ESTIMATE THE CROP YIELD USING DATA ANALYTICS

INTRODUCTION

Crop yield prediction is one of the challenging tasks in agriculture. It plays an essential role in decision making at global, regional, and field levels. The prediction of crop yield is based on soil, meteorological, environmental, and crop parameters. Crop prediction attributes are defined by multiple factors such as genotype, climate and the interactions between the two. Accurate crop prediction needs a fundamental understanding of the functional relationship between cultivation and interactive factors like the genotype and climate.

PROJECT OVERVIEW

Data analytics based on prior crop prediction, soil quality analysis to achieve high crop yield throughout technology solution. The main objectives of this project is to predict crop-yield which can be extremely useful to farmers in planning for harvest and sale of grain harvest.

PURPOSE

Crop yield estimation has an important role on economy development. These predictions warn the decision makers about potential reduction in crop yields and allow timely import and export decision.

LITERATURE SURVEY

At present we are at the immense need of another Green revolution to supply the food demand of growing population. With the decrease of available cultivable land globally and the decreased cultivable water resources, it is almost impossible to report higher crop yield. Agricultural based data analytics is one approach, believed to have a significant role and positive impact on the increase of crop yield by providing the optimum condition for the plant growth and decreasing the yield gaps and the crop damage and wastage. With this aim the present paper reviews about the various advances, design models, software tools and algorithms applied in the prediction assessment and estimation of the crop yield. India is basically agriculture based country and approximately 70% our country economics is directly or indirectly related to the agricultural crops. The principle crop which occupies the highest (60-70%) percentage of cultivable land in the Indian soil is the paddy culture and it is the major crop especially in central and south parts of the India. Rice crop cultivation plays an imperative part in sustenance security of India, contributing over 40% to general yield generation. The enhanced yield of the rice crop depends largely on the water availability and climatic conditions. For example, low precipitation or temperature extremes can drastically diminish rice yield. Growing better strategies to foresee yield efficiency in a mixture of climatic conditions can help to understand the role of different principle factors that influence the rice crop yield. Data analytics methods related to the rice crop yield prediction and estimation will certainly support the farmers to understand the optimum condition of the significant factors for the rice crop yield.

EXISTING PROBLEM

Initially the raw data set was collected and it is subjected to preprocess for noise removing (replacement of missing values) and computational methods. From that dataset, it is subjected to Feature selection for make a predictive modeling. In this proposed approach it is mainly focused on Regression Techniques. Various regression analysis should be performed and it was compared and tested. Regression analysis is a form of predictive modeling technique which investigates the association between a dependent (target) and independent variable(s) (predictor). This technique is used for forecasting, time series modeling and discovers the causal effect relationship between the variables. Regression analysis indicates the significant relationships between dependent variable and independent variable and it indicates the strength of impact of multiple independent variables on a dependent variable.

REFERENCES

1. Apolo-Apolo OE, Martínez-Guanter J, Egea G, Raja P, PérezRuiz M. 2020. Deep learning techniques for estimation of the yield and size of citrus fruits using a UAV. European Journal of Agronomy. 115. doi:https://doi.org/10.1016/j.eja.2020.126030. [Crossref], [PubMed], [Web of Science ®], [Google Scholar]

2. Apolo-Apolo OE, Pérez-Ruiz M, Martínez-Guanter J, Valente J. 2020. A cloudbased environment for generating yield estimation maps from apple orchards using UAV imagery and a deep learning technique. Frontiers in Plant Science. 11. doi:https://doi.org/10.3389/fpls.2020.01086. [Crossref], [PubMed], [Web

of Science ®], [Google Scholar]

3. Chlingaryan A, Sukkarieh S, Whelan B. 2018. Machine learning approaches for crop yield prediction and nitrogen status estimation in precision agriculture: A review. Computers and Electronics in Agriculture. 151:61–69. doi:https://doi.org/10.1016/j.compag.2018.05.012. [Crossref], [Web of Science ®], [Google Scholar]

4. Dharani M, Thamilselvan R, Natesan P, Kalaivaani P, Santhoshkumar S. 2021. Review on crop prediction using deep learning techniques. Paper presented at the Journal of Physics: Conference Series. [Crossref], [Google Scholar]

PROBLEM STATEMENT DEFINITION

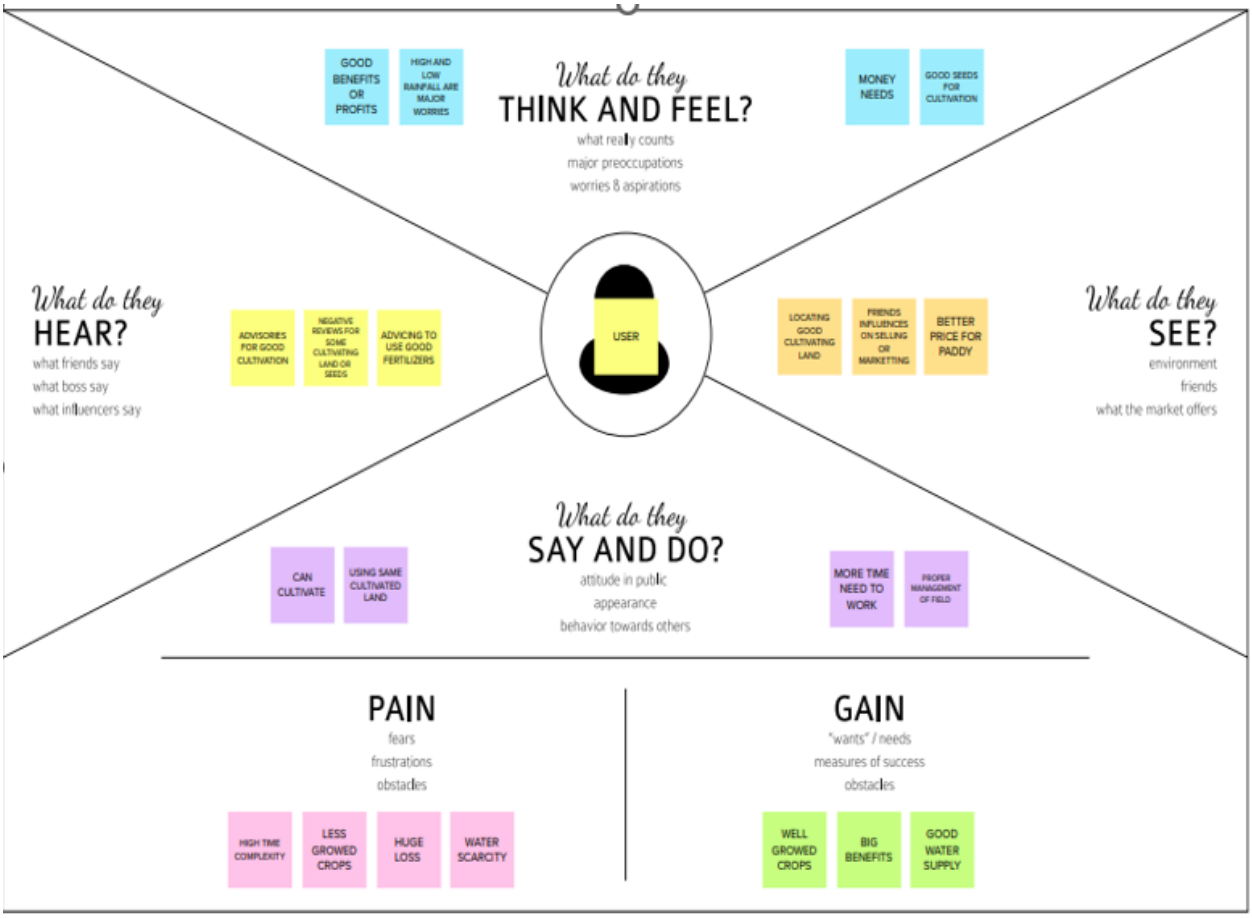
Data based on prior crop prediction, soil quality analysis to achieve high crop yield throughout technology solution. The main objectives of this project is to predict crop-yield which can be extremely useful to farmers in planning for harvest and sale of grain harvest.

