PROJECT REPORT

Team ID	PNT2022TMID25946
Project Name	ESTIMATE THE CROP YIELD USING DATA ANALYTICS

1. INTRODUCTION

1.1 Project Overview

Crop production in India is one of the most important sources of income and India is one of the top countries to produce crops. For this project, we are using Data Analytics. Analytics is the interpretation of data pattern that assist decision- making and performance improvement. As per this project we will be analyzing some important visualization, creating a dashboard and by going through these we will get most of the insights of Crop production in India. A dashboard helps us to monitor events or activities at a glance by providing key insights and analysis about our data on one or more pages or screens. In this project, we visualize, analyse and gain most of the insights by creating a dashboard.

1.2 Purpose

Crop yeild Estimation is of great importance to global food production. But, crop yield prediction is one of the challenging tasks in agriculture. The main purpose of this estimation is to predict the future outcomes based on historical and current agricultural data. This is done by analysing some important visualization, creating a dashboard and by going through these we will get most of the insights of Crop production in India. Farmers require accurate yield estimates for a number of reasons like crop insurance purposes, delivery estimates, planning harvest and storage requirements. The prediction of crop yield can be based on the above problems and Farmers can estimate yields themselves or utilize data compiled by others.

2. LITERATURE SURVEY

2.1 Existing Problem

Farmers must meet the changing needs of our planet and the expectations of regulators, consumers, and food processors and retailers. There are increasing pressures from climate change, soil erosion and biodiversity loss and from consumers' changing tastes in food and concerns about how it is produced. In addition to this problems, there are certain other problems related to farm lands. If all the farmland was a single large continuous farm the analysis of the crops would be far easier – however, farms tend to be a mixture of small farms and large agribusiness varying in size by the owner, the crop and the economics of the country. Identifying different farms, and what they are growing at different scales becomes complex and prone to error. And the natural world that farming works with – plants, pests and diseases – continue to pose their own challenges. While modern agriculture provides a large number of solutions, the outcome is not always the same because each farm is unique: different landscapes, soils, available technology and potential yields.

2.2 References

I. Surya, P. and Aroquiaraj, I.L., 2018. Crop yield prediction in agriculture using data mining predictive analytic techniques. International Journal of Research and Analytical Reviews, 5(4), pp.783-787.

II. Nishant, P.S., Venkat, P.S., Avinash, B.L. and Jabber, B., 2020, June. Crop yield prediction based on indian agriculture using machine learning. In 2020 International Conference for Emerging Technology (INCET) (pp. 1-4). IEEE.

III. Nasira, G.M. and Hemageetha, N., 2012. Forecasting model for vegetable price using back propagation neural network. International Journal of Computational Intelligence and Informatics, 2(2), pp.110-115.

IV. Surya, P. and Aroquiaraj, I.L., 2018. Crop yield prediction in agriculture using data mining predictive analytic techniques. International Journal of Research and Analytical Reviews, 5(4), pp.783-787.

