

AGRICULTURE ANALYSIS USING DATAMINING TECHNIQUES

A Project Report Phase – II

Submitted in partial fulfillment of the requirements for the award of
Bachelor of Engineering degree in Electronics and Communication Engineering

by

RACHAPALLI GUNA SEKHAR REDDY(Reg.No - 39130154)
SURA PAVAN KUMAR REDDY(Reg.No - 39130454)



DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
SCHOOL OF ELECTRICAL AND ELECTRONICS

SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)

Accredited with Grade “A” by NAAC

JEPPIAAR NAGAR, RAJIV GANDHI SALAI, CHENNAI - 600119

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SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY

(DEEMED TO BE UNIVERSITY)

Accredited with —All grade by NAAC

Jeppiaar Nagar, Rajiv Gandhi Salai, Chennai – 600 119

www.sathyabama.ac.in

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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This is to certify that this Project Report is the bonafide work of RACHAPALLI GUNA SEKHAR REDDY(REG NO: 39130154) AND SURA PAVAN KUNAR REDDY (REG NO: 39130454) who have done the project work as an individual who carried out the project entitled “**AGRICULTURE ANALYSIS USING DATAMINING TECHNIQUES**” under our supervision from November 2022 to April 2023.

Internal Guide

Ms.I.MARY SAJIN SANJU

Head of the Department

Dr. T. RAVI, M.E., Ph.D.

Submitted for Viva voce Examination held on 19-04-2023

Internal Examiner

External Examiner

DECLARATION

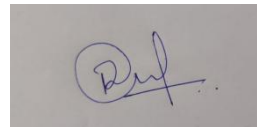
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DATE: 19-04-2023

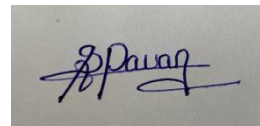
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SIGNATURE OF THE CANDIDATES

1.



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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. The proposed system provides connectivity to farmers via a mobile application. 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), 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.

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CHAPTER-1

INTRODUCTION

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.

CHAPTER-2

2.1 LITERATURE SURVEY

A Review on Data Mining Techniques for Fertilizer Recommendation,2018

To keep up nutrition levels in the soil in case of deficiency, fertilizers are added to soil. The standard issue existing among the Indian agriculturists choose approximate amount of fertilizers and add them manually. Excess or deficient extension of fertilizers can harm the plants life and reduce the yield. This paper gives overview of various data mining frameworks used on cultivating soil dataset for fertilizer recommendation.

A Survey on Data Mining Techniques in Agriculture,2017

Agriculture is the most critical application area especially in the developing nations like India .Use of information technology in agriculture can change the situation of decision making and farmers can yield in better way. Data mining plays a important role in decision making on several aspects with agriculture field. It examines about role of data mining in the farming field and their related work by a few authors in related to agriculture domain. It additionally talks about on various data mining applications in taking care of the several agriculture problems. This paper integrates the work of several authors in a single place so it is valuable for specialists to get data of current situation of data mining systems and applications in context to farming field.

AgroNutri Android Application,2016

This paper communicates the idea regarding the making of AgroNutri an android application that helps in conveying the harvest particular fertilizer amount to be applied. The idea is to calculate the measure of NPK composts to be applied depend on the blanked proposal of the crop of interest. This application works depend on the product chosen by the farmer and that is taken as input, thus providing the farmers. The future scope of the AgroNutri is that GPRS can be included so that according to location nutrients are suggested. Further

this application would be incorporated as a piece of the accuracy agriculture wherein sensors can be utilized to discover the measure of NPK present in the dirt and that sum can be deducted from the suggestion and giving us the exact measure of supplements to be added.

Machine Learning: Applications in Indian Agriculture,2016

Agriculture is a field that has been lacking from adaption of technologies and their advancements. Indian agriculturists should be up to the mark with the universal procedures. Machine learning is a native concept that can be applied to every field on all inputs and outputs. It has effectively settled its ability over ordinary calculations of software engineering and measurements. Machine learning calculations have improved the exactness of artificial intelligence machines including sensor based frameworks utilized in accuracy farming. This paper has evaluated the different uses of machine learning in the farming area. It additionally gives a knowledge into the inconveniences looked by Indian farmers and how they can be resolved using these procedures.

Impacts of population growth, economic development, and technical change on global food production and consumption,2015

Throughout the following decades humanity will request more food from less land and water assets. This investigation evaluates the food production effects of four elective advancement situations from the Millennium Ecosystem Assessment and the Special Report on Emission Scenarios. partially and jointly considered are land and water supply impacts from population development, and specialized change, and forests and agriculture demand request shifts from population development and economic improvement. The income impacts on nourishment request are registered with dynamic flexibilities. Worldwide farming area increments by up to 14% somewhere in the range of 2010 and 2030. Deforestation restrictions strongly impact the price of land and water resources but have little consequences for the global level of food production and food prices. While projected income changes have the highest partial impact on per capita food consumption levels, population growth leads to the highest increase in total food production.

Brief history of agricultural systems modelling, 2016

Rural frameworks science creates information that enables analysts to consider complex issues or take educated farming choices. The rich history of this science represents the decent variety of frameworks and scales over which they work and have been contemplated. Demonstrating, a basic apparatus in agrarian frameworks science, has been expert by researchers from an extensive variety of controls, who have contributed ideas and instruments over six decades. As agrarian researchers currently consider the "people to come" models, information, and learning items expected to meet the inexorably mind boggling frameworks issues looked by society, it is vital to check out this history and its exercises to guarantee that we stay away from re-innovation and endeavor to think about all elements of related difficulties. To this end, we outline here the historical backdrop of rural frameworks demonstrating and distinguish exercises discovered that can help control the structure and advancement of up and coming age of farming framework apparatuses and techniques. Various past occasions joined with generally innovative advancement in different fields have unequivocally added to the development of farming framework demonstrating, including improvement of process-based bio-physical models of yields and domesticated animals, factual models dependent on verifiable perceptions, and financial streamlining and reproduction models at family unit and local to worldwide scales. Attributes of rural frameworks models have changed broadly relying upon the frameworks included, their scales, and the extensive variety of purposes that spurred their advancement and use by specialists in various controls. Late patterns in more extensive joint effort crosswise over establishments, crosswise over orders, and between people in general and private segments recommend that the stage is set for the significant advances in rural frameworks science that are required for the up and coming age of models, databases, learning items and choice emotionally supportive networks. The exercises from history ought to be considered to help stay away from barricades and entanglements as the network builds up this up and coming age of horticultural frameworks models.

A Smart Agricultural Model by Integrating IoT, Mobile and Cloud-based Big Data Analytics, 2017

In the cultivating field, the system models play a significant role to the enhancement of the agro-normal and money related conditions. In the proportions of benefits of the field and farm examinations to give the information and to recognize fitting and fruitful organization practices. It can recognize the organization to arrive managers and transversely over reality as long as the required soil, the board, environment, and money related information. Decision Support Systems (DSSs) use to make the information for the vermin the board, develop the officials. These systems are not using the impelled strategies to process the data. Thusly, use the adroit system thoughts to take the decisions for the issue. It expect a crucial activity in the comprehension of agronomic results, and their use as decision sincerely steady systems for farmers is extending.

An Overview of Internet of Things and Data Analytics in Agriculture: Benefits and Challenges, 2018

A blueprint of IoT and DA in agriculture has been shown in this paper. A couple of zones related to the association of IoT in agribusiness have been discussed in detail. The investigation of composing exhibits that there are clusters of work advancing being produced of IoT development that can be used to increase operational efficiency and gainfulness of plant and creatures. The benefits of IoT and DA, and open troubles have been identified and inspected in this paper. IoT is depended upon to offer a couple of benefits to the agribusiness division. Regardless, there are up 'til now different issues to be steered to make it moderate for close to nothing and medium-scale farmers. The key issues are security and cost. It is typical that as contention increases in the cultivating part

Circulation Mode Selection Based on Cost Analysis, 2017

If every farmer and each average production base will join their optimal conditions in making cooperatives, it will accomplish economies of scale. Furthermore, producers will have

an all the more favourable position in the plans with downstream firms (shipper or retailer). Second, the main customers of wholesale market are not inhabitants nearby who buy small quantities products but lower distributors or retailers. More redesigned transportation mode respects intensive attempt of new agrarian things, which prompts bolster the movement of new chain joint logistics and strengthen resource utilize and made logistics advantage quality. Refresh everything considered agrarian things spread. By then, regard the examination of gigantic worth control of standard things and achieve the mind blowing control to stream process.

Support Vector Machine-based Fuzzy Self-learning Control for Induction Machines, 2010

Using support vector machine (SVM) is to realize the self learning of fuzzy inference system (FIS), based on a fast modified varying metric method (MDFP) and a support vector machine identifier (SVMI), a SVM-FIS self-learning controller for the threephase induction machine adjustable speed system has been designed. The proposed controller is not only of the advantages that FIS does not depend on the plant model, strong robustness, and adaptive self-learning ability, but also learning ability and generalization performance of SVM. The designed processes of SVM-FIS, MDFP, and SVMI algorithms have been described in details. Simulation results show the feasibility, correctness and effectiveness of the proposed control strategy, such as the excellent static and dynamic performances, and strong anti-interference ability.

CHAPTER-3

REQUIREMENT ANALYSIS

3.1 EXISTING SYSTEM

Extensive work has been done, and many ML algorithms have been applied in the agriculture sector. The biggest challenge in agriculture is to increase farm production and offer it to the end-user with the best possible price and quality. It is also observed that at least 50% of the farm produce gets wasted, and it never reaches the end-user. The proposed model suggests the methods for minimizing farm produce wastage. One of the recent works, S. Pavani et.al. presented a model where the crop yield is predicted using KNN algorithms by making the clusters. It has been shown that KNN clustering proved much better than SVM or regression. Nishant et. al. predicted the crop yield for the specific year with the help of advanced regression techniques like Enet, Lasso and Kernel Ridge algorithms. The Stacking regression helped to enhance the accuracy of the algorithms.

3.2 DISADVANTAGES OF EXISTING SYSTEM

- The main challenge faced in agriculture sector is the lack of knowledge about the changing variations in climate. Each crop has its own suitable climatic features. This can be handled with the help of precise farming techniques. The precision farming not only maintains the productivity of crops but also increases the yield rate of production.
- The existing system which recommends crop yield is either hardware-based being costly to maintain, or not easily accessible.
- Despite many solutions that have been recently proposed, there are still open challenges in creating a user-friendly application with respect to crop recommendation.

3.3 PROPOSED SYSTEM

- In this project, we have proposed a model that addresses the existing 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 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 main objective is to obtain a better variety of crops that can be grown over the season. The proposed system would help to minimize the difficulties faced by farmers in choosing a crop and maximize the yield.

3.4 ADVANTAGES OF PROPOSED SYSTEM

- The proposed model predicts the crop yield for the data sets of the given region. Integrating agriculture and ML will contribute to more enhancements in the agriculture sector by increasing the yields and optimizing the resources involved. The data from previous years are the key elements in forecasting current performance.
- The proposed system uses recommender system to suggest the right time for using fertilizers.
- The methods in the proposed system includes increasing the yield of crops, real-time analysis of crops, selecting efficient parameters, making smarter decisions and getting better yield.