1.What does the problem affect?	**1.Water availability** **2.Air pollution** **3.Temperature etc...**

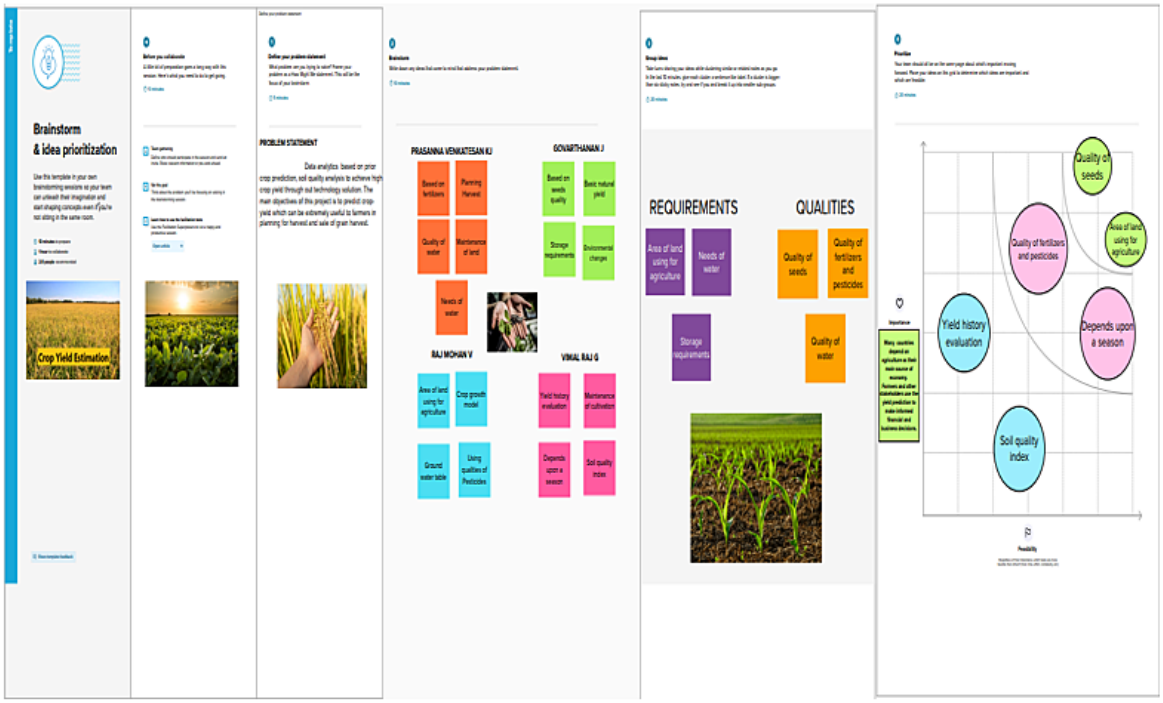
2.What are the boundaries for the problem?	**Boundary line analysis is one way to examine how soil variables influences crop yield in large datasets**
3.What is the issue?	**1.Changing of climate** **2.Sudden change in Weather**
4.When does the issue occur?	**1.No Proper maintenance 2. Over dose of pesticides and fertilizers**
5.Why it is important that we fix the problem?	**Improving the yields in crop on a global basis will allow farmers to meet global demand for feed, fuel and food while minimizing the need to bring amount of the new land into the crop production.**
6.What methodology used to solve the issue?	**1.Monitoring crops growth** **2. Regular Scouting** **3.Crop protection**
7.where does the issue occur?	**Using the fertilizers and pesticides above the limited levels it can be caused the Crop severely.**

IDEATION & PROPOSED SOLUTION

EMPATHY MAP CANVAS



IDEATION & BRAINSTORMING



PROPOSED SOLUTION

In this proposed system, the datasets are collected and refined based on the commonality. The input parameters are given. By analysing and predicting using KNN algorithm, the result are produced and some suggestions are given.

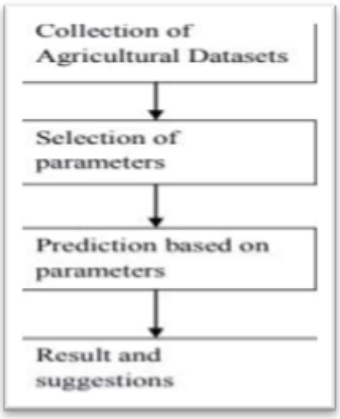


Fig. -1: Proposed Architecture

Step 1: The datasets have been collected and refined based on commonality uses such as location, crop, Area, soil type, temperature, humidity etc. From these parameters name of the crop and net yield rate of the crop can be predicted.

Step 2: Based on various analyses the parameters location, soil type and area are taken as input and prediction have been undertaken. The attribute soil type specifies the type of soil in a particular region such as Coastal alluvials, Laterite soil and Dark brown alayey soil and the attribute location specifies the 4 different areas such as Mangalore, Kodagu, Hassan, Kasargod.

Step 3: By using KNN algorithm, the particular crop has been analysed and predicted by taking various parameters into an account such as soil type area and location.

Step 4: By analysing and predicting the crop name and price of particular crop can be found out. This helps the farmers to take the correct decision to sow the crops such that yield rate can be increase.

PROBLEM SOLUTION FIT

REQUIREMENT ANALYSIS

FUNCTIONAL REQUIREMENT

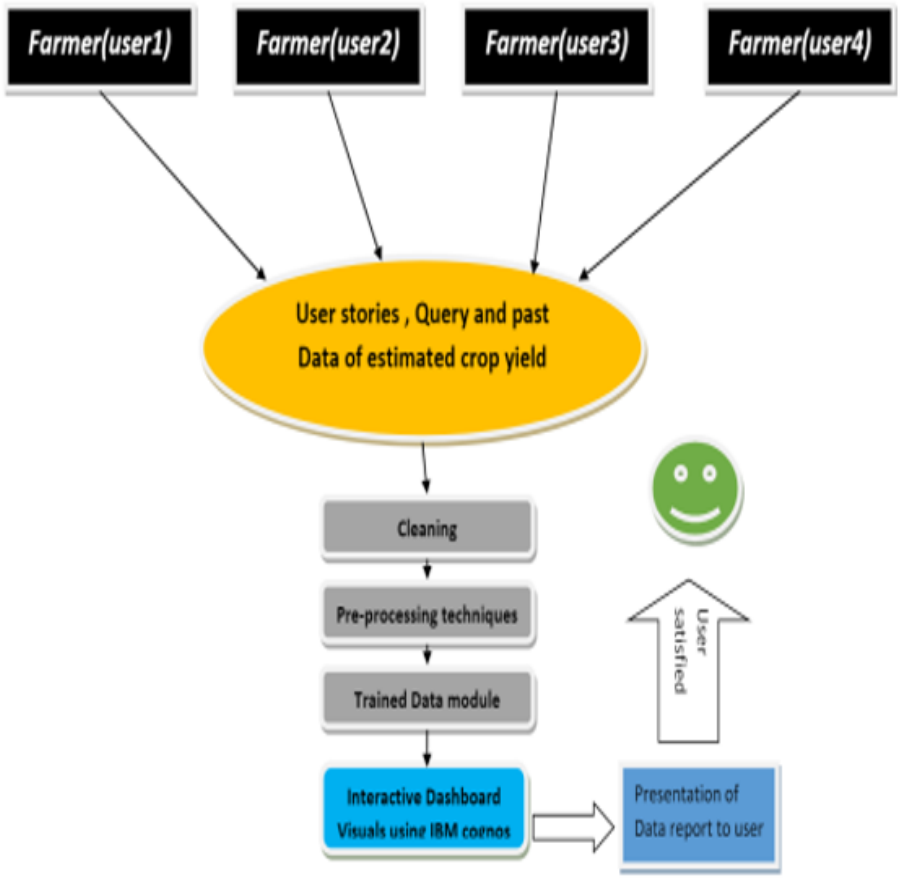
The Functional Requirements Definition reports and tracks the basic information expected to effectively portray business and handy necessities. The Functional Requirements Definition report is made in the midst of the Planning Phase of the endeavor. Its objective gathering is the endeavor boss, errand gathering, wander bolster, client/customer, and any accomplice whose information/respect into the necessities definitions system is required