V. Antony, B., 2021. Prediction of the production of crops with respect to rainfall. Environmental Research, 202, p.111624.
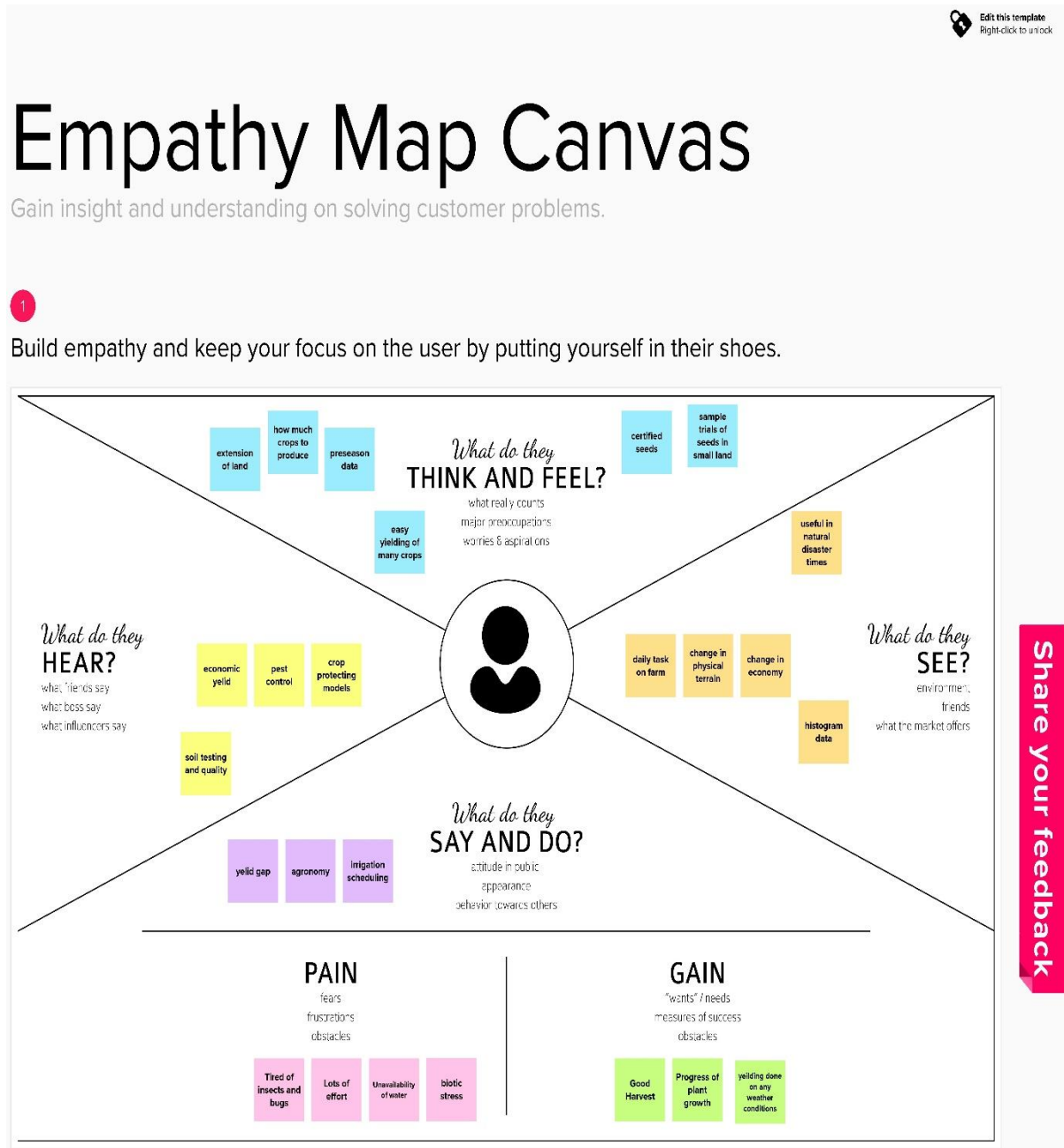
2.3 Problem Statement Definition

Crop yield prediction is an important agricultural problem**.** Data Analytics can be used in crop yield prediction in order to assure food security by guiding the farmers. Yield prediction in developing countries can help prevent famine, support the local economy, and improve sustainable agricultural practices. The Agricultural yield primarily depends on weather conditions, pesticides. Accurate information about history of crop yield is important for making better decisions.

The Problem Statement revolves around prediction of crop yield using Machine Learning Techniques. The goal of the project is to help the users choose a suitable crop to grow in order to maximize the yield and hence the profit. The system proposed tries to overcome the drawbacks of existing systems and make predictions by analyzing structured data. The solution we are proposing is to design a system taking into consideration the most influencing parameters to grow a crop and to get a better selection of crops which can be grown over the season. This would help reduce the difficulties faced by the farmers in selecting the crop to get high yield.

