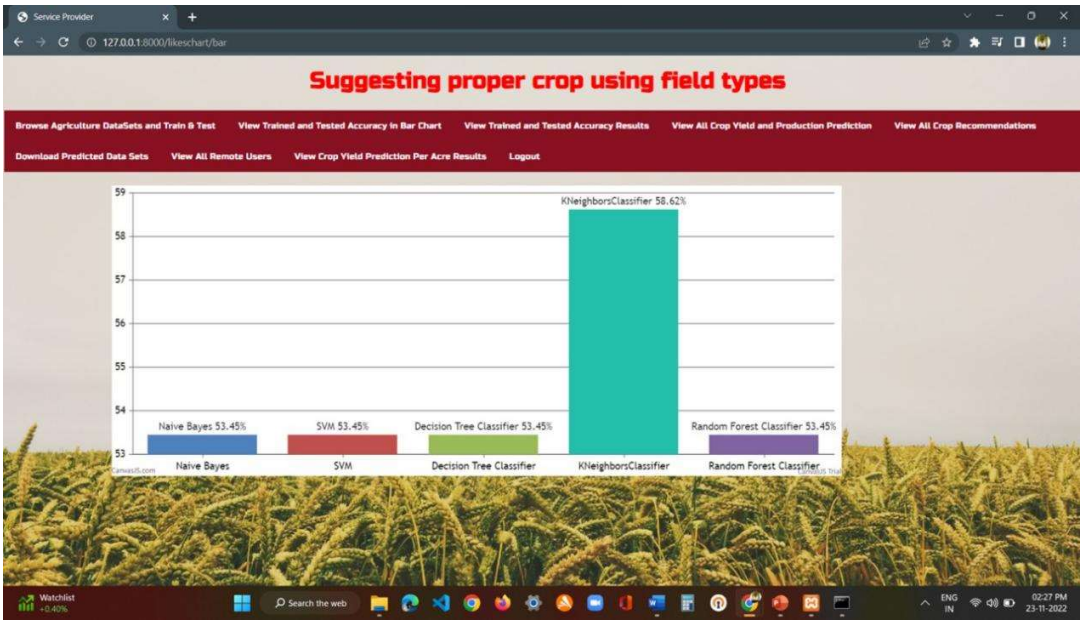
5.1. VIEW ALL REMOTE USER PAGE :



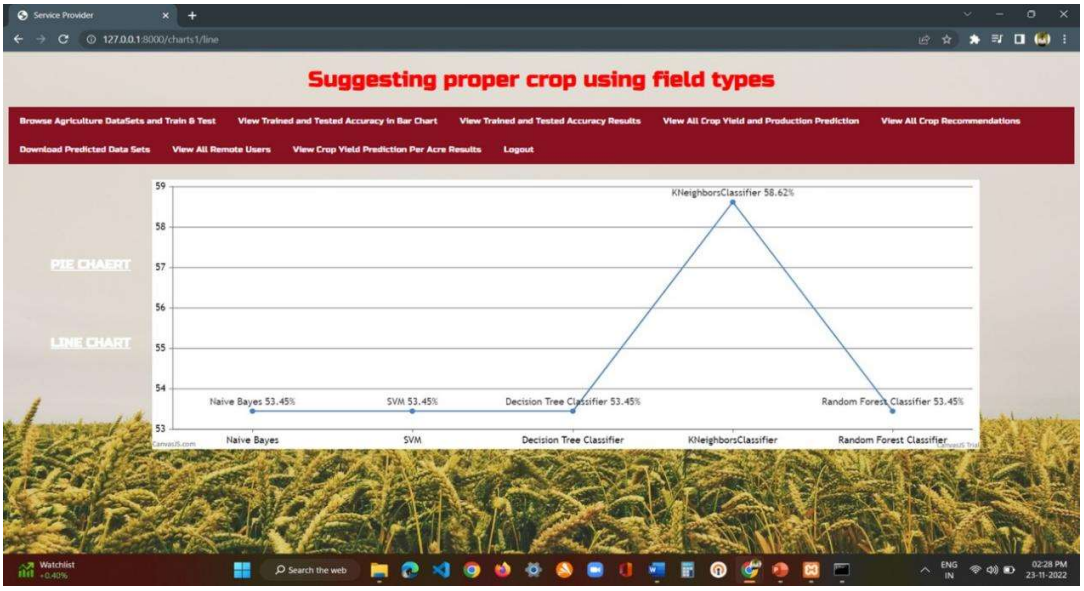
5.2. BROWSE AGRICULTURE DATASETS AND TRAIN TEST:



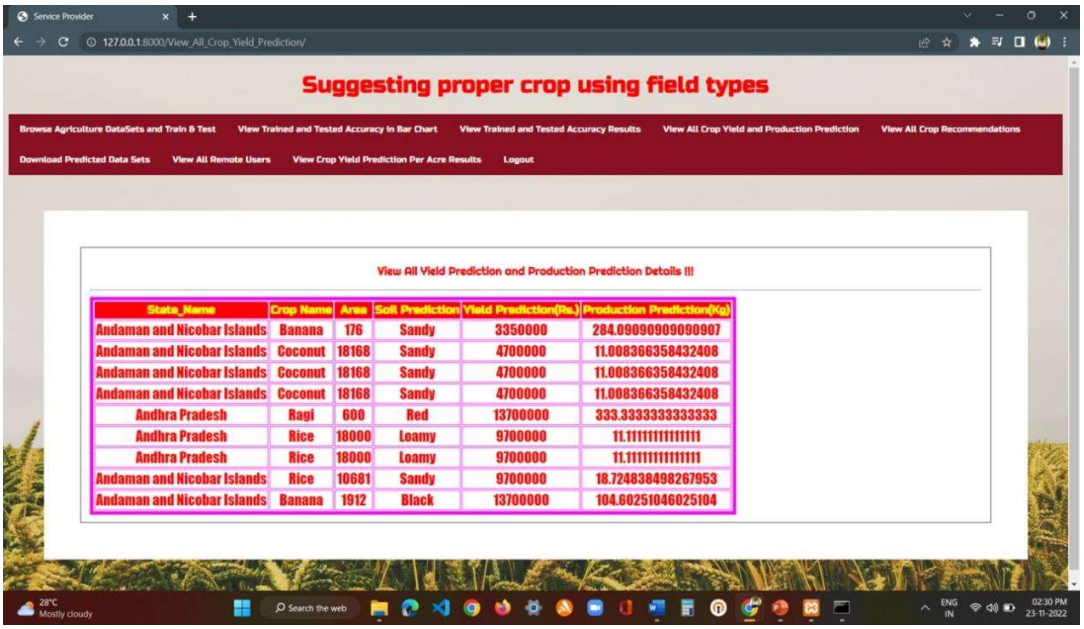
5.3. VIEW TRAINED AND TESTED ACCURACY IN BAR CHART:



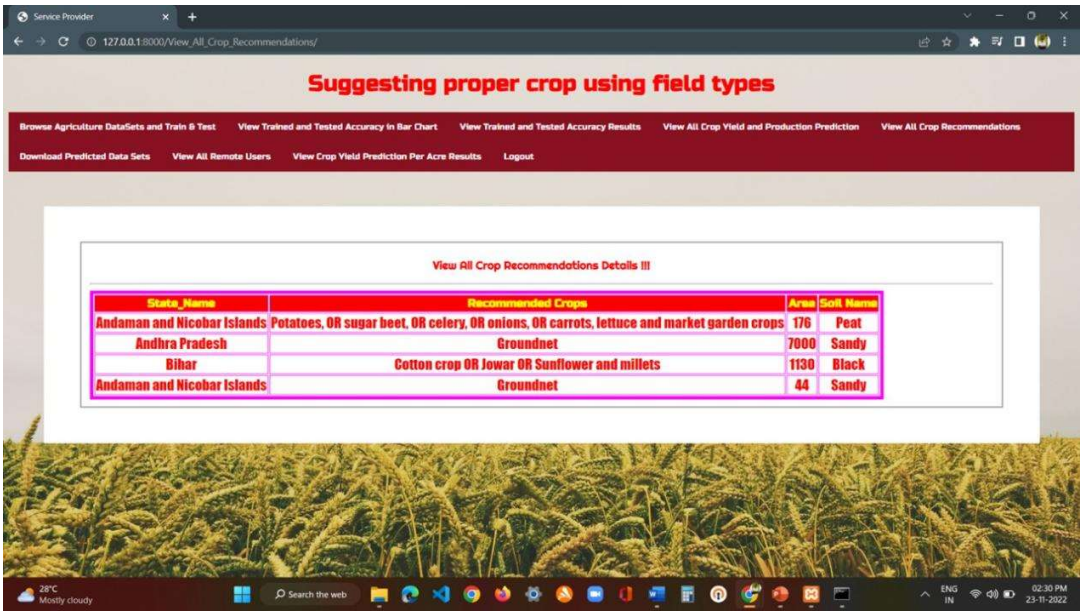
5.4. VIEW TRAINED AND TESTED ACCURACY RESULTS:



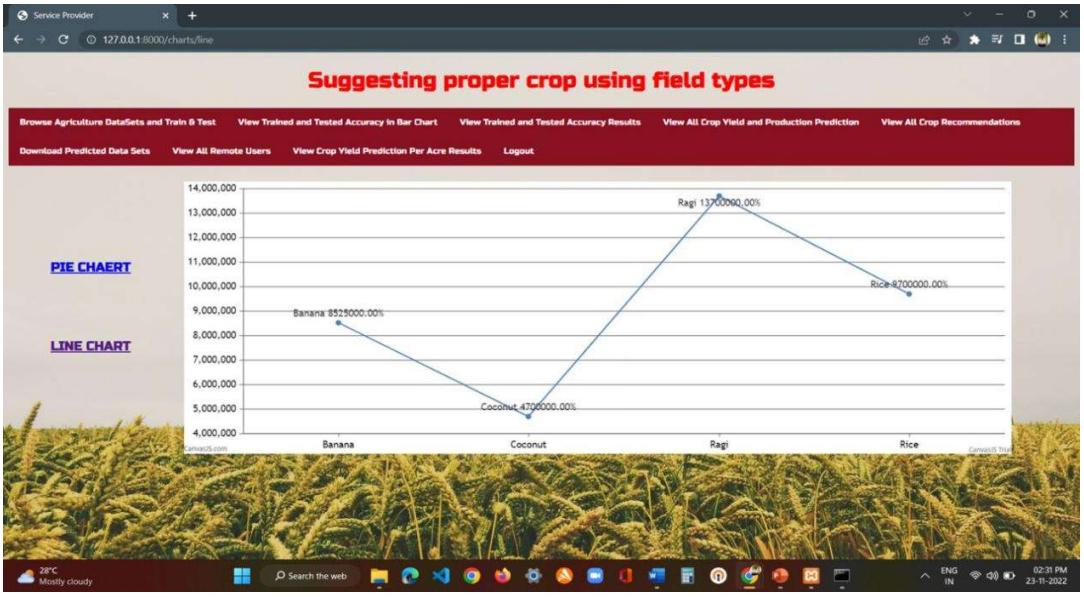
5.5. VIEW ALL YIELD PREDICTION AND PRODUTION PREDICTION DETAILS:



5.6. VIEW ALL CROP RECOMMENDATION DETAILS:



5.7. VIEW CROP YIELD PREDICTION PER ACRE RESULTS :



9.CONCLUSION

This paper highlighted the limitations of current systems and their practical usage on yield prediction. Then walks through a viable yield prediction system to the farmers, a proposed system provides connectivity to farmers via a web application. The web application includes multiple features that users can leverage for the selection of a crop. The inbuilt predictor system helps the farmers to predict the yield of a given crop. The inbuilt recommend system allows a user exploration of the possible crops and their yield to take more educated decisions. For yield to accuracy, various machine learning algorithms such as Random Forest, ANN, SVM, MLR, and KNN were implemented and tested on the given datasets from the Maharashtra and Karnataka states. The various algorithms are compared with their accuracy. The results obtained indicate that Random Forest Regression is the best among the set of standard algorithms used on the given datasets with an accuracy of 95%. The proposed model also explored the timing of applying fertilizers and recommends appropriate duration.

The future work will be focused on updating the datasets from time to time to produce accurate predictions, and the processes can be automated. Another functionality to be implemented is to provide the correct type of fertilizer for the given crop and location. To implement this thorough study of available fertilizers and their relationship with soil and climate needs to be done. An analysis of available statistical data needs to be done.

10. FUTURE ENHANCEMENT

As we all know, much agricultural research has been conducted and continues to be conducted in order to improve productivity, boost the Indian economy, and, most importantly, assist farmers in increasing their income. In order to accomplish this, proposed system will advise farmers on the best crop to cultivate on their land. So that farmers can profit from it.

11. REFERENCES

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2015 May 6 (pp. 138-145). IEEE.

12. APPENDIX

The appendixes are not always considered part of the actual Requirements Specification and are not always necessary. They may include Sample input/output formats, descriptions of cost analysis studies, or results of user surveys, Supporting or background information that can help the readers of the Requirements Specification, A description of the problems to be solved by the system, Special packaging instructions for the code and the media to meet security, export, initial loading, or other requirements.

Business Requirement	**Area**	**Deliverables**	**Status**
BR_LR_01 The system should validate the relationship between Bargaining Unit/Location and Job Class.---Comments: Business Process = "Assigning a Bargaining Unit to an Appointment" (Priority 1)	BUA	BUA-CD-01 Assign BU Conceptual Design	Accepted
		BUA-PF-01 Derive Bargaining Unit-Process Flow Diagram	Accepted
		BUA-PF-01 Derive Bargaining Unit-Process Flow Diagram	Accepted
BR_LR_09 The system should provide the capability for the Labor Relations Office to maintain the job class/union relationship.---Comments: Business Process = "Maintenance" (Priority 1)	BUA	BUA-CD-01 Assign BU Conceptual Design	Accepted
		BUA-PF-02 BU Assignment Rules Maint Process Flow Diagram	Ready For Review