NON-FUNCTIONAL REQUIREMENTS

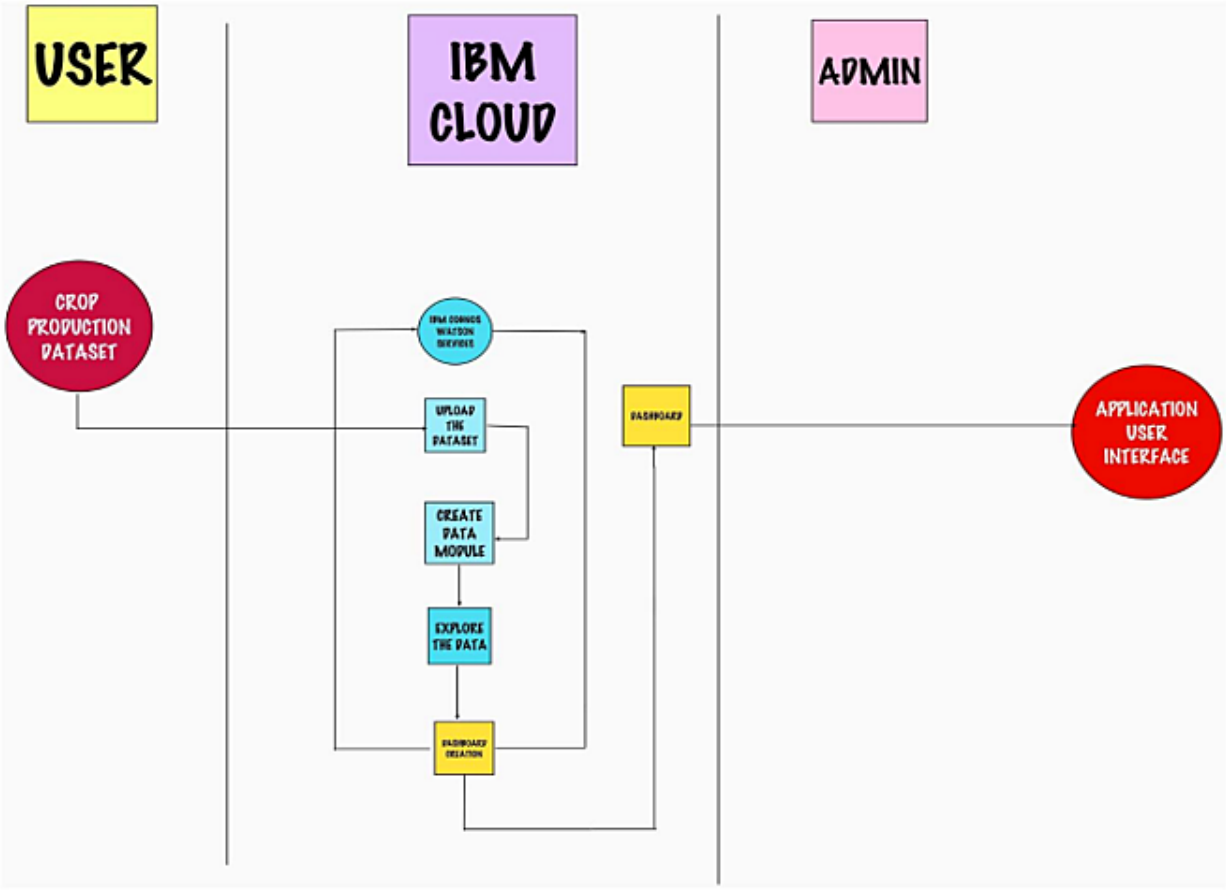
A non-functional requirement (NFR) is a requirement that specifies criteria that can be used to judge the operation of a system, rather than specific behaviors. Non functional requirements specifies the quality attribute of a software system. The software system can be judged based on reliability, security, maintainability, performance, portability, scalability and flexibility