3. IDEATION AND PROPOSED SOLUTION

3.1 Empathy Map Canvas

3.2 Ideation and Brainstorming
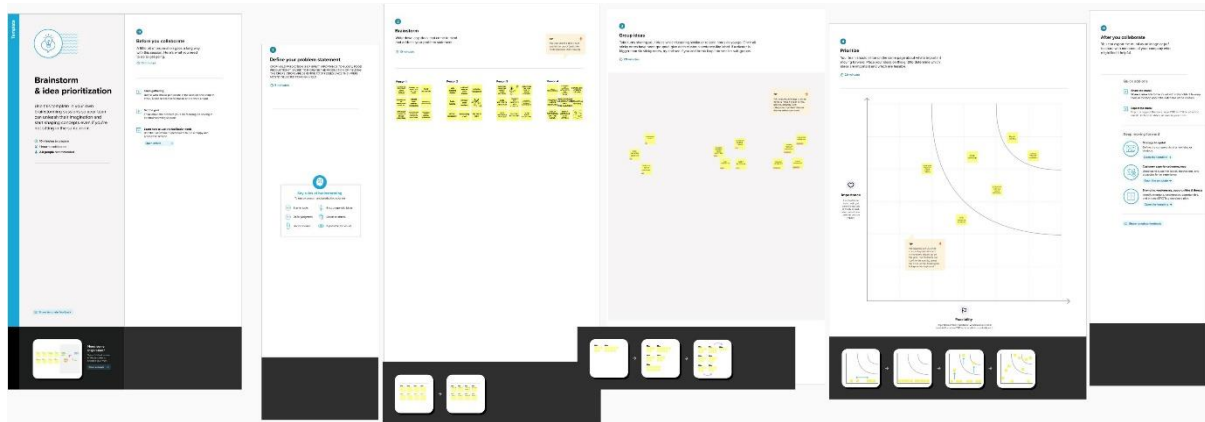
3.3 Proposed Solution

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	With the changing of climate, without caring much about soil replenishing and due to several crop diseases, agriculture faces increasing problems leading to considerable yield losses of crops.
2.	Idea / Solution description	Crop yeild predicition is of great importance to global food production. The four most important factors that influence crop yield are soil fertility, availability of water, climate, and diseases or pests.Estimation of these, will help

		to increase the crop production. An accurate crop yield prediction model can help farmers to decide on what to grow and when to grow.
3.	Novelty / Uniqueness	Great dashboards are clear, intuitive, and customizable. They display information clearly and efficiently with several visualizations. They show trends and changes in data over time. The most important widgets and data components are effectively presented in a limited space.
4.	Social Impact / Customer Satisfaction	Crop yield simulations help to understand the cumulative effects of water and nutrient deficiencies, pests, diseases, the impact of crop yield variability, and other field conditions over the growing season. Accurate yield predictions not only help farmers make informed economic and management decisions but also support famine prevention efforts.
5.	Business Model (Revenue Model)	Estimation of crop yield is created as a dashboard. This will be utilized by food production companies and beverages. By this way, the product

		will fetch more revenue to the organisation.
6.	Scalability of the Solution	A dashboard is created. And this will be useful not only for farmers to increase crop production, but also for Department of Agriculture and Farmers Welfare to make better decisions and also for agricultural students to understand better about agriculture.

3.4 Problem Solution Fit

4. REQUIREMENT ANALYSIS

4.1 Functional Requirement

FR No.	Functional Requirement (Epic)	Sub Requirement (Story /Sub-Task)
FR-1	User Registration	Registration through Gmail
FR-2	Login to Dashboard	Visualizations of crop growth rate
FR-3	Interactive Dashboard	Change the fields of visualizations according to user needs

4.2 Non-Functional Requirement

FR No.	Non-Functional Requirement	Description
NFR-1	Usability	Easy to access and usethe Dashboard effectively
NFR-2	Security	User login credentials aremaintained in a secured manner and restricted to unauthorised access
NFR-3	Reliability	Dataset used are collected from trustworthy sites and it is up-to date
NFR-4	Performance	Higher performance
NFR-5	Availability	Actively available to all sources
NFR-6	Scalability	It is scalable sinceit has interactive Dashboard