CHAPTER-4

DESCRIPTION OF PROPOSED SYSTEM

4.1 SYSTEM ARCHITECTURE

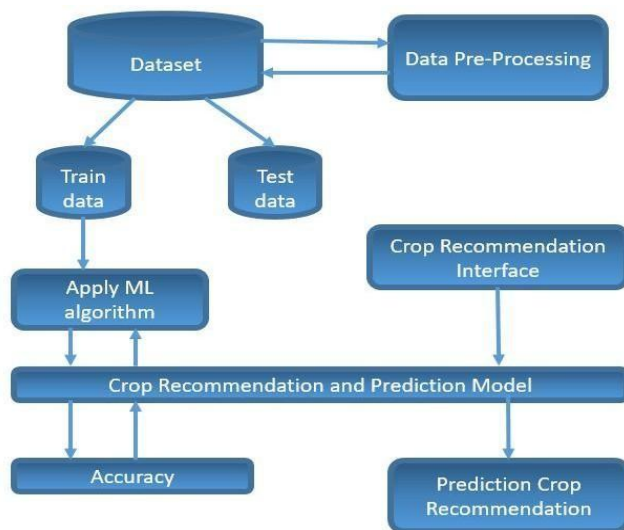


Figure 4.1: System Architecture

4.2 SYSTEM REQUIREMENTS

4.3 HARDWARE REQUIREMENTS:

- System - Pentium-IV
- Speed - 2.4GHZ
- Hard disk - 40GB
- Monitor - 15VGA color
- RAM - 512MB

4.4 SOFTWARE REQUIREMENTS:

- Operating System - Windows XP
- Coding language - Python

CHAPTER-5

IMPLEMENTATION DETAILS

5.1 Python:

Python is a high-level, interpreted, interactive and object-oriented scripting language. Python is designed to be highly readable. It uses English keywords frequently where as other languages use punctuation, and it has fewer syntactical constructions than other languages.

- ***Python is Interpreted*** – Python is processed at runtime by the interpreter. You do not need to compile your program before executing it. This is similar to PERL and PHP.
- ***Python is Interactive*** – You can actually sit at a Python prompt and interact with the interpreter directly to write your programs.
- ***Python is Object-Oriented*** – Python supports Object-Oriented style or technique of programming that encapsulates code within objects.
- ***Python is a Beginner's Language*** – Python is a great language for the beginner-level programmers and supports the development of a wide range of applications from simple text processing to WWW browsers to games.

5.2 History of Python

Python was developed by Guido van Rossum in the late eighties and early nineties at the National Research Institute for Mathematics and Computer Science in the Netherlands.

Python is derived from many other languages, including ABC, Modula-3, C, C++, Algol-68, SmallTalk, and Unix shell and other scripting languages.

Python is copyrighted. Like Perl, Python source code is now available under the GNU General Public License (GPL).

Python is now maintained by a core development team at the institute, although Guido van Rossum still holds a vital role in directing its progress.

5.3 Python Features

Python's features include –

- **Easy-to-learn** – Python has few keywords, simple structure, and a clearly defined syntax. This allows the student to pick up the language quickly.
- **Easy-to-read** – Python code is more clearly defined and visible to the eyes.
- **Easy-to-maintain** – Python's source code is fairly easy-to-maintain.
- **A broad standard library** – Python's bulk of the library is very portable and cross-platform compatible on UNIX, Windows, and Macintosh.
- **Interactive Mode** – Python has support for an interactive mode which allows interactive testing and debugging of snippets of code.
- **Portable** – Python can run on a wide variety of hardware platforms and has the same interface on all platforms.
- **Extendable** – You can add low-level modules to the Python interpreter. These modules enable programmers to add to or customize their tools to be more efficient.
- **Databases** – Python provides interfaces to all major commercial databases.
- **GUI Programming** – Python supports GUI applications that can be created and ported to many system calls, libraries and windows systems, such as Windows MFC, Macintosh, and the X Window system of Unix.
- **Scalable** – Python provides a better structure and support for large programs than shell scripting.

Apart from the above-mentioned features, Python has a big list of good features, few are listed below –

- It supports functional and structured programming methods as well as OOP.
- It can be used as a scripting language or can be compiled to byte-code for building large applications.

- It provides very high-level dynamic data types and supports dynamic type checking.
- It supports automatic garbage collection.
- It can be easily integrated with C, C++, COM, ActiveX, CORBA, and Java.

Python is available on a wide variety of platforms including Linux and Mac OS X. Let's understand how to set up our Python environment.

5.4 Getting Python

The most up-to-date and current source code, binaries, documentation, news, etc., is available on the official website of Python <https://www.python.org>.

Windows Installation

Here are the steps to install Python on Windows machine.

- Open a Web browser and go to <https://www.python.org/downloads/>.
- Follow the link for the Windows installer python-XYZ.msifile where XYZ is the version you need to install.
- To use this installer python-XYZ.msi, the Windows system must support Microsoft Installer 2.0. Save the installer file to your local machine and then run it to find out if your machine supports MSI.
- Run the downloaded file. This brings up the Python install wizard, which is really easy to use. Just accept the default settings, wait until the install is finished, and you are done.

The Python language has many similarities to Perl, C, and Java. However, there are some definite differences between the languages.

FirstPythonProgram

Let us execute programs in different modes of programming.

Interactive Mode Programming

Invoking the interpreter without passing a script file as a parameter brings up the following prompt –

```
$ python
```

```
Python2.4.3(#1,Nov112010,13:34:43)
```

```
[GCC 4.1.220080704(RedHat4.1.2-48)] on linux2
```

```
Type "help", "copyright", "credits" or "license" for more information.
```

```
>>>
```

Type the following text at the Python prompt and press the Enter –

```
>>>print"Hello, Python!"
```

If you are running new version of Python, then you would need to use print statement with parenthesis as in **print ("Hello, Python!");**. However in Python version 2.4.3, this produces the following result –

```
Hello, Python!
```

Script Mode Programming

Invoking the interpreter with a script parameter begins execution of the script and continues until the script is finished. When the script is finished, the interpreter is no longer active.

Let us write a simple Python program in a script. Python files have extension **.py**. Type the following source code in a test.py file –

```
print"Hello, Python!"
```

We assume that you have Python interpreter set in PATH variable. Now, try to run this program as follows –

```
$ python test.py
```

This produces the following result –

```
Hello, Python!
```

Flask Framework:

Flask is a web application framework written in Python. Armin Ronacher, who leads an international group of Python enthusiasts named Pocco, develops it. Flask is based on Werkzeug WSGI toolkit and Jinja2 template engine. Both are Pocco projects.

Http protocol is the foundation of data communication in world wide web. Different methods of data retrieval from specified URL are defined in this protocol.

The following table summarizes different http methods –

Sr.No	Methods & Description
1	GET Sends data in unencrypted form to the server. Most common method.
2	HEAD Same as GET, but without response body
3	POST Used to send HTML form data to server. Data received by POST method is not cached by server.
4	PUT Replaces all current representations of the target resource with the uploaded content.
5	DELETE Removes all current representations of the target resource given by a URL

By default, the Flask route responds to the **GET** requests. However, this preference can be altered by providing methods argument to **route()** decorator.

In order to demonstrate the use of **POST** method in URL routing, first let us create an HTML form and use the **POST** method to send form data to a URL.

Save the following script as login.html

```
<html>

<body>

<form action="http://localhost:5000/login" method="post">

<p>Enter Name:</p>

<p><input type="text" name="nm"/></p>

<p><input type="submit" value="submit"/></p>

</form>

</body>

</html>
```

Now enter the following script in Python shell.

```
from flask import Flask, redirect, url_for, request

app = Flask(__name__)

@app.route('/success/<name>')

def success(name):

    return 'welcome %s' % name

@app.route('/login', methods=['POST', 'GET'])

def login():
```

```
if request.method == 'POST':  
  
    user = request.form['nm']  
  
    return redirect(url_for('success', name = user))  
  
else:  
  
    user = request.args.get('nm')  
  
    return redirect(url_for('success', name = user))  
  
if __name__ == '__main__':  
  
    app.run(debug = True)
```

After the development server starts running, open **login.html** in the browser, enter name in the text field and click **Submit**.



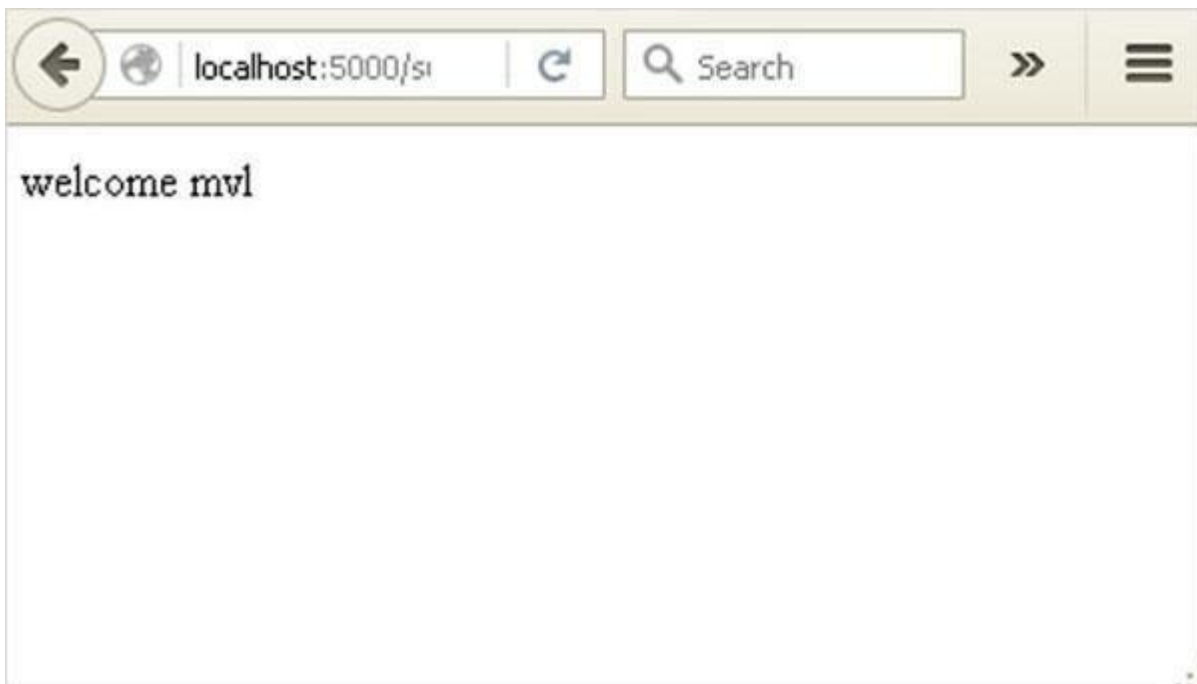
The screenshot shows a web browser window with the address bar displaying 'file:///C:/login.ht'. The main content area contains a form with the label 'Enter Name:'. Below the label is a text input field with the value 'mvl'. Underneath the input field is a button labeled 'submit'.

Form data is POSTed to the URL in action clause of form tag.

http://localhost/login is mapped to the **login()** function. Since the server has received data by **POST** method, value of 'nm' parameter obtained from the form data is obtained by –

```
user = request.form['nm']
```

It is passed to **‘/success’** URL as variable part. The browser displays a **welcome** message in the window.