PROJECT DESIGN

DATA FLOW DIAGRAMS



SOLUTION & TECHNICAL ARCHITECTURE



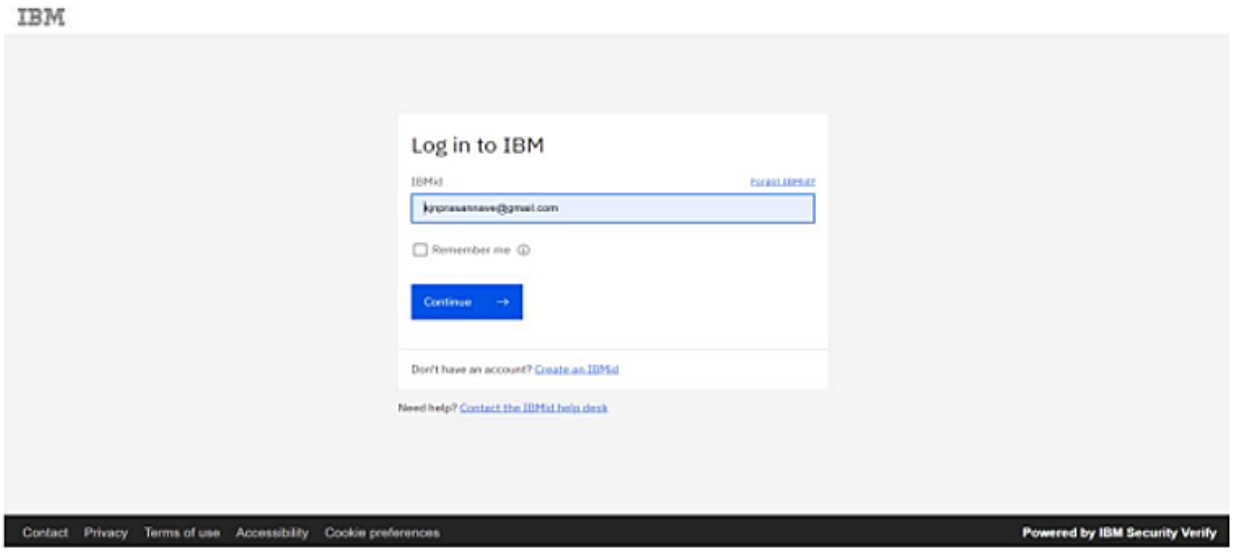
USER STORIES

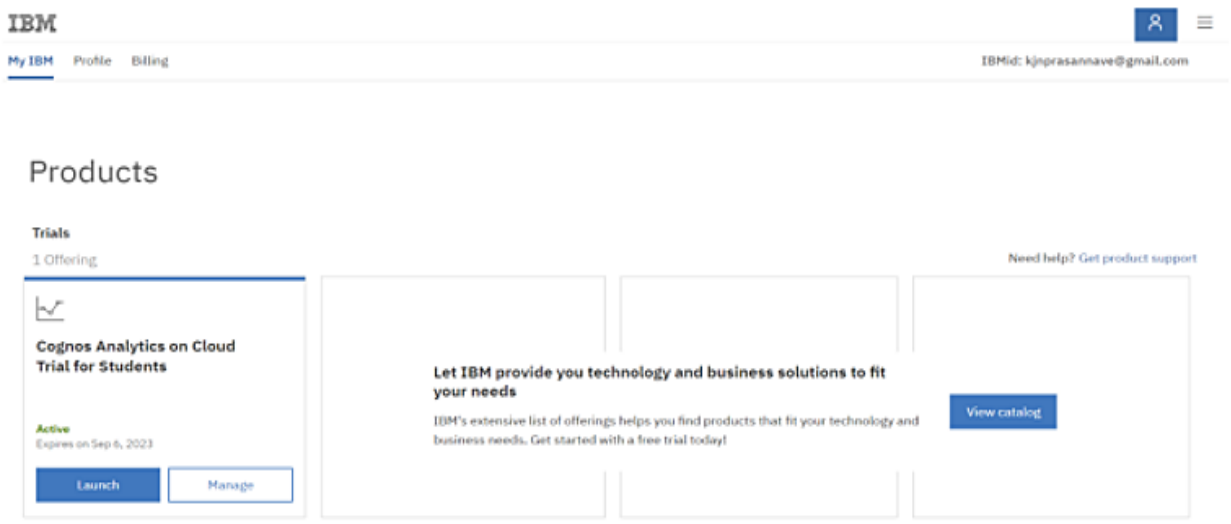
Use the below template to list all the user stories for the product.

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (Farmer)	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	I can access my account / dashboard	High	Sprint-1
		USN-2	As a user, I will receive confirmation email once I have registered for the application	I can receive confirmation email & click confirm	High	Sprint-1
		USN-3	As a user, I can register for the application through Whatsapp , Facebook	I can register & access the dashboard with Whatsapp , Facebook Login	Low	Sprint-1
	Required Data	-	Cropping history , profit and loss in their farming	Past dataset of cropping and field estimation of crop yield	High	Sprint-2
	Analysis		Clean and analyse to data according to the set past data		HIgh	Sprint-3
Customer Care Executive	Customer Care Executive (Communication)		As a user, i can provide support systems for companies that often communicate with the customers	I can maintain strong relationships with customer and client ,so I can ease their queries and increase productivity	medium	Sprint-4
Estimator	Estimation		As a user,i can see all the items we will try to estimate this session	I have a feel for the size of the various items in the product based	Medium	Sprint-4

PROJECT PLANNING & SCHEDULING

SPRINT PLANNING & ESTIMATION


IBM
Log in to IBM
IBMid
Forgot IBMid?
kjnprasannave@gmail.com
Remember me
Continue
Don't have an account? Create an IBMid
Need help? Contact the IBMid help desk
Contact
Privacy
Terms of use
Accessibility
Cookie preferences
Powered by IBM Security Verify