5. PROJECT DESIGN

5.1 Data Flow Diagram

Data Flow Diagram level-0
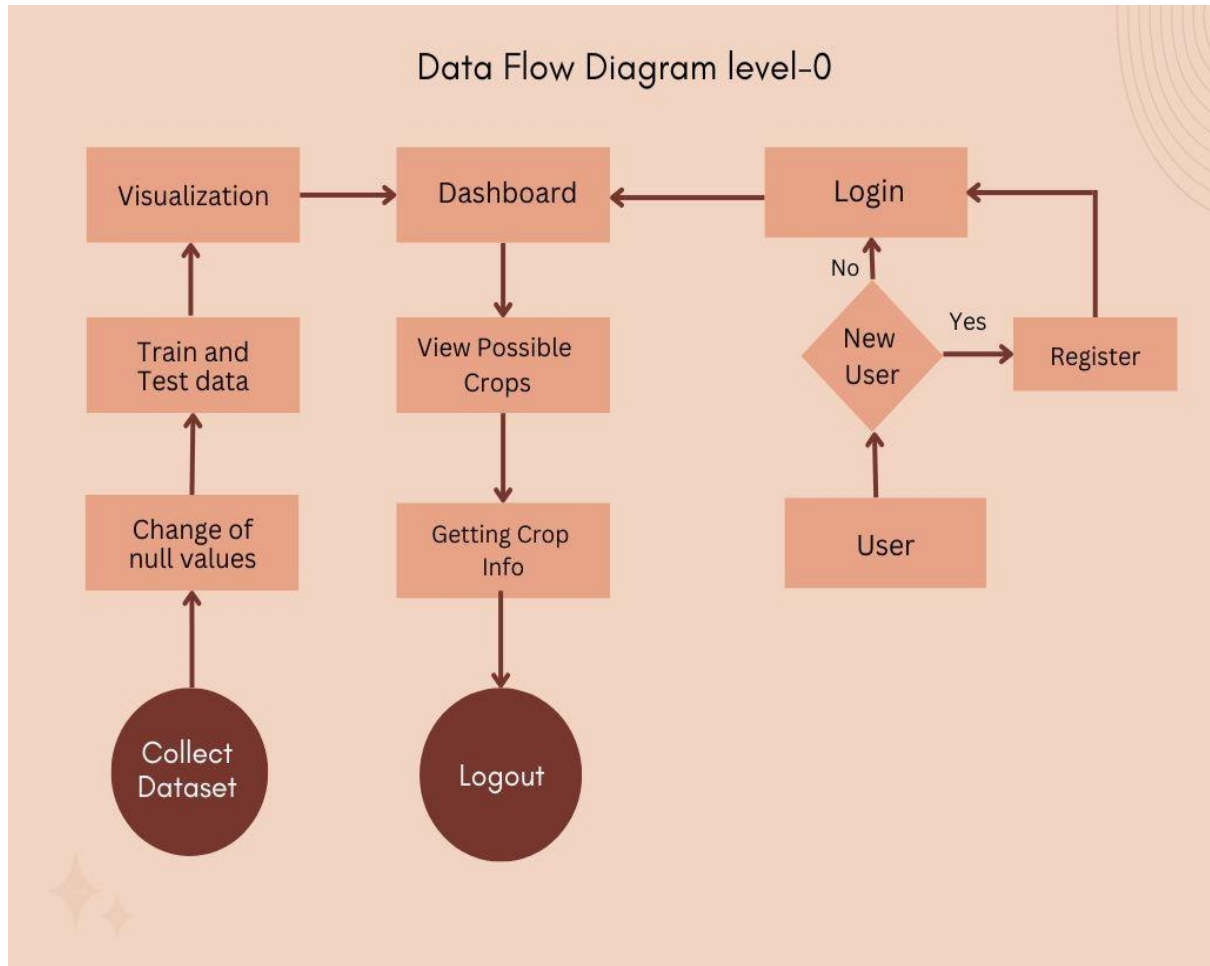
5.2 Solution And Technical Architecture