Change the method parameter to **‘GET’** in **login.html** and open it again in the browser. The data received on server is by the **GET** method. The value of **‘nm’** parameter is now obtained by –

```
User = request.args.get('nm')
```

Here, **args** is dictionary object containing a list of pairs of form parameter and its corresponding value. The value corresponding to **‘nm’** parameter is passed on to **‘/success’** URL as before.

What is Python?

Python is a popular programming language. It was created in 1991 by Guido van Rossum.

It is used for:

- web development (server-side),
- software development,
- mathematics,
- system scripting.

What can Python do?

- Python can be used on a server to create web applications.
- Python can be used alongside software to create workflows.
- Python can connect to database systems. It can also read and modify files.
- Python can be used to handle big data and perform complex mathematics.
- Python can be used for rapid prototyping, or for production-ready software development.

Why Python?

- Python works on different platforms (Windows, Mac, Linux, Raspberry Pi, etc).
- Python has a simple syntax similar to the English language.
- Python has syntax that allows developers to write programs with fewer lines than some other programming languages.
- Python runs on an interpreter system, meaning that code can be executed as soon as it is written. This means that prototyping can be very quick.
- Python can be treated in a procedural way, an object-orientated way or a functional way.

Good to know

- The most recent major version of Python is Python 3, which we shall be using in this tutorial. However, Python 2, although not being updated with anything other than security updates, is still quite popular.
- In this tutorial Python will be written in a text editor. It is possible to write Python in an Integrated Development Environment, such as Thonny, Pycharm, Netbeans or Eclipse which are particularly useful when managing larger collections of Python files.

Python Syntax compared to other programming languages

- Python was designed to for readability, and has some similarities to the English language with influence from mathematics.
- Python uses new lines to complete a command, as opposed to other programming languages which often use semicolons or parentheses.
- Python relies on indentation, using whitespace, to define scope; such as the scope of loops, functions and classes. Other programming languages often use curly-brackets for this purpose.

5.5 Python Install

Many PCs and Macs will have python already installed.

To check if you have python installed on a Windows PC, search in the start bar for Python or run the following on the Command Line (cmd.exe):

```
C:\Users\Your Name>python --version
```

To check if you have python installed on a Linux or Mac, then on linux open the command line or on Mac open the Terminal and type:

```
python --version
```

If you find that you do not have python installed on your computer, then you can download it for free from the following website: <https://www.python.org/>

Python Quickstart

Python is an interpreted programming language, this means that as a developer you write Python (.py) files in a text editor and then put those files into the python interpreter to be executed.

The way to run a python file is like this on the command line:

```
C:\Users\Your Name>python helloworld.py
```

Where "helloworld.py" is the name of your python file.

Let's write our first Python file, called helloworld.py, which can be done in any text editor.

```
helloworld.py
```

```
print("Hello, World!")
```

Simple as that. Save your file. Open your command line, navigate to the directory where you saved your file, and run:

```
C:\Users\Your Name>python helloworld.py
```

The output should read:

```
Hello, World!
```

Congratulations, you have written and executed your first Python program.

The Python Command Line

To test a short amount of code in python sometimes it is quickest and easiest not to write the code in a file. This is made possible because Python can be run as a command line itself.

Type the following on the Windows, Mac or Linux command line:

```
C:\Users\Your Name>python
```

From there you can write any python, including our hello world example from earlier in the tutorial:

```
C:\Users\Your Name>python
Python 3.6.4 (v3.6.4:d48eceb, Dec 19 2017, 06:04:45) [MSC v.1900 32 bit (Intel)] on win32
Type "help", "copyright", "credits" or "license" for more information.
>>> print("Hello, World!")
```

Which will write "Hello, World!" in the command line:

```
C:\Users\Your Name>python
Python 3.6.4 (v3.6.4:d48eceb, Dec 19 2017, 06:04:45) [MSC v.1900 32 bit (Intel)] on win32
Type "help", "copyright", "credits" or "license" for more information.
>>> print("Hello, World!")
Hello, World!
```

Whenever you are done in the python command line, you can simply type the following to quit the python command line interface:

```
exit()
```

Execute Python Syntax

As we learned in the previous page, Python syntax can be executed by writing directly in the Command Line:

```
>>>                                     print("Hello,                                     World!")
Hello, World!
```

Or by creating a python file on the server, using the .py file extension, and running it in the Command Line:

```
C:\Users\Your Name>python myfile.py
```

Python Indentations

Where in other programming languages the indentation in code is for readability only, in Python the indentation is very important.

Python uses indentation to indicate a block of code.

Example

```
if 5 > 2:
    print("Five is greater than two!")
```

Python will give you an error if you skip the indentation:

Example

```
if 5 > 2:
print("Five is greater than two!")
```

Comments

Python has commenting capability for the purpose of in-code documentation.

Comments start with a #, and Python will render the rest of the line as a comment:

Example

Comments in Python:

```
#This is a comment.
print("Hello, World!")
```

Docstrings

Python also has extended documentation capability, called docstrings.

Docstrings can be one line, or multiline.

Python uses triple quotes at the beginning and end of the docstring:

Example

Docstrings are also comments:

```
"""This is a
multiline docstring."""
print("Hello, World!")
```

CHAPTER-6

RESULTS AND DISCUSSION

6.1 RESULT

In this paper, we have surveyed the various climate change methodologies in data mining and agricultural methodologies in data mining. Climate change affects on agriculture and its fields and yields, crop cultivations and its effect on economy. This survey suggests that the more predictions are accurate about climate the more helpful is it for the farmers. Therefore, the Analysis of Agriculture Data using Data Mining Techniques is done.

6.2 DISCUSSION

6.21 MODULES

- Admin Login
- Metadata
- Data Pre-processing
- Crop Prediction Module
- Crop Recommendation Module

6.3 MODULE DESCRIPTION

6.31 Admin login

This is the first activity, Admin needs to provide a correct contact number and a password, which user enters while registering, in order to login into the webpage. If information provided by the admin matches with the data in the database table then user successfully login into the webpage else message of login failed is displayed and user need to re-enter correct information.

6.32 Metadata

All the main data used in the data set are initialized with the number to use in the algorithm it is like initializing all the details. In this metadata, we are going to initialize all the crop names with the numbers. This data makes us use the data easily in the algorithm. Here the metadata of all the crops is given with a particular number. This number is not duplicated that is one number is given to one crop, the same number is not given to the other crop. This metadata consists of more than a hundred crops that grown all over India.

6.33 Data Pre-processing

Here the raw data in the crop data is cleaned and the metadata is appended to it by removing the things which are converted to the integer. So, the data is easy to train. Here all the data. In this pre-processing, we first load the metadata into this and then this metadata will be attached to the data and replace the converted data with metadata. Then this data will be moved further and remove the unwanted data in the list and it will divide the data into the train and the test data.

6.34 Crop Prediction Module

The obtained result will be helpful for the farmers to know the Yield of the crop so, he can go for the better crop which gives high yield and also say them the efficient use of agriculture field. This way we can help the farmers to grow the crop which gives them better yield.

6.35 Crop Recommendation Module

In this module, 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.

6.4 REQUIREMENT ANALYSIS

Requirement analysis, also called requirement engineering, is the process of determining user expectations for a new modified product. It encompasses the tasks that determine the need for analysing, documenting, validating and managing software or system requirements. The requirements should be documentable, actionable, measurable, testable and traceable related to identified business needs or opportunities and define to a level of detail, sufficient for system design.

6.5 FUNCTIONAL REQUIREMENTS

It is a technical specification requirement for the software products. It is the first step in the requirement analysis process which lists the requirements of particular software systems including functional, performance and security requirements. The function of the system depends mainly on the quality hardware used to run the software with given functionality.

Usability

It specifies how easy the system must be use. It is easy to ask queries in any format which is short or long, porter stemming algorithm stimulates the desired response for user.

Robustness

It refers to a program that performs well not only under ordinary conditions but also under unusual conditions. It is the ability of the user to cope with errors for irrelevant queries during execution.

Security

The state of providing protected access to resource is security. The system provides good security and unauthorized users cannot access the system there by providing high security.

ECONOMICAL FEASIBILITY

This study is carried out to check the economic impact that the system will have on the organization. The amount of fund that the company can pour into the research and development of the system is limited. The expenditures must be justified. Thus the developed system as well within the budget and this was achieved because most of the technologies used are freely available. Only the customized products had to be purchased.

TECHNICAL FEASIBILITY

This study is carried out to check the technical feasibility, that is, the technical requirements of the system. Any system developed must not have a high demand on the available technical resources. This will lead to high demands on the available technical resources. This will lead to high demands being placed on the client. The developed system must have a modest requirement, as only minimal or null changes are required for implementing this system.

Reliability

It is the probability of how often the software fails. The measurement is often expressed in MTBF (Mean Time Between Failures). The requirement is needed in order to ensure that the processes work correctly and completely without being aborted. It can handle any load and survive and survive and even capable of working around any failure.

Compatibility

It is supported by version above all web browsers. Using any web servers like localhost makes the system real-time experience.

Flexibility

The flexibility of the project is provided in such a way that it has the ability to run on different environments being executed by different users.

Safety

Safety is a measure taken to prevent trouble. Every query is processed in a secured manner without letting others to know one's personal information.

6.6 NON- FUNCTIONAL REQUIREMENTS

Portability

It is the usability of the same software in different environments. The project can be run in any operating system.

Performance

These requirements determine the resources required, time interval, throughput and everything that deals with the performance of the system.

Accuracy

The result of the requesting query is very accurate and high speed of retrieving information. The degree of security provided by the system is high and effective.

Maintainability

Project is simple as further updates can be easily done without affecting its stability. Maintainability basically defines that how easy it is to maintain the system. It means that how easy it is to maintain the system, analyse, change and test the application. Maintainability of this project is simple as further updates can be easily done without affecting its stability.

6.7 DATA FLOW DIAGRAM:

1. The DFD is also called as bubble chart. It is a simple graphical formalism that can be used to represent a system in terms of input data to the system, various processing carried out on this data, and the output data is generated by this system.
2. The data flow diagram (DFD) is one of the most important modeling tools. It is used to model the system components. These components are the system process, the data used by the process, an external entity that interacts with the system and the information flows in the system.
3. DFD shows how the information moves through the system and how it is modified by a series of transformations. It is a graphical technique that depicts information flow and the transformations that are applied as data moves from input to output.
4. DFD is also known as bubble chart. A DFD may be used to represent a system at any level of abstraction. DFD may be partitioned into levels that represent increasing information flow and functional detail.