IBM
My IBM
Profile
Billing
IBMid: kjnprasannave@gmail.com
Products
Trials
1 Offering
Need help? Get product support
Cognos Analytics on Cloud Trial for Students
Active
Expires on Sep 6, 2023
Launch
Manage
Let IBM provide you technology and business solutions to fit your needs
IBM's extensive list of offerings helps you find products that fit your technology and business needs. Get started with a free trial today!
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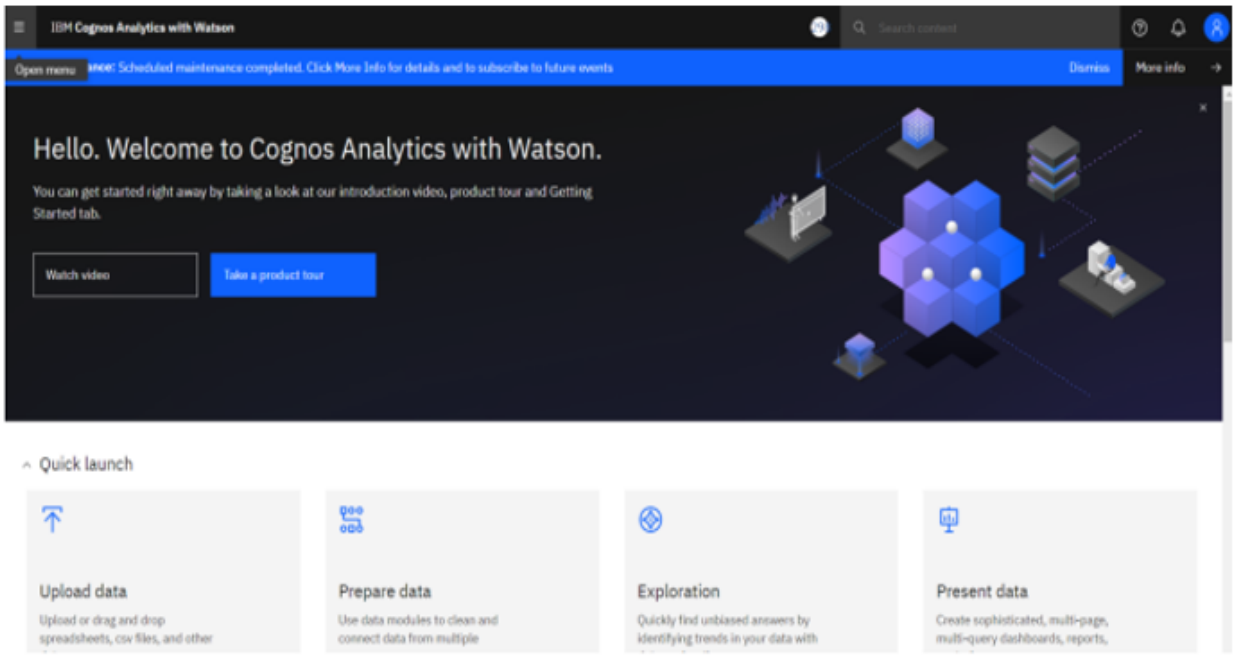
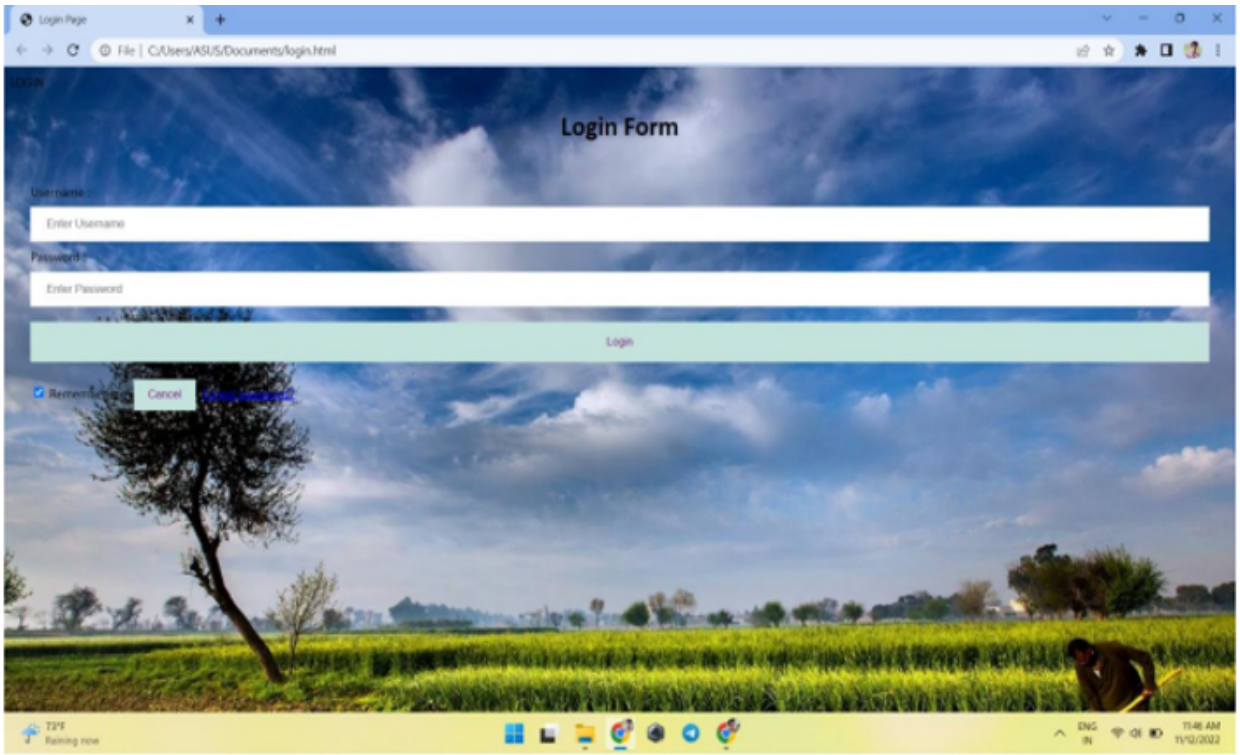
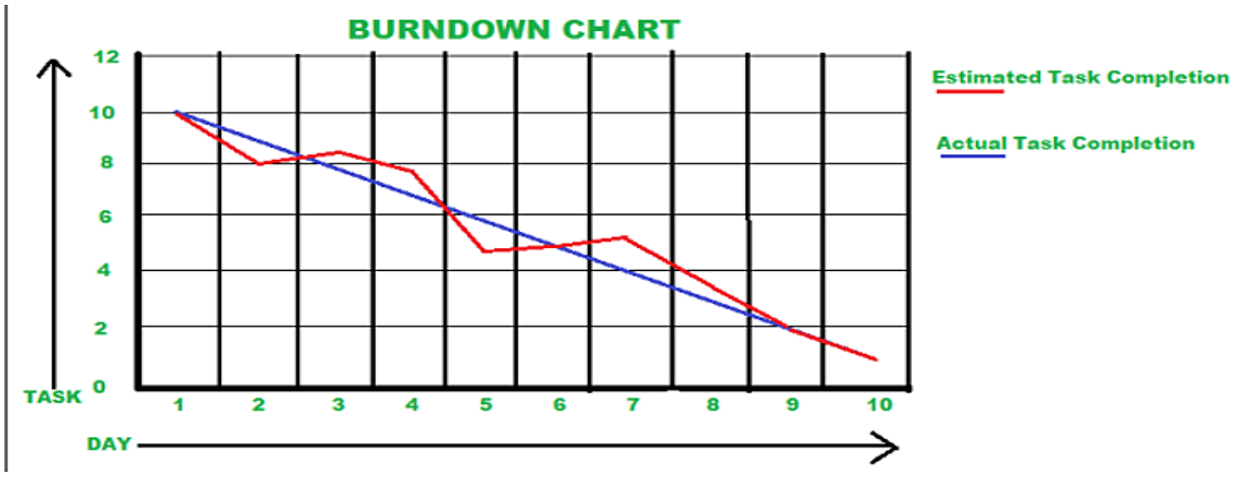
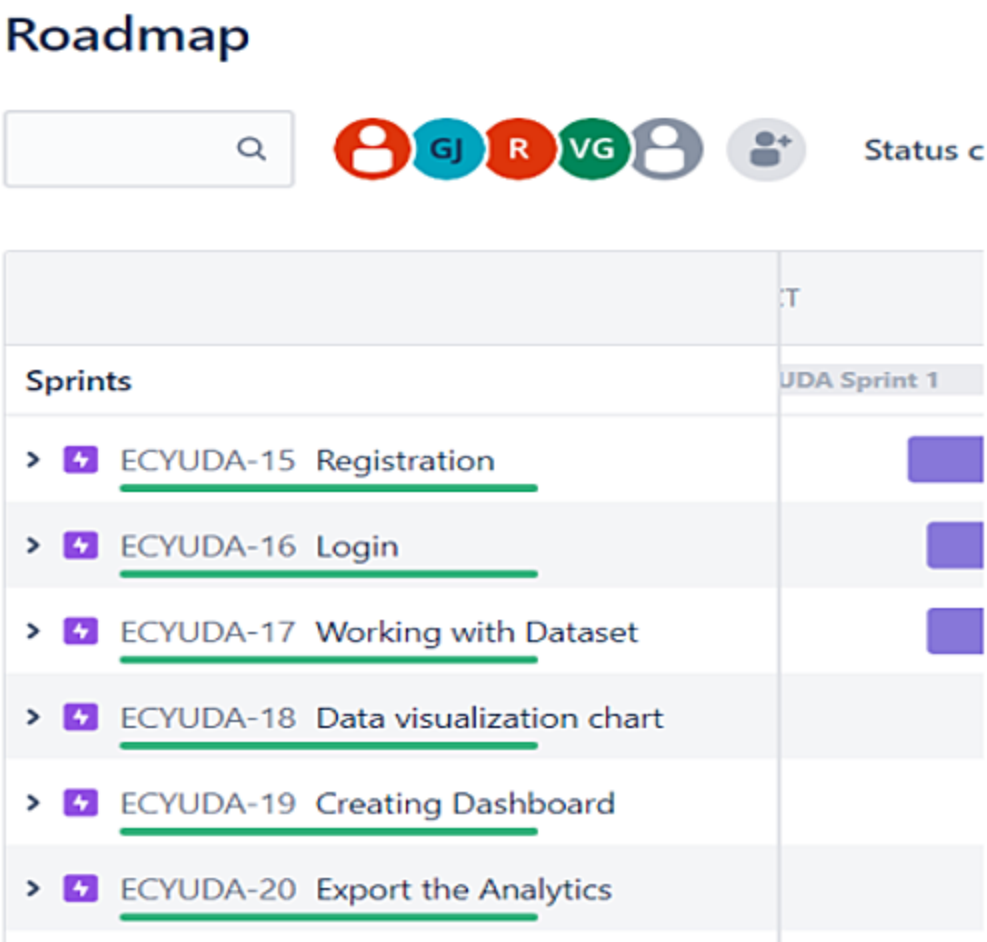

IBM Cognos Analytics with Watson
Open menu
Scheduled maintenance completed. Click More Info for details and to subscribe to future events
Dismiss
More info
Hello. Welcome to Cognos Analytics with Watson.
You can get started right away by taking a look at our introduction video, product tour and Getting Started tab.
Watch video
Take a product tour
Quick launch
Upload data
Upload or drag and drop spreadsheets, csv files, and other
Prepare data
Use data modules to clean and connect data from multiple
Exploration
Quickly find unbiased answers by identifying trends in your data with
Present data
Create sophisticated, multi-page, multi-query dashboards, reports,