SOLUTION ARCHITECTURE

Crop Production Data → Data Processing → Training Phase → Evaluation Phase → Testing Phase → Decision System → Dashboard of Crop Yield Estimation ← Login ← User
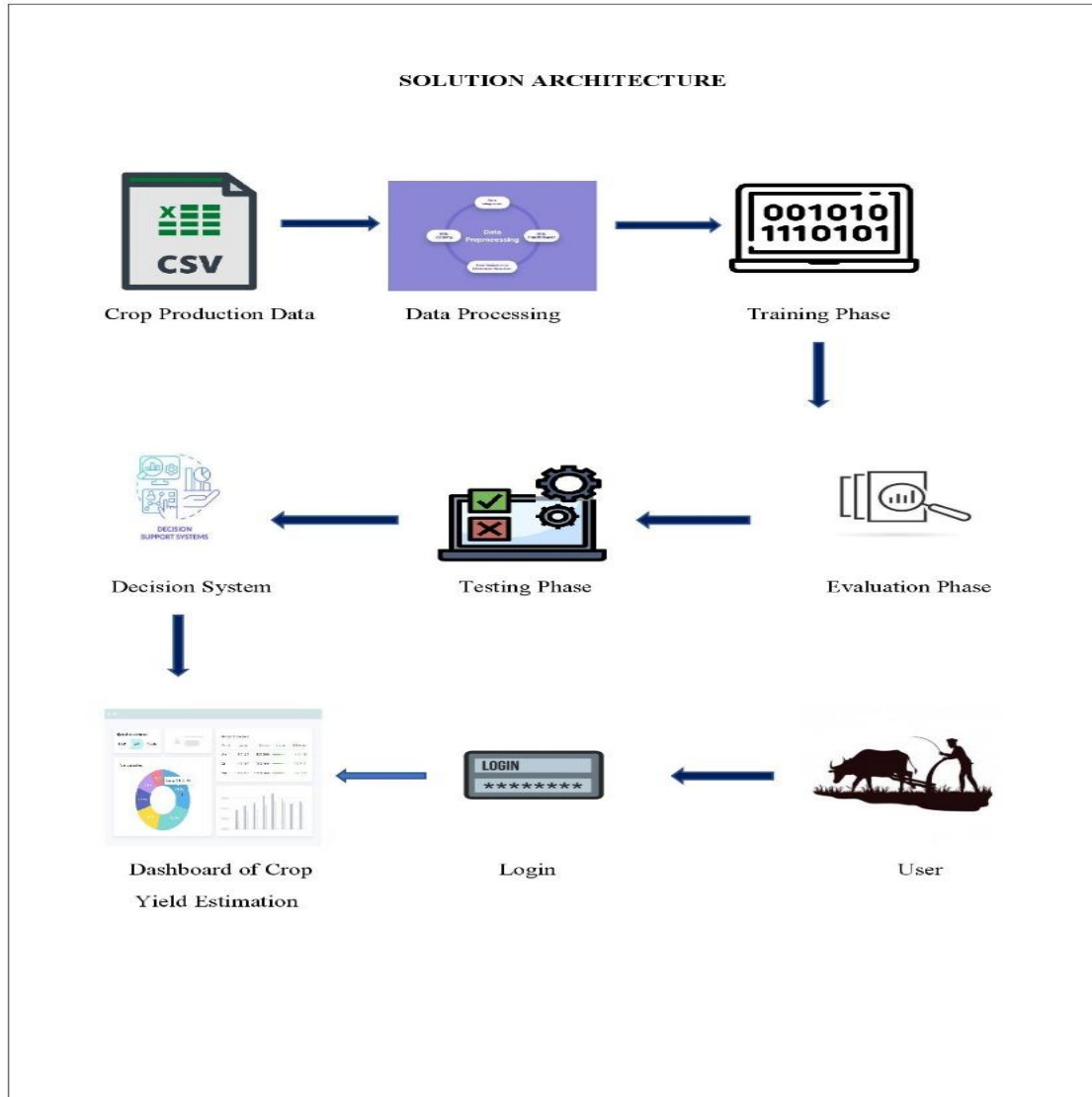
5.3 User Stories