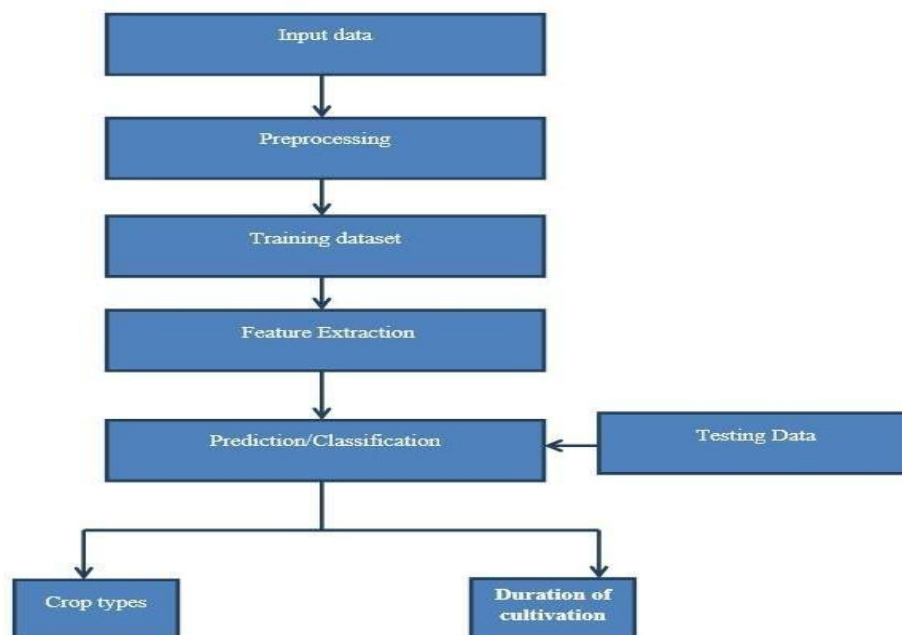


Figure 6.6:Data Flow Diagram

6.8 UML DIAGRAMS

UML stands for Unified Modeling Language. UML is a standardized general-purpose modeling language in the field of object-oriented software engineering. The standard is managed, and was created by, the Object Management Group.

The goal is for UML to become a common language for creating models of object oriented computer software. In its current form UML is comprised of two major components: a Meta-model and a notation. In the future, some form of method or process may also be added to; or associated with, UML.

The Unified Modeling Language is a standard language for specifying, Visualization, Constructing and documenting the artifacts of software system, as well as for business modeling and other non-software systems.

The UML represents a collection of best engineering practices that have proven successful in the modeling of large and complex systems.

The UML is a very important part of developing objects oriented software and the software development process. The UML uses mostly graphical notations to express the design of software projects.

6.9 GOALS:

The Primary goals in the design of the UML are as follows:

1. Provide users a ready-to-use, expressive visual modeling Language so that they can develop and exchange meaningful models.
2. Provide extendibility and specialization mechanisms to extend the core concepts.
3. Be independent of particular programming languages and development process.
4. Provide a formal basis for understanding the modeling language.
5. Encourage the growth of OO tools market.
6. Support higher level development concepts such as collaborations, frameworks, patterns and components.
7. Integrate best practices.

6.10 USE CASE DIAGRAM

A use case diagram in the Unified Modeling Language (UML) is a type of behavioral diagram defined by and created from a Use-case analysis. Its purpose is to present a graphical overview of the functionality provided by a system in terms of actors, their goals (represented as use cases), and any dependencies between those use cases. The main purpose of a use case diagram is to show what system functions are performed for which actor. Roles of the actors in the system can be depicted. It encapsulates the system's functionality by incorporating use cases, actors, and their relationships. It models the tasks, services, and functions required by a system/subsystem of an application. It depicts the high-level functionality of a system and also tells how the user handles a system. The main purpose of a use case diagram is to portray the dynamic aspect of a system. It accumulates the system's requirement, which includes both internal as well as external influences. It invokes persons, use cases, and several things that invoke the actors and elements accountable for the implementation of use case diagrams.

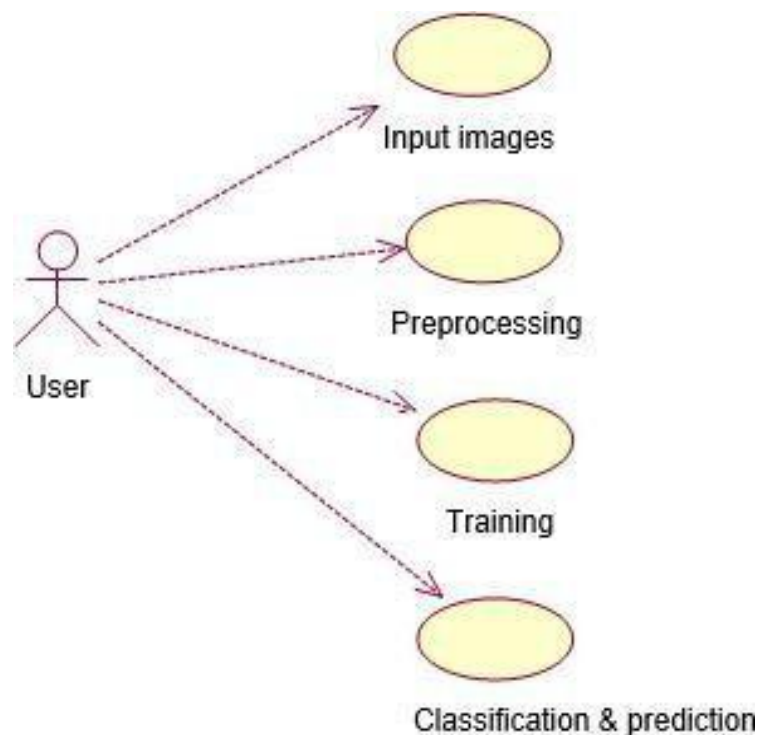


Figure 6.9: Use Case Diagram

6.11 CLASS DIAGRAM

In software engineering, a class diagram in the Unified Modeling Language (UML) is a type of static structure diagram that describes the structure of a system by showing the system's classes, their attributes, operations (or methods), and the relationships among the classes. A static view of an application is depicted in the class diagram. It displays the properties, classes, functions, and relationships of the software system to provide an overview of the software system. It explains which class contains information. It organizes class names, properties, and functions into a discrete compartment to aid in program development. The following are the functions of class diagrams

1. Define the main responsibilities of the system.
2. Serves as a basis for component diagrams and deployment. Use forward and reverse engineering.

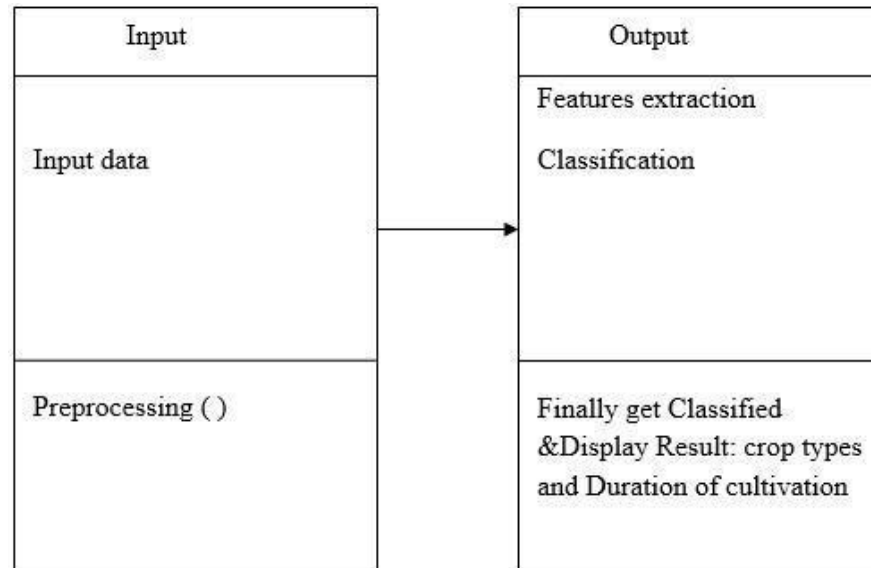


Figure 6.10: Class Diagram

6.12 SEQUENCE DIAGRAM

A sequence diagram in Unified Modeling Language (UML) is a kind of interaction diagram that shows how processes operate with one another and in what order. It is a construct of a Message Sequence Chart. Sequence diagrams are sometimes called event diagrams, event scenarios, and timing diagram. It helps to visualize various dynamic parameters. It describes the communication between two rescue lines as a series of events arranged in time in which these rescue lines participated during the performance. The lifeline is represented by a vertical bar in UML while the message flow is represented by a vertical dotted line that crosses the bottom of the page. It includes both repetitions and branches.

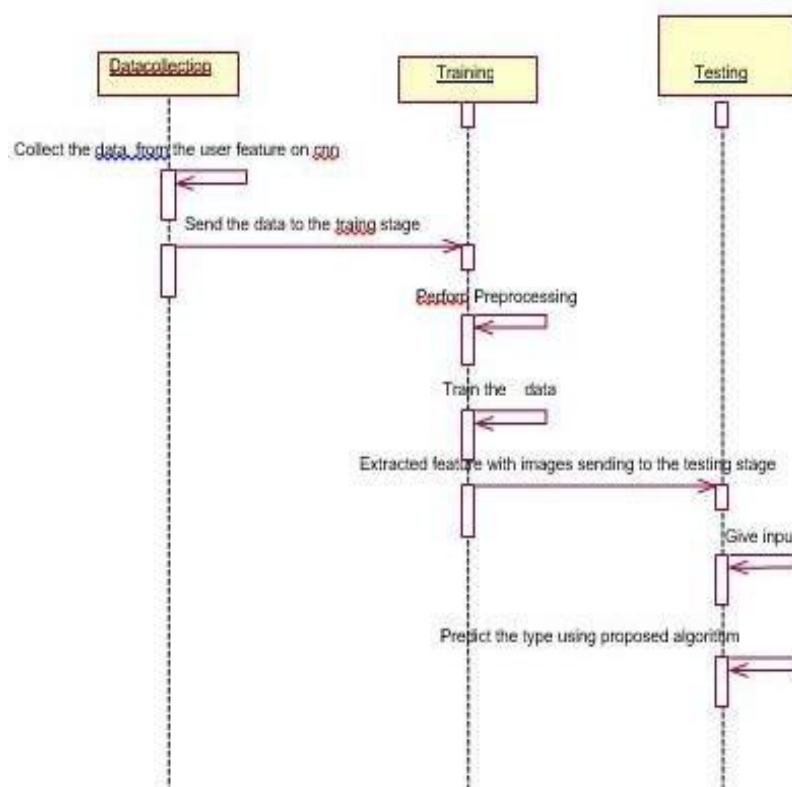


Figure 6.11: Sequence Diagram

6.13 ACTIVITY DIAGRAM

Activity diagrams are graphical representations of workflows of stepwise activities and actions with support for choice, iteration and concurrency. In the Unified Modeling Language, activity diagrams can be used to describe the business and operational step-by-step workflows of components in a system. An activity diagram shows the overall flow of control. It is made up of a group of nodes that are linked to one another by means of edges. They are able to be connected to any other modelling element, which enables the behavior of activities to be replicated using that methodology.