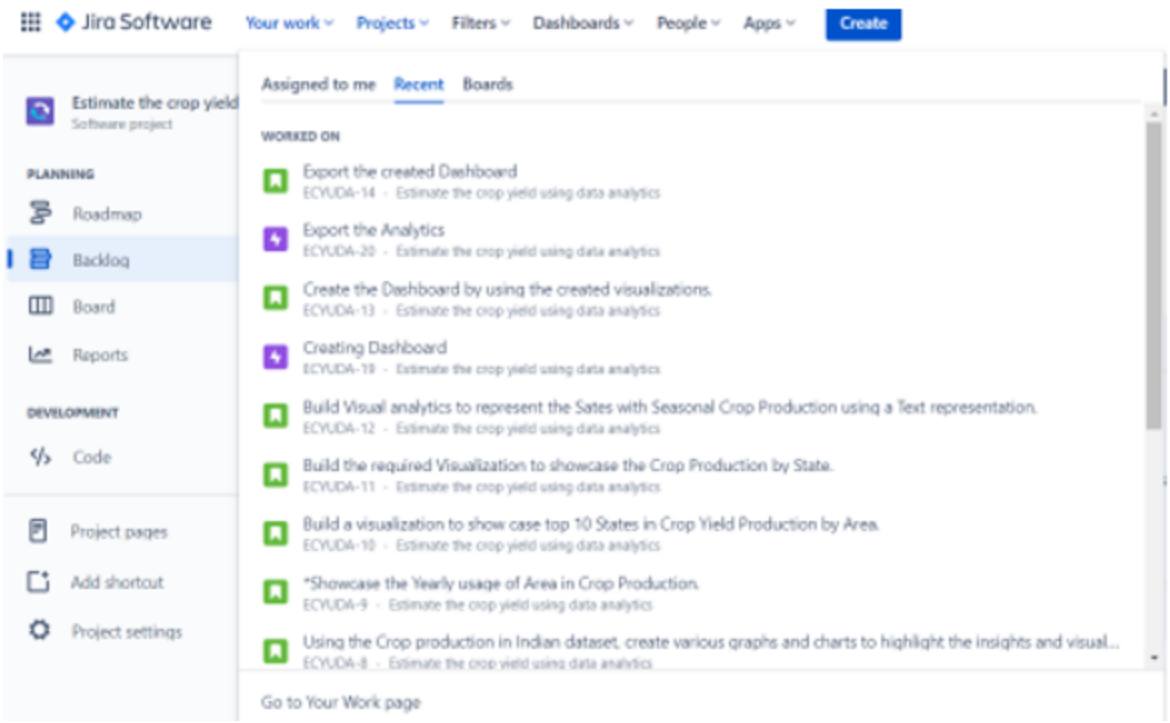

Login Page
File | C:/Users/ASUS/Documents/login.html
Login Form
User name :
Enter Username
Password :
Enter Password
Login
Cancel

SPRINT DELIVERY SCHEDULE

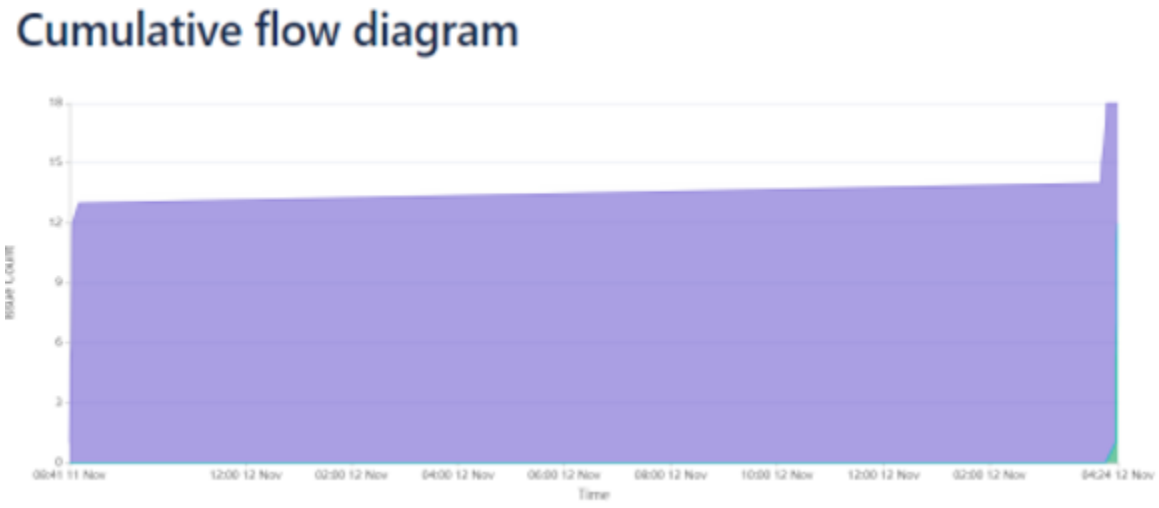


REPORTS FROM JIRA





Velocity report



CODING & SOLUTIONING (Explain the features added in the project along with code)

FEATURE 1

LOGIN

```
<!DOCTYPE html>
<html>
<head>
<meta name="viewport" content="width=device-width, initial-scale=1">
<title> Login Page </title>
<style>
Body {
  font-family: Calibri, Helvetica, sans-serif;
  background-color:white;
                                background-image:url('https://2.bp.blogspot.com/-
pLLWS1j5PCQ/VqyQUTUqtdI/AAAAAAAABE64/QYlUh6421co/s1600/2d
```

```
e5113b6a62d0360130b90442106237_large.jpeg');"
}
button {

      background-color:#c3e3dc;
      width: 100%;
       color: purple;
       padding: 15px;
       margin: 10px 0px;
       border: none;
       cursor: pointer;
        }
form {
       border: 3px solid #f156189;
   }
input[type=text], input[type=password] {
       width: 100%;
       margin: 8px 0;
       padding: 12px 20px;
       display: inline-block;
       border: 2px white;
       box-sizing: border-box;
   }
button:hover {
       opacity: 0.7;
```

```
    }
  .cancelbtn {
        width: auto;
        padding: 10px 18px;
        margin: 10px 5px;
    }
.container {
        padding: 25px;
<!--         background-color:pink; -->
    }
</style>
</head>
<body>
    <center> <h1>Login Form </h1> </center>
    <form>
        <div class="container">
            <label>Username : </label>
                        <input type="text" placeholder="Enter Username"
name="username" required>
            <label>Password : </label>
                        <input type="password" placeholder="Enter Password"
name="password" required>
            <button type="submit">Login</button>
            <input type="checkbox" checked="checked"> Remember me
            <button type="button" class="cancelbtn"> Cancel</button>
```

```
            <a href="#"> Forgot password? </a>
        </div>
    </form>
</body>
</html>
```