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (Mobile user)	Registration	USN-1	As a user, I can register for the	I can access my account / dashboard	High	Sprint -1

			application by entering my email, password.			
	Login	USN-2	As a user, I can log into the application by entering email & password	I can enter the user name and password	High	Sprint -1
	Dashboard	USN-3	Estimation of crop yield will be displayed	I can access the dashboard	High	Sprint -1
Customer (Web user)	Accessing the dashboard	USN-1	View the estimation of crops available on the dashboard and take decisions accordingly	I can use the information for crop yielding	High	Sprint -1
Customer Care Executive	Connects the user	USN-1	Connects the user with the dashboard	I can access the services	Medium	Sprint -3
Administrator	Provides services	Admin	Estimate the crop yield and display the visualizations on the dashboard	I can update visualizations	High	Sprint -1

6. PROJECT PLANNING AND SCHEDULING

6.1 Sprint Planning And Estimation

Sprint	FunctionalRequirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Registration	USN-1	As a user, I can register for the application by entering my email and password	10	High	Merlin White
	Login	USN-2	As a user, I can log into the application by entering email & password.	10	High	Merlin White, Varshini
Sprint-2	Working with the Dataset	USN-1	Importing the dataset on cognos platform and understand, clean and prepare the dataset.	10	High	Nivetha, Merlin White
	Data Visualization chart	USN-2	After importing the dataset, we create some visualizations t o understand mor e about the soil, crop yield, crop rotation, etc.	10	High	Varshini
			Building visualizations to show crop	4	Low	Nivetha

			production in each state.			
			Building visualizations to show crop growth from	6	Medium	Merlin White
Sprint-3	Creating the Dashboard	USN-6	Creating the dashboard to display the visualizations which gives insights of Crop production in India.	10	High	MerlinWhite,Nivetha, Varshini
Sprint-4	Export the Analytics	USN-7	Exporting the created dashboard to showcase the work to others.	10	High	Merlin White,Nivetha, Varshini

6.2 Sprint Delivery Schedule

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date(Actual)
Sprint-1	20	6 Days	24 Oct 2022	24 Oct 2022	20	29 Oct 2022

Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022	20	04 Nov 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	20	11 Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	20	19 Nov 2022

6.3 Reports From JIRA

Projects / Estimate the crop yield using data analytics

Backlog   •••

🔍 [   ]   MD NK VB 👤⁺   Epic ⌄   📊 Insights

⌄ **ECYUDA Sprint 1** 24 Oct – 29 Oct (4 issues)   0 0 30   Complete sprint •••

As a user I must enter into the application

🔖 ~~ECYUDA-1~~ As a user, I can register for the application by entering my email, password, and co... REGISTRATION   10   DONE ⌄   MD

🔖 ~~ECYUDA-2~~ As a user, I will receive confirmation email once I have registered for the application. REGISTRATION   4   DONE ⌄   MD

🔖 ~~ECYUDA-3~~ As a user, I can register for the application through Gmail. REGISTRATION   6   DONE ⌄   NK

🔖 ~~ECYUDA-4~~ As a user, I can log into the application by entering email & password LOGIN   10   DONE ⌄   VB

\+ Create issue

⌄ **ECYUDA Sprint 2** 31 Oct – 5 Nov (4 issues)   0 0 30   Complete sprint •••

Projects / Estimate the crop yield using data analytics

All sprints   🔩 ☆   **Complete sprint**   •••

🔍 [   ]   MD NK 👤⁺   Epic ⌄   Sprint 2 ⌄   Clear filters   GROUP BY None ⌄   📊 Insights

TO DO	IN PROGRESS 1 OF 1 ISSUE	IN REVIEW 1 OF 1 ISSUE	DONE ✓
	Exporting the created dashboard to showcase the work to others.	Creating the dashboard to display the visualizations which gives insights of Crop production in India	
	EXPORTING THE ANALYTICS	CREATING DASHBOARD	
	🔖 ECYUDA-