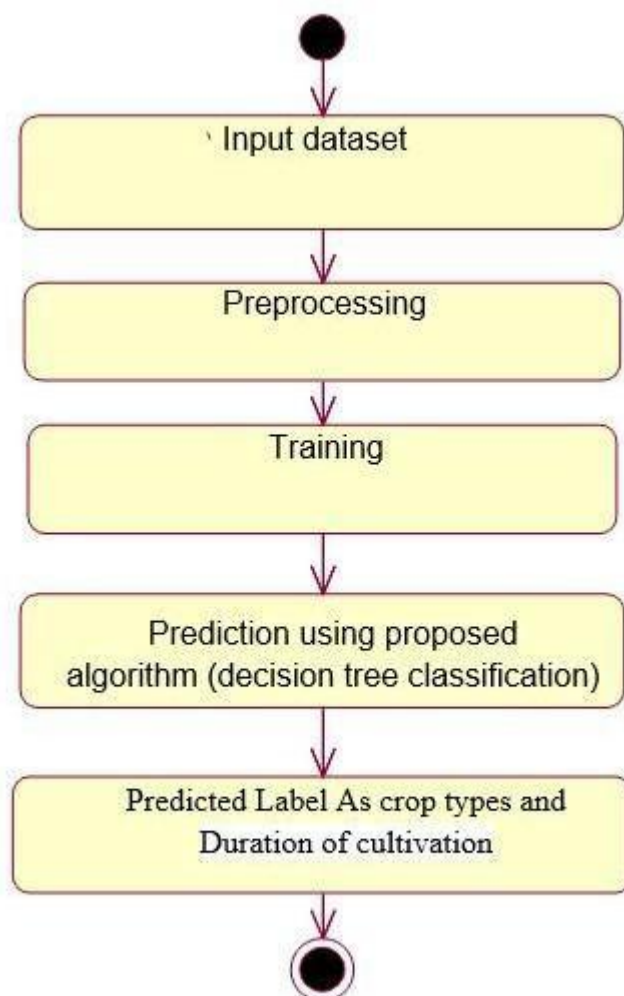


Figure 6.12:Activity Diagram

6.14 INPUT DESIGN AND OUTPUT DESIGN

6.14.1 INPUT DESIGN

The input design is the link between the information system and the user. It comprises the developing specification and procedures for data preparation and those steps are necessary to put transaction data in to a usable form for processing can be achieved by inspecting the computer to read data from a written or printed document or it can occur by having people keying the data directly into the system. The design of input focuses on controlling the amount of input required, controlling the errors, avoiding delay, avoiding extra steps and keeping the process simple. The input is designed in such a way so that it provides security and ease of use with retaining the privacy. Input Design considered the following things:

- What data should be given as input?
- How the data should be arranged or coded?
- The dialog to guide the operating personnel in providing input.
- Methods for preparing input validations and steps to follow when error occur.

OBJECTIVES

1. Input Design is the process of converting a user-oriented description of the input into a computer-based system. This design is important to avoid errors in the data input process and show the correct direction to the management for getting correct information from the computerized system.
2. It is achieved by creating user-friendly screens for the data entry to handle large volume of data. The goal of designing input is to make data entry easier and to be free from errors. The data entry screen is designed in such a way that all the data manipulates can be performed. It also provides record viewing facilities.
3. When the data is entered it will check for its validity. Data can be entered with the help of screens. Appropriate messages are provided as when needed so that the user will not be in maize of instant. Thus the objective of input design is to create an input layout that is easy to follow

6.14.2 OUTPUT DESIGN

A quality output is one, which meets the requirements of the end user and presents the information clearly. In any system results of processing are communicated to the users and to other system through outputs. In output design it is determined how the information is to be displaced for immediate need and also the hard copy output. It is the most important and direct source information to the user. Efficient and intelligent output design improves the system's relationship to help user decision-making.

1. Designing computer output should proceed in an organized, well thought out manner; the right output must be developed while ensuring that each output element is designed so that people will find the system can use easily and effectively. When analysis design computer output, they should Identify the specific output that is needed to meet the requirements.
2. Select methods for presenting information.
3. Create document, report, or other formats that contain information produced by the system.

The output form of an information system should accomplish one or more of the following objectives.

- ❖ Convey information about past activities, current status or projections of the
- ❖ Future.
- ❖ Signal important events, opportunities, problems, or warnings.
- ❖ Trigger an action.
- ❖ Confirm an action.

6.15 REQUIREMENT ANALYSIS

SYSTEM STUDY

FEASIBILITY STUDY

The feasibility of the project is analyzed in this phase and business proposal is put forth with a very general plan for the project and some cost estimates. During system analysis the feasibility study of the proposed system is to be carried

out. This is to ensure that the proposed system is not a burden to the company. For feasibility analysis, some understanding of the major requirements for the system is essential.

Three key considerations involved in the feasibility analysis are

- ◆ ECONOMICAL FEASIBILITY
- ◆ TECHNICAL FEASIBILITY
- ◆ SOCIAL FEASIBILITY

ECONOMICAL FEASIBILITY

This study is carried out to check the economic impact that the system will have on the organization. The amount of fund that the company can pour into the research and development of the system is limited. The expenditures must be justified. Thus the developed system as well within the budget and this was achieved because most of the technologies used are freely available. Only the customized products had to be purchased.

TECHNICAL FEASIBILITY

This study is carried out to check the technical feasibility, that is, the technical requirements of the system. Any system developed must not have a high demand on the available technical resources. This will lead to high demands on the available technical resources. This will lead to high demands being placed on the client. The developed system must have a modest requirement, as only minimal or null changes are required for implementing this system.

SOCIAL FEASIBILITY

The aspect of study is to check the level of acceptance of the system by the user. This includes the process of training the user to use the system efficiently. The user must not feel threatened by the system, instead must accept it as a necessity. The level of acceptance by the users solely depends on the methods that are employed to educate the user about the system and to make him familiar with it. His level of confidence must be raised so that he is also able to make some constructive

criticism, which is welcomed, as he is the final user of the system.

SYSTEM TESTING

The purpose of testing is to discover errors. Testing is the process of trying to discover every conceivable fault or weakness in a work product. It provides a way to check the functionality of components, sub assemblies, assemblies and/or a finished product. It is the process of exercising software with the intent of ensuring that the Software system meets its requirements and user expectations and does not fail in an unacceptable manner. There are various types of test. Each test type addresses a specific testing requirement.

TYPES OF TESTS

Unit testing

Unit testing involves the design of test cases that validate that the internal program logic is functioning properly, and that program inputs produce valid outputs. All decision branches and internal code flow should be validated. It is the testing of individual software units of the application. It is done after the completion of an individual unit before integration. This is a structural testing, that relies on knowledge of its construction and is invasive. Unit tests perform basic tests at component level and test a specific business process, application, and/or system configuration. Unit tests ensure that each unique path of a business process performs accurately to the documented specifications and contains clearly defined inputs and expected results.

Integration testing

Integration tests are designed to test integrated software components to determine if they actually run as one program. Testing is event driven and is more concerned with the basic outcome of screens or fields. Integration tests demonstrate that although the components were individually satisfactory, as shown by successfully unit testing, the combination of components is correct and consistent. Integration testing is specifically aimed at exposing the problems that arise from the combination of components.

Functional test

Functional tests provide systematic demonstrations that functions tested are available as specified by the business and technical requirements, system documentation, and user manuals.

Functional testing is centered on the following items:

Valid Input : identified classes of valid input must be accepted.

Invalid Input : identified classes of invalid input must be rejected.

Functions : identified functions must be exercised.

Output : identified classes of application outputs must be exercised.

Systems/Procedures: interfacing systems or procedures must be invoked.

Organization and preparation of functional tests is focused on requirements, key functions, or special test cases. In addition, systematic coverage pertaining to identify Business process flows; data fields, predefined processes, and successive processes must be considered for testing. Before functional testing is complete, additional tests are identified and the effective value of current tests is determined.

System Test

System testing ensures that the entire integrated software system meets requirements. It tests a configuration to ensure known and predictable results. An example of system testing is the configuration oriented system integration test. System testing is based on process descriptions and flows, emphasizing pre-driven process links and integration points.

White Box Testing

White Box Testing is a testing in which in which the software tester has knowledge of the inner workings, structure and language of the software, or at least its purpose. It is purpose. It is used to test areas that cannot be reached from a black box level.

Black Box Testing

Black Box Testing is testing the software without any knowledge of the inner workings, structure or language of the module being tested. Black box tests, as most other kinds of tests, must be written from a definitive source document, such as specification or requirements document, such as specification or requirements document. It is a testing in which the software under test is treated, as a black box .you cannot “see” into it. The test provides inputs and responds to outputs without considering how the software works.

Unit Testing:

Unit testing is usually conducted as part of a combined code and unit test phase of the software lifecycle, although it is not uncommon for coding and unit testing to be conducted as two distinct phases.

Test strategy and approach

Field testing will be performed manually and functional tests will be written in detail.

Test objectives

- All field entries must work properly.
- Pages must be activated from the identified link.
- The entry screen, messages and responses must not be delayed.

Features to be tested

- Verify that the entries are of the correct format
- No duplicate entries should be allowed
- All links should take the user to the correct page.

Integration Testing

Software integration testing is the incremental integration testing of two or more integrated software components on a single platform to produce failures

caused by interface defects.

The task of the integration test is to check that components or software applications, e.g. components in a software system or – one step up – software applications at the company level – interact without error.

Test Results: All the test cases mentioned above passed successfully. No defects encountered.

Acceptance Testing

User Acceptance Testing is a critical phase of any project and requires significant participation by the end user. It also ensures that the system meets the functional requirements.

Test Results: All the test cases mentioned above passed successfully. No defects encountered.

CHAPTER-7

CONCLUSION

In this paper, significance of management of crops was studied vastly. Farmers need assistance with recent technology to grow their crops. Proper prediction of crops can be informed to agriculturists in time basis. Many Machine Learning techniques have been used to analyze the agriculture parameters. Some of the techniques in different aspects of agriculture are studied by a literature study. Blooming Neural networks, Soft computing techniques plays significant part in providing recommendations. Considering the parameter like production and season, more personalized and relevant recommendations can be given to farmers which makes them to yield good volume of production.

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APPENDIX

A. SOURCE CODE

```
import numpy as np
import pandas as pd
from flask import Flask, request, jsonify, render_template, redirect, flash, send_file
from sklearn.preprocessing import MinMaxScaler
from werkzeug.utils import secure_filename
import pickle

import numpy as np
import pandas as pd
from flask import Flask, request, jsonify, render_template, redirect, flash, send_file
from sklearn.preprocessing import MinMaxScaler
from werkzeug.utils import secure_filename
import pickle
import numpy as np
import pandas as pd
from sklearn.tree import DecisionTreeClassifier
from sklearn.ensemble import RandomForestClassifier, BaggingClassifier,
AdaBoostClassifier, VotingClassifier

app = Flask(__name__) #Initialize the flask App

#forest = pickle.load(open('boosting.pkl','rb'))
#crop = pickle.load(open('crop.pkl','rb'))
@app.route('/')

@app.route('/index')
def index():
    return render_template('index.html')

@app.route('/analysis')
```

```

def analysis():
    return render_template('analysis.html')

@app.route('/chart')
def chart():
    return render_template('chart.html')

#@app.route('/future')
#def future():
#    return render_template('future.html')

@app.route('/login')
def login():
    return render_template('login.html')

@app.route('/upload')
def upload():
    return render_template('upload.html')

@app.route('/preview', methods=["POST"])
def preview():
    if request.method == 'POST':
        dataset = request.files['datasetfile']
        df = pd.read_csv(dataset, encoding = 'unicode_escape')
        df.set_index('Id', inplace=True)
        return render_template("preview.html", df_view = df)

#@app.route('/home')
#def home():
#    return render_template('home.html')

@app.route('/prediction', methods = ['GET', 'POST'])
def prediction():
    return render_template('prediction.html')