FEATURE 2

REGISTRATION

```
<!DOCTYPE html>
<html>
<head>
    <title></title>
    <meta name="viewport" content="width=device-width, initial-
scale=1.0">
    <link rel="stylesheet" type="text/css"
href="{{url_for('static',filename='style.css')}}">
    <link rel="stylesheet" href="https://cdnjs.cloudflare.com/ajax/libs/font-
awesome/4.7.0/css/font-awesome.min.css">
    <!-- jQuery library -->
    <script
src="https://ajax.googleapis.com/ajax/libs/jquery/3.2.1/jquery.min.js"></scr
ipt>
    <!-- Latest compiled JavaScript -->
    <script
src="https://maxcdn.bootstrapcdn.com/bootstrap/3.3.7/js/bootstrap.min.js">
```

```
</script>
    <script src="https://www.google.com/recaptcha/api.js" async
defer></script>
    <style type="text/css">
        body{
            margin: 10px 10px 10px 100px;
            background-color: aliceblue;
        }
        .error {
            color: red;
        }
        .fm1 {
            text-align: center;
        }
        .lb1 {
            text-align: center;
            padding: 25px;
        }
        .lb2 {
            margin-left: 20px;
        }
        .lb3 {
            margin-right: 35px;
        }
        .container {
```

```
            display: block;
        }
        .k{
            border-radius: 15px;
        }
    </style>
</head>

<body>
    <?php
include 'header.php';
?>
    <div class="heading fix">
        <label class="lb1">REGISTRATION</label>
    </div>
    <div class="outerbox">
        <div class="fixedbox">
            <span class="content">
                <h4>Hello, Friend!</h4>
                <p>Enter your personal details and start journey with us</p>
            </span>
        </div>
        <div class="scrollbox">
            <div class="registerdonor">
                <form action="process.php" method="POST" id="myform">
```

```
<div class="login">
    <h3>Login Details</h3>
    <table class="fm1">
        <tr>
            <td colspan="2">
                <label class="lb1" class="username">User Name:-
</label>
                <input type="text" name="user_name" required
pattern="^[A-Za-z0-9._%+-@]{5,10}$"
                    title="Enter a username between 5 to 10 letter"
autocomplete="off">
            </td>
        </tr>
        <tr>
            <td>
                <label class="lb1">Full Name:-</label>
                <input type="text" name="user_full_name" required
pattern="[A-z ]+$"
                    title="Use only character & whitespace"
autocomplete="off">
            </td>
        </tr>
        <tr>
            <td>
                <label class="lb1">Email Id:-</label>
```

```
                        <input type="email" name="user_email" required
                            pattern="[A-Za-z0-9._%+-]+@[A-z0-9.-]+\.[a-
z]{2,}$"
                            title="Email id is not Valid" autocomplete="off">
                    </td>
                </tr>
                <tr>
                    <td>
                        <label class="lb1">Password:-</label>
                        <input type="password" name="password" required
                            pattern="(?=.\d)(?=.[a-z])(?=.*[A-Z]).{6,}"
                            title="Must contain at least one number and one
uppercase and lowercase letter, and at least 6 or more characters"
                            id="password" autocomplete="off">
                    </td>
                </tr>
                <tr>
                    <td>
                        <label>Confirm Password:-</label>
                        <input type="text" name="confirm_password"
required
                            pattern="(?=.\d)(?=.[a-z])(?=.*[A-Z]).{6,}"
                            title="Must contain at least one number and one
uppercase and lowercase letter, and at least 6 or more characters"
                            id="confirm_password" autocomplete="off">
```

```
                    </td>
                </tr>
            </table>
        </div>
        <div class="container">
            <h3>Contact Details</h3>
            <table class="fm1">
                <tr>
                    <td>
                        <label>Mobile Number:-</label>
                        <input type="text" name="user_number" required
pattern="^[1-9]{1}[0-9]{9}$"
                            title="Number is not valid" autocomplete="off">
                    </td>
                </tr>
                <tr>
                    <td>
                        <label class="lb1">Pincode</label>
                        <input type="text" name="pincode" required
pattern="^[0-9]{6}$"
                            title="Pincode is not valid" autocomplete="off">
                    </td>
                </tr>
                <tr>
                    <td rowspan="1">
```

```
                        <label class="lb1">Address:-</label>
                        <textarea name="Address" placeholder="follow with
pincode" required></textarea>
                    </td>
                </tr>

                <!-- <tr>
                    <td>
                        <label class="lb1">City:-</label >
                        <input type="text" name="city">
                    </td>
                </tr> -->
                <tr>
                    <td>
                        <label class="lb1">State:-</label>
                        <input type="text" name="state">
                    </td>
                </tr>
            </table>
        </div>
        <div class="personal">
            <h3>Personal Details</h3>
            <table class="fm1">
                <tr>
                    <td>
```

```
                        <label>Date Of Birth:-</label>
                        <input type="date" name="date_of_birth" required
autocomplete="off">
                    </td>
                </tr>
                <tr>
                    <td>
                        <div class="radio">
                            <label class="lb3">Gender:-</label>
                            <input type="radio" name="gender"
class="radio1" value="Male"><span
                                class="radioname" required
autocomplete="off">Male</span>
                            <input type="radio" class="radio2"
name="gender" value="Female"><span
                                class="radioname" required
autocomplete="off">Female</span>
                        </div>
                    </td>
                </tr>
                <tr>
                    <td>
                        <label class="lb1">Blood Group</label>
                        <input type="text" list="bloodgroup"
name="blood_group" placeholder="----Select----"
```

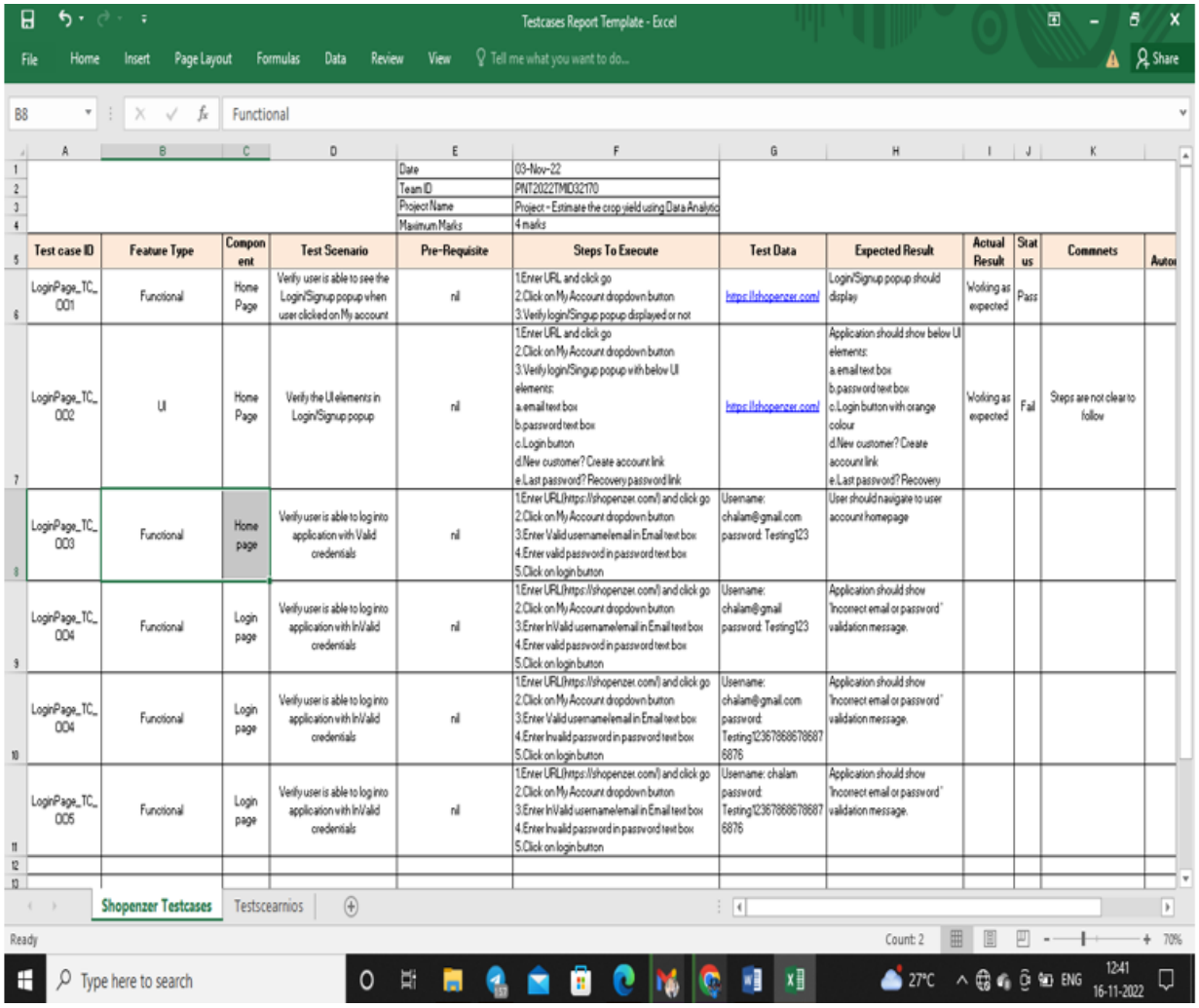
```
                    required autocomplete="off">
                <datalist id="bloodgroup">
                    <option value="A+"></option>
                    <option value="A-"></option>
                    <option value="AB+"></option>
                    <option value="B+"></option>
                    <option value="B-"></option>
                    <option value="O+"></option>
                    <option value="O-"></option>
                </datalist>
            </td>
            <!-- <tr>
            <td>
                <label class="lb1">Plasma Type</label >
                <input type="text" list="plasmatype"
name="plasma_type" placeholder="----Select----"
                    required autocomplete="off">
                <datalist id="plasmatype">
                    <option value="Hot"></option>
                    <option value="Warm"></option>
                    <option value="Cold"></option>
                    <option value="Ultra Cold"></option>
                </datalist>
            </td>
        </tr> -->
```

```
                    <tr>
                        <td>
                            <label class="lb1">Weight In Kg :-</label>
                            <input type="number" name="weight" required
autocomplete="off">
                        </td>
                    </tr>
                </table>
            </div>
            <p class="lb2"><input type="checkbox" name="terms"
id="checkbox" required autocomplete="off">
                <!-- I agree to have my contact details broadcasted to the
registered donors of PGHS.net -->
                I agree that the above details are true </p>
            <input type="reset" class="lb2 k" name="submit"
value="Reset">
            <a href="login.html">
                <input type="button" class="lb2 k"
onclick="href='login.html';" value="Submit"></a>
        </div>
        </form>
    </div>
</div>
</div>
<!-- Responsive table  -->
```

```
<div class="rregisterdonor">
    <form action="process.php" method="POST" id="myform">
</html>
```