```

```

#@app.route('/upload')
#def upload_file():
#    return render_template('BatchPredict.html')

@app.route('/predict',methods=['POST'])
def predict():
    int_feature = [x for x in request.form.values()]

    final_features = [np.array(int_feature)]

    y_pred=crop.predict(final_features)

    if y_pred[0] == 'Paddy IGKVR-2 (IET 19795)':
        label="Crop: Paddy IGKVR-2 (IET 19795) Duration of cultivation: 105-123"
    elif y_pred[0] == 'Paddy CR Dhan 501 (IET 19189)':
        label="Crop: Paddy CR Dhan 501 (IET 19189) Duration of cultivation: 105-126"
    elif y_pred[0] == 'Wheat VL Gehun 907 (VL 907)':
        label="Crop: Wheat VL Gehun 907 (VL 907)) Duration of cultivation: 60-154"
    elif y_pred[0] == 'Wheat WHD 943':
        label="Crop: Wheat WHD 943 Duration of cultivation: 60-157"
    elif y_pred[0] == 'Millet Nandi-65 (MH-1549)':
        label="Crop: Millet Nandi-65 (MH-1549) Duration of cultivation: 65-70"
    elif y_pred[0] == 'Lentil Pant Lentil-8(Pant L-063)':
        label="Crop: Lentil Pant Lentil-8(Pant L-063) Duration of cultivation: 45-60"
    elif y_pred[0] == 'Bajra':
        label="Crop: Bajra Duration of cultivation: 45-50"
    elif y_pred[0] == 'Cardamom':

```

```

        label="Crop: Cardamom Duration of cultivation: 730-735"
elif y_pred[0] == 'Urad':
    label="Crop: Urad Duration of cultivation: 70-85"
elif y_pred[0] == 'Jowar':
    label="Crop: Jowar Duration of cultivation: 65-75"
elif y_pred[0] == 'Paddy CR Dhan 401 (REETA)':
    label="Crop: Paddy CR Dhan 401 (REETA) Duration of cultivation:
105-124    "
elif y_pred[0] == 'Millet MH 1540 (86M64) (Hybrid)':
    label="Crop: Millet MH 1540 (86M64) (Hybrid) Duration of cultivation:
65-73"
elif y_pred[0] == 'Sugarcane Karan 5 (Co 0124)':
    label="Crop: Sugarcane Karan 5 (Co 0124) Duration of cultivation: 300-
451"
elif y_pred[0] == 'Banana':
    label="Crop: Banana Duration of cultivation: 365-370"
elif y_pred[0] == 'Arhar':
    label="Crop: Arhar Duration of cultivation: 120-200"
elif y_pred[0] == 'Clove':
    label="Crop: Clove Duration of cultivation: 120-180    "
elif y_pred[0] == 'Oilseed':
    label="Crop: Oilseed Duration of cultivation: 110-115"
elif y_pred[0] == 'Tea':
    label="Crop: Tea Duration of cultivation: 60-65"
elif y_pred[0] == 'Coffee':
    label="Crop: Coffee Duration of cultivation: 240-270"
elif y_pred[0] == 'Turmeric':
    label="Crop: Turmeric Duration of cultivation: 210-270"
elif y_pred[0] == 'Cashewnut':
    label="Crop: Cashewnut Duration of cultivation: 1030-1035"
elif y_pred[0] == 'Ragi':
    label="Crop: Ragi Duration of cultivation: 5.0-7.0"
elif y_pred[0] == 'Soyabean':
    label="Crop: Soyabean Duration of cultivation: 45-65"

```

```

elif y_pred[0] == 'Black Gram':
    label="Crop: Black Gram Duration of cultivation: 70-85"
elif y_pred[0] == 'Khesari':
    label="Crop: Khesari Duration of cultivation: 125-130"
elif y_pred[0] == 'Wheat MACS 6222':
    label="Crop: Wheat MACS 6222 Duration of cultivation: 60-151"
elif y_pred[0] == 'Black Pepper':
    label="Crop: Black Pepper Duration of cultivation: 120-150"
elif y_pred[0] == 'Chillies':
    label="Crop: Chillies Duration of cultivation: 40-45"
elif y_pred[0] == 'Garlic':
    label="Crop: Garlic Duration of cultivation: 120-150"
elif y_pred[0] == 'Wheat MPO(JW) 1215 (MPO 1215)':
    label="Crop: Wheat MPO(JW) 1215 (MPO 1215) Duration of cultivation:
60-150"
elif y_pred[0] == 'Maize PMH 5 (JH 3110)':
    label="Crop: Maize PMH 5 (JH 3110) Duration of cultivation: 95-105"
elif y_pred[0] == 'Groundnut Kadiri Harithandhra (K 1319)':
    label="Crop: Groundnut Kadiri Harithandhra (K 1319) Duration of
cultivation: 110-121"
elif y_pred[0] == 'Groundnut GPBD 5':
    label="Crop: Groundnut GPBD 5 Duration of cultivation: 110-122"
elif y_pred[0] == 'Lentil Pant Lentil-7(Pant L-024)':
    label="Crop: Lentil Pant Lentil-7(Pant L-024) Duration of cultivation: 45-
61"
elif y_pred[0] == 'Tobacco':
    label="Crop: Tobacco Duration of cultivation: 90-120"
elif y_pred[0] == 'Tomato':
    label="Crop: Tomato Duration of cultivation: 50-60"
elif y_pred[0] == 'Cocoa':
    label="Crop: Cocoa Duration of cultivation: 150-180"
elif y_pred[0] == 'Rubber':
    label="Crop: Rubber Duration of cultivation: 120-130"
elif y_pred[0] == 'Masoor':

```

```

        label="Crop: Masoor Duration of cultivation: 120-130"
elif y_pred[0] == 'Sunhemp':
    label="Crop: Sunhemp Duration of cultivation: 60-90"
elif y_pred[0] == 'Varagu':
    label="Crop: Varagu Duration of cultivation: 160-165"
elif y_pred[0] == 'Paddy CR Dhan 601 (IET 18558)':
    label="Crop: Paddy CR Dhan 601 (IET 18558) Duration of cultivation:
105-125"
elif y_pred[0] == 'Wheat Netravati (NIAW 1415)':
    label="Crop: Wheat Netravati (NIAW 1415) Duration of cultivation: 95-
100"
elif y_pred[0] == 'Maize HSC1':
    label="Crop: Maize HSC1 Duration of cultivation: 95-100"
elif y_pred[0] == 'Millet Nandi-61 (MH-1548)':
    label="Crop: Millet Nandi-61 (MH-1548) Duration of cultivation: 65-71"
elif y_pred[0] == 'Millet 86M64 (MSH 203) (Hybrid)':
    label="Crop: Millet 86M64 (MSH 203) (Hybrid) Duration of cultivation:
65-72"
elif y_pred[0] == 'Barley Pusa Losar (BH- 380)':
    label="Crop: Barley Pusa Losar (BH- 380) Duration of cultivation: 60-
72"
elif y_pred[0] == 'Maize DHM 119 (BH 4062)':
    label="Crop: Maize DHM 119 (BH 4062) Duration of cultivation: 95-
103"
elif y_pred[0] == 'Millet HHB 226 (MH 1479)':
    label="Crop: Millet HHB 226 (MH 1479) Duration of cultivation: 65-76"
elif y_pred[0] == 'Jute':
    label="Crop: Jute Duration of cultivation: 120-150"
elif y_pred[0] == 'Paddy Chinsurah Rice (IET 19140)':
    label="Crop: Paddy Chinsurah Rice (IET 19140) Duration of cultivation:
105-120"
elif y_pred[0] == 'Paddy (CNI 383-5-11)':
    label="Crop: Paddy (CNI 383-5-11) Duration of cultivation: 105-121"
elif y_pred[0] == 'Paddy IGKVR-1 (IET 19569)':

```

```

label="Crop: Paddy IGKVR-1 (IET 19569) Duration of cultivation: 105-
122"
elif y_pred[0] == 'Onion':
    label="Crop: Onion Duration of cultivation: 80-150"
elif y_pred[0] == 'Cotton CNH012':
    label="Crop: Cotton CNH012 Duration of cultivation: 80-150"
elif y_pred[0] == 'Cotton CICR-3 (CISA 614)':
    label="Crop: Cotton CICR-3 (CISA 614) Duration of cultivation: 105-
120"
elif y_pred[0] == 'Rice':
    label="Crop: Rice Duration of cultivation: 105-120"
elif y_pred[0] == 'Flax':
    label="Crop: Flax Duration of cultivation: 120-140"
elif y_pred[0] == 'Barley BH-902':
    label="Crop: Barley BH-902 Duration of cultivation: 60-70"
elif y_pred[0] == 'Sunflower':
    label="Crop: Sunflower Duration of cultivation: 90-100"
elif y_pred[0] == 'Maize HQPM-4':
    label="Crop: Maize HQPM-4 Duration of cultivation: 95-101"
elif y_pred[0] == 'Groundnut Girnar - 3 (PBS 12160)':
    label="Crop: Groundnut Girnar - 3 (PBS 12160) Duration of cultivation:
175-180"
elif y_pred[0] == 'Dry Ginger':
    label="Crop: Dry Ginger Duration of cultivation: 175-180"
elif y_pred[0] == 'Horse Gram':
    label="Crop: Horse Gram Duration of cultivation: 120-180"
elif y_pred[0] == 'Castor Seed':
    label="Crop: Castor Seed Duration of cultivation: 7.0-10"
elif y_pred[0] == 'Sesame':
    label="Crop: Sesame Duration of cultivation: 40-45"
elif y_pred[0] == 'Sugarcane Karan 6 (Co 0239)':
    label="Crop: Sugarcane Karan 6 (Co 0239) Duration of cultivation: 300-
450"
elif y_pred[0] == 'Peas':