TESTING

Test Cases



Testcases Report Template - Excel

				Date	03-Nov-22						
				Team ID	PNT2022TMID32170						
				Project Name	Project - Estimate the crop yield using Data Analytic						
				Maximum Marks	4 marks						
Test case ID	Feature Type	Component	Test Scenario	Pre-Requisite	Steps To Execute	Test Data	Expected Result	Actual Result	Status	Commnets	Auto
LoginPage_TC_OO1	Functional	Home Page	Verify user is able to see the Login/Signup popup when user clicked on My account	nil	1.Enter URL and click go 2.Click on My Account dropdown button 3.Verify login/Singup popup displayed or not	https://shopenzer.com/	Login/Signup popup should display	Working as expected	Pass		
LoginPage_TC_OO2	UI	Home Page	Verify the UI elements in Login/Signup popup	nil	1.Enter URL and click go 2.Click on My Account dropdown button 3.Verify login/Singup popup with below UI elements: a.email text box b.password text box c.Login button d.New customer? Create account link e.Last password? Recovery password link	https://shopenzer.com/	Application should show below UI elements: a.email text box b.password text box c.Login button with orange colour d.New customer? Create account link e.Last password? Recovery	Working as expected	Fail	Steps are not clear to follow	
LoginPage_TC_OO3	Functional	Home page	Verify user is able to log into application with Valid credentials	nil	1.Enter URL(https://shopenzer.com/) and click go 2.Click on My Account dropdown button 3.Enter Valid username/email in Email text box 4.Enter valid password in password text box 5.Click on login button	Username: chalam@gmail.com password: Testing123	User should navigate to user account homepage				
LoginPage_TC_OO4	Functional	Login page	Verify user is able to log into application with InValid credentials	nil	1.Enter URL(https://shopenzer.com/) and click go 2.Click on My Account dropdown button 3.Enter InValid username/email in Email text box 4.Enter valid password in password text box 5.Click on login button	Username: chalam@gmail password: Testing123	Application should show "Incorrect email or password" validation message.				
LoginPage_TC_OO4	Functional	Login page	Verify user is able to log into application with InValid credentials	nil	1.Enter URL(https://shopenzer.com/) and click go 2.Click on My Account dropdown button 3.Enter Valid username/email in Email text box 4.Enter Invalid password in password text box 5.Click on login button	Username: chalam@gmail.com password: Testing1236786867868776	Application should show "Incorrect email or password" validation message.				
LoginPage_TC_OO5	Functional	Login page	Verify user is able to log into application with InValid credentials	nil	1.Enter URL(https://shopenzer.com/) and click go 2.Click on My Account dropdown button 3.Enter InValid username/email in Email text box 4.Enter Invalid password in password text box 5.Click on login button	Username: chalam password: Testing1236786867868776	Application should show "Incorrect email or password" validation message.				

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USER ACCEPTANCE TESTING

PURPOSE OF DOCUMENT

The purpose of this document is to briefly explain the test coverageand open issuesof the [Estimate the crop yield using data analytics] project at the time of the release to User Acceptance Testing (UAT).

DEFECT ANALYSIS

This reportshows the numberof resolved or closed bugs at each severity level, and how they were resolved

Resolution	Severity 1	Severity 2	Severity 3	Severity 4	Subtotal
By Design	9	3	2	3	18
Duplicate	1	0	3	0	4
External	2	3	0	1	6
Fixed	10	2	4	20	36
Not Reproduced	0	0	1	0	1
Skipped	0	0	1	1	2
Won't Fix	0	5	2	1	8
Totals	22	13	13	26	72

TEST CASE ANALYSIS

This report shows the numberof test cases that have passed, failed,and untested

Section	Total Cases	Not Tested	Fail	Pass
Print Engine	7	0	0	7
Client Application	51	0	0	51
Security	2	0	0	2
Outsource Shipping	3	0	0	3
Exception Reporting	9	0	0	9
Final Report Output	4	0	0	4
Version Control	2	0	0	2

RESULTS

Performance Metrics

Model Performance Testing:

Project team shall fill the following information in model performance testing template.

S.No.	Parameter	Screenshot / Values
1.	Dashboard design	No of Visualizations / Graphs – 5 - 6 visualization/5 - 6 graphs
2.	Data Responsiveness	Users and Analyst or Developers
3.	Amount Data to Rendered (DB2 Metrics)	7 districts
4.	Utilization of Data Filters	Simple or Gravity ,hot and Vacuum Filtration
5.	Effective User Story	No of Scene Added – 40 user stories
6.	Descriptive Reports	No of Visualizations / Graphs – 4 visualization / 4 graph

ADVANTAGES

Crop yield prediction is also used by farmers to make decisions about when to plant and harvest crops based on soil moisture content, pest infestations, and other factors such as weather conditions and fertilizer requirements.

CONCLUSION

The work demonstrated the potential use of data mining techniques in predicting the crop yield based on the input parameters average rainfall and area of field. The developed webpage is user friendly and the accuracy of predictions are above 90 percent. The districts selected in the study indicating higher accuracy of prediction. The user friendly web page developed for predicting crop yield can be used by any user by providing average rainfall and area of that place. The process was adopted for all the area to improve and authenticate the validity of yield prediction which are useful for the farmers for the prediction of a specific crop.

FUTURE SCOPE

The future work aimed at the analysis of the entire set of data and will be devoted to suitable strategies for improving the efficiency of the proposed algorithm. Use of such kind of approach to forecasting is not restricted to agriculture alone. The clustering and regression is one of the capable tool in field of data mining which can be used in several different ways.

APPENDIX

GitHub = https://github.com/IBM-EPBL/IBM-Project-6862-1658841101

Project Demo Link = https://clipchamp.com/watch/z0HVeseYAQ8