```

```

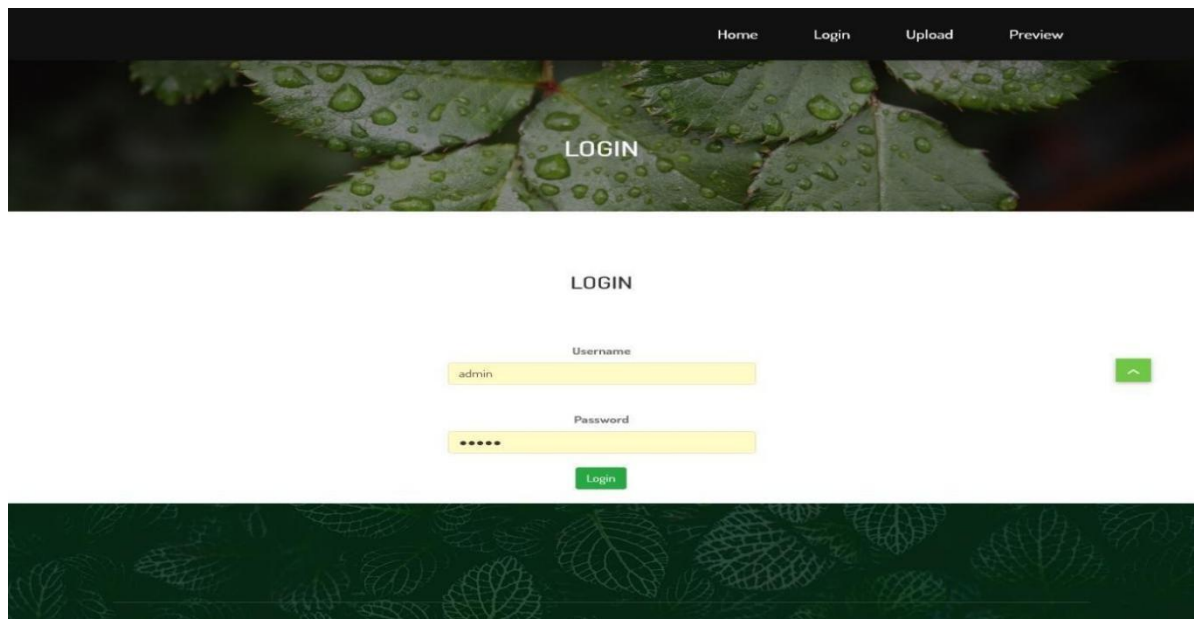
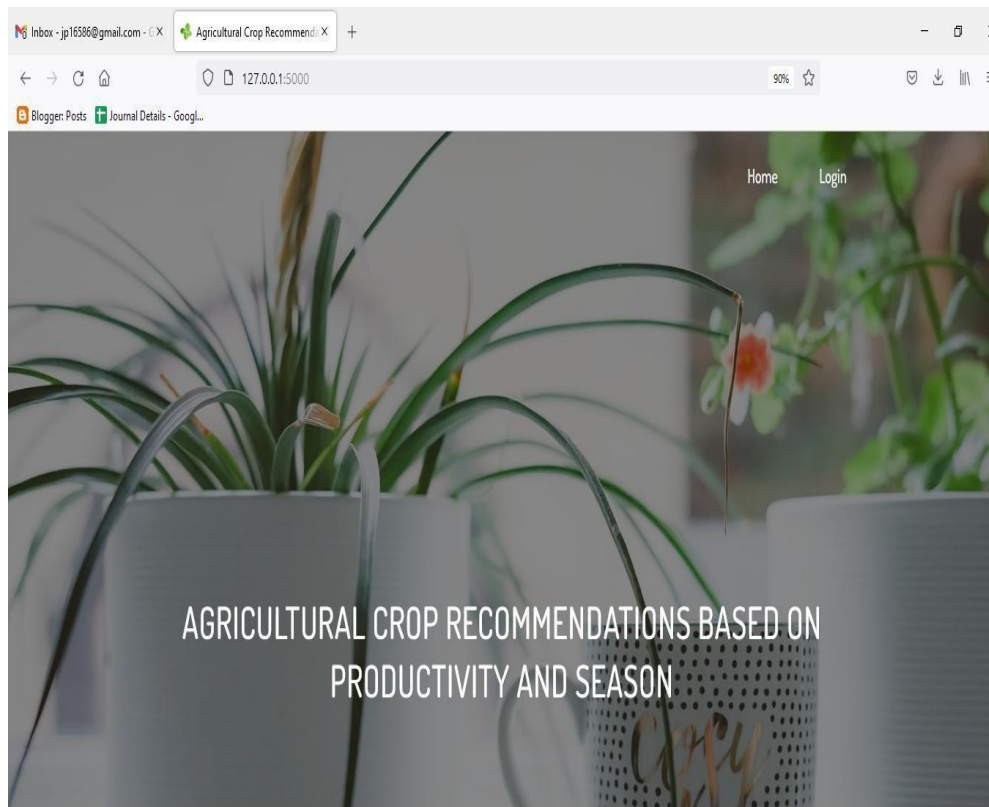
        label="Crop: Peas Duration of cultivation: 50-100"
    elif y_pred[0] == 'Paddy RC Maniphou 11 (IET 20193)':
        label="Crop: Paddy RC Maniphou 11 (IET 20193) Duration of
cultivation: 105-127"
    elif y_pred[0] == 'Cowpea':
        label="Crop: Cowpea Duration of cultivation: 45-90"
    elif y_pred[0] == 'Maize MCH 36 (Hybrid) (DKC 9099)':
        label="Crop: Maize MCH 36 (Hybrid) (DKC 9099) Duration of
cultivation: 95-102"
    elif y_pred[0] == 'Pulses':
        label="Crop: Pulses Duration of cultivation: 95-102"
    elif y_pred[0] == 'Sugarcane Co-0218':
        label="Crop: Sugarcane Co-0218 Duration of cultivation: 300-452"
    elif y_pred[0] == 'Wheat PDW 314':
        label="Crop: Wheat PDW 314 Duration of cultivation: 60-152"
    elif y_pred[0] == 'Sweet potato':
        label="Crop: Sweet potato Duration of cultivation: 120-125"
    elif y_pred[0] == 'Cotton VBCH 2231':
        label="Crop: Cotton VBCH 2231 Duration of cultivation: 150-180"

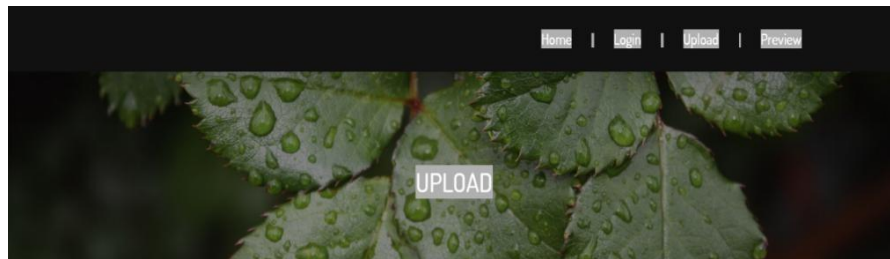
    return render_template('prediction.html', prediction_text=label)
#@app.route('/performance')
#def performance():
    return render_template('performance.html')

if __name__ == "__main__":
    app.run(debug=True)

```

B.SCREENSHOTS





UPLOAD

Browse...

No file selected.

Upload



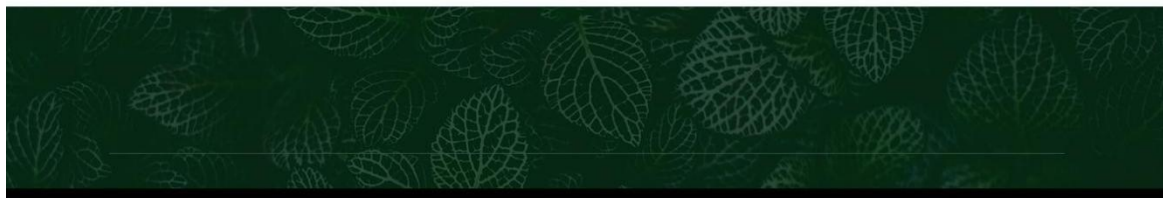
PREVIEW

States	Rainfall	Ground Water	Temperature	Soil type	Season	Crops	^ Fertilisers required	Cost of cultivation	Expected revenues	Quantity of seeds per hectare
Andhra Pradesh	110.75	9.74	31.5	Clayey	Kharif	Paddy IGKVR-2 (IET 19795)	Potassium,Urea	22810	63851.8391	25kg
Andhra Pradesh	110.75	9.74	31.5	Alluvial	Kharif	Paddy IGKVR-2 (IET 19795)	Potassium,Urea	22810	63851.8391	25kg

Manipur	148.80	4.00	30.5	Black	Kharif	Bajra	Nitrogen,Phosphorus,Potash	8000	70414.47817	4.5kg
Odisha	215.00	5.00	30.0	Latterite	Kharif	Bajra	Nitrogen,Phosphorus,Potash	8000	70414.47817	4.5kg
Odisha	215.00	5.00	30.5	Black	Kharif	Bajra	Nitrogen,Phosphorus,Potash	8000	70414.47817	4.5kg
Punjab	60.00	8.90	30.0	Latterite	Kharif	Bajra	Nitrogen,Phosphorus,Potash	8000	70414.47817	4.5kg
Punjab	60.00	8.90	30.5	Black	Kharif	Bajra	Nitrogen,Phosphorus,Potash	8000	70414.47817	4.5kg

820	Uttarakhand	164.50	7.50	37.5	Black	winter	Sweet potato	NPK(low)
821	Puducherry	137.50	12.30	23.5	Alluvial	Kharif	Cotton VBCH 2231	NPK

[Click to Train / Test](#)





CROP PREDICTION

Enter the details:

State:

Rainfall:

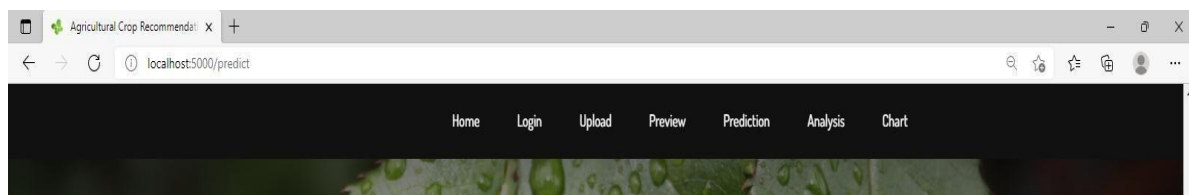
Ground Water:

Temperature:

Soil type:

Season:

Prediction is



CROP PREDICTION

Enter the details:

State:

Rainfall:

Ground Water:

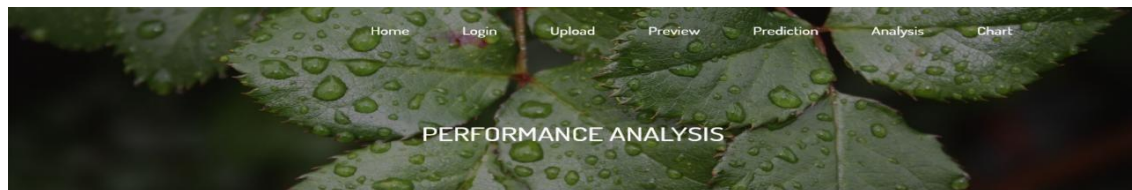
Temperature:

Soil type:

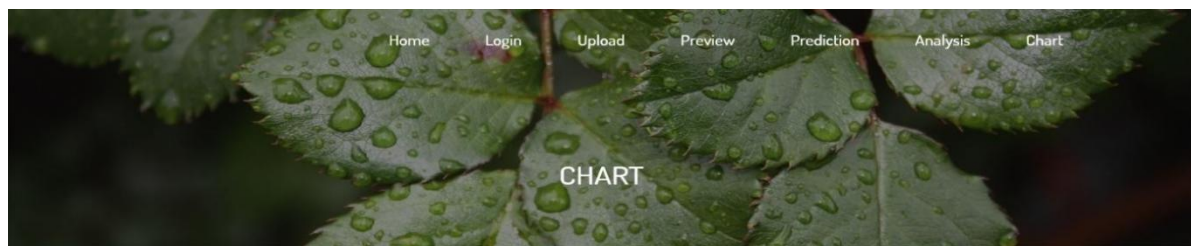
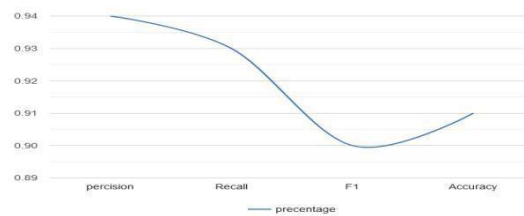
Season:

Prediction is

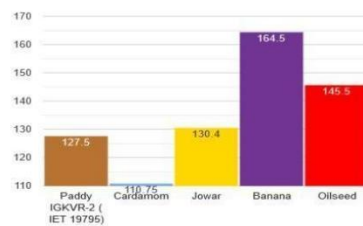
Crop: Sweet potato Duration of cultivation: 120-125 Best Fertilizer:
NPK(low)



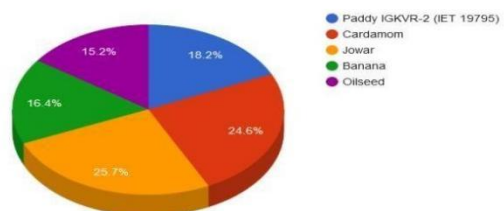
performance analysis



Crop recommendation for Rainfall (Top 5 crop)



Crop recommendation for Temperature (Top 5 crop)



B. RESEARCH PAPER

AGRICULTURE ANALYSIS USING DATAMINING TECHNIQUES

R. Guna Sekhar

S.Pavan Kumar

Ms.I.Mary Sajin Sanju

Student

Student

Associate Professor

Sathyabama University

Sathyabama University

Sathyabama University

gunadarling1308@gmail.com

pavankumar.sura77@gmail.com

jeensanju@gmail.com

ABSTRACT

As a coastal state, Tamil Nadu is dealing with agricultural uncertainty, that is reducing its production. With greater humans and vicinity, greater products will be produced, however it can't be. Farmers had word of mouth in previous a long time, but now due to climatic elements it cannot be taken with no consideration. Agricultural records and parameters provide insight into agricultural statistics. The growth of facts era brings a few essential tendencies in agricultural sciences to help farmers with precise agricultural statistics. In this jogging situation, records approximately the application of contemporary technological techniques within the area of agriculture is acceptable. Machine studying methods without a doubt give an explanation for the sample with the data and help us make predictions. Agricultural issues including crop availability, crop rotation, water necessities, fertilizer requirements and protection can be addressed. Due to the various motives of the climatic environment, it's miles important to have an efficient machine to facilitate the cultivation of plants and to help farmers in manufacturing and control. This will assist future farmers to enhance agriculture. A recommendation

machine can be provided to the farmer to assist him get his crops via the mines. To enforce this approach, crops are advocated in phrases of their climatic factors and amount. Data analytics paves the way for growing beneficial extracts from agricultural databases. The crop dataset become analyzed and crop suggestions have been made based on yield and season.

Keywords: Machine Learning , Yield, Random forest regressor, Decision Tree regressor, GDP, Digitalization

INTRODUCTION

India is an agricultural united states of america with the second largest area of cultivated land, exceeding 1.6 million square kilometers. Most of India's populace is in agriculture and India's financial system is closely dependent on agriculture. India has the capacity to grow to be an agricultural superpower. Agriculture contributes to economic boom and paves the manner for rural development. The use of superior generation in agriculture is much less commonplace in India. Due to this antique practice, the fruit yields had been not thought to be as high because the farmers could have trusted in the farming system. Therefore, many farmers omitted agriculture and grew to become to other pursuits. In some instances

there has additionally been an boom in suicide attempts through farmers. The want for technical help in this place is therefore strongly endorsed. Because agriculture has been around because time immemorial, past agricultural information can be easily collected and recommended.

OBJECTIVE

The motive of the author's article is to build a crop yield machine. The device allows farmers in deciding on the right crop for their field based on the desired parameters.

LITERATURE SURVEY

**S.Pudumalar;E.Ramanujam;R.Harine
Rajashree;C.Kavya;
T. Kiruthika; J. Nisha**

Crops that are included inside the predictive version encompass coriander, pulses, cotton, paddy rice, sorghum, peanuts, sugarcane, bananas, and pulses. Various soil traits were considered to provide the prediction, which includes pH, intensity, erosion, permeability, texture, drainage, retention date, and soil color. The centurion method is used, which mixes or extra exclusive fashions for higher prediction possibilities. The technique used in ensembles became referred to as the general public vote technique.

Rakesh Kumar, M. P. Singh,J. P. Singh

Crops are checked and indicated according to the information of crop evaluation. This categorization is derived from numerous statistics mining algorithms. This article provides insight into diverse coupling regulations which includes K-Nearest Neighbor and Naive Bayes. Using this report, we evaluated and determined the class guidelines that might be suitable for the data we would use in our design.

Dharti Vyas, Amol Borole, Shikha Singh

The article proposes a hypothesis primarily based at the analysis of research records and

considers the improvement of numerous forms of predictive models. A sample dataset is taken from the dataset, and exclusive regression methods try to become aware of and discover each assets. Specific regression methods are discussed here: more than one linear, linear, non-linear, polynomial, comb and logistic regression. Using this newsletter, we take a comparative analysis of different seek algorithms. This helps to determine which set of rules is excellent suited for the intended device.

EXISTING SYSTEM

- Tripathy et al. It supplied a machine for managing insecticides in crop manufacturing the usage of mining statistics.
- Pritam Bose advanced a SNN model for area-time analysis yielding estimation.
- A crop and yield prediction version proposed through Shreya S. Bhamose used a changed clustering algorithm to are expecting crop yield in addition to crop water requirements.

DISADVANTAGES OF THE EXISTING SYSTEM

In the existing device, simplest the unique nation is taken under consideration, and now not all states and other parameters.

Relatively slow to build.

The interpretation is difficult.

Computationally highly-priced

PROPOSED SYSTEM

Crop production relies upon on several agricultural parameters. Based at the proposed work of the production of end result in preceding years, the crops may be advocated to the farmers.

These styles of offerings will allow the farmer recognize if he will carry a terrific harvest this years. Crop production can end up less due

to crop diseases, water troubles and many different reasons. By considering production, farmers can see which plants are in excessive volume on the market this yr. From this, the farmer can decide the developments in plants within the coming years. Farmers may be given pointers based on the crop developing season.

The mission statement of the challenge is to propose fruits to farmers using Decision Classifiers. The essential manner of this project is that the pre-processing facts may be provided to us, then it's miles used to prepare the version for renovation and the uterus to connect with the UI interface to give the entire and final output.

CONVENIENT PROPOSAL SYSTEM

In our proposed system, we have used a massive records set that consists of all the states of India, whereas in the current gadget, most effective the particular state has been taken under consideration.

These techniques can be drawn for the education of farmers. The visual image indicates the farmer a deeper information of the culmination to pick out for cultivation.

It does now not require business enterprise or scales

Easy to do

Easy to interpret

Computationally cheaper

SYSTEM ARCHITECTURE

SYSTEM REQUIREMENTS

HARDWARE REQUIREMENTS

- System : Pentium Dual Core.
- Hard Disk : 120 GB.
- Monitor : 15" LED

- Input Devices : Keyboard, Mouse
- Ram : 4 GB.

SOFTWARE REQUIREMENTS

- Operating system: Windows 7/10.
- Coding Language :Python

MODULES

- ❖ Data Collection
- ❖ Dataset
- ❖ Data Preparation
- ❖ Model Selection
- ❖ Analyze and Prediction
- ❖ Accuracy on test set
- ❖ Saving the Trained Model

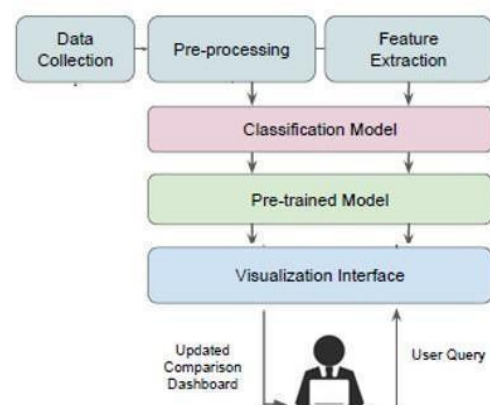
MODULES DESCRIPTION

Data Collection:

This is the first real step in sincerely developing a system mastering version, information series. This is a important step that determines how right the model will be. The an increasing number of statistics we get, the higher our version will carry out.

There are numerous techniques of records series, which includes net feed, manual intervention, and so forth.

The dataset used on this crop advice is from someplace else in India.



Dataset:

The dataset consists of 821 individual data. There are 14 columns in the dataset, which are described below.

1. State: Number of states in India.
2. Rain: in mm.
3. Groundwater: general groundwater degree.
4. Temperature: temperature in tiers Celsius.
5. Soil type: range of soil kinds.
6. The season, which season is appropriate for plants
7. Vegetation: kinds of vegetation
8. Required fertilizers: forms of fertilizers required
9. Cultivation value: the entire price of lifestyle
10. Expected returns: Total Expected returns
11. Number of seeds consistent with hectare: range of seeds in line with hectare
12. Culture period: number of days for subculture length.
13. Demand for crops: demand for vegetation (excessive, low)
14. Crops for mixed plants, which plants may be combined for sowing

Data preparation:

Process facts and put together for education. Clean up what is needed (put off duplicates, fix mistakes, handle missing values, normalize, convert information types, and many others.).

Visualize the information to assist find applicable relationships between variables or order inequalities (bias raised!) or different exploratory analysis.

Divide into settings for schooling and assessment

Model analyzing:

A selection tree is a tree shape that resembles a flowchart, in which an inner node represents a function (or attribute), a department represents a selection rule, and

a leaf node represents each final results. The top node within the decision tree is called the foundation node. . The time complexity of decision timber relies upon on the wide variety of entries and the number of attributes within the records. A selection tree is a non-distribution or non-parametric approach that doesn't depend on assumptions about the opportunity distribution. Decision bushes can take care of multidimensional records with suitable accuracy.

Before we get into it, let's be clean with some terms:

- Instances: Refer to a vector of features or attributes that outline the enter space.
- attribute: a amount describing an instance
- Concept: A characteristic that maps enter to output.
- Target Concept: We are attempting to find the function, this is the answer to the truth.
- Hypothesis class: the set of all feasible capabilities.
- Sample: Input records with an connected label that is the suitable output (additionally known as the education set).
- Concept candidate: We bear in mind the idea to be a target idea.
- Test kit: much like a training package, to check a candidate concept and determine effectiveness.

We analyze and provide:

In the real dataset, we selected simplest 7 capabilities.

1. State: Number of states in India.
2. Rain: in mm.
3. Groundwater: general groundwater level.
4. Temperature: temperature in tiers Celsius.
5. Soil type: quantity of soil sorts.
6. The season, which season is appropriate for plants

7. Vegetation: styles of vegetation

Carefully inside the test set:

In the test set we got an accuracy of ninety.7%.

Make certain you have got it stored to your environment. Next we import the parameters and version inside the .Pkl report.

Conclusion

Agriculture is a mainly vital place of application as within the developed countries of India. Use of Information Technologies in agriculture can trade the state of affairs through identifying and farmers can produce higher plants. Data mining memories key position in selecting many troubles related to rural place It performs the position of statistics mining agriculture and exertions told via several authors in the context of agriculture. Also approximately numerous matters facts mining packages in solving various agriculture problems.

RESULT

In this paper, we have surveyed the various climate change methodologies in data mining and agricultural methodologies in data mining. Climate change affects on agriculture and its fields and yields, crop cultivations and its effect on economy. This survey suggests that the more predictions are accurate about climate the more helpful is it for the farmers. Therefore, the Analysis of Agriculture Data using Data Mining Techniques is done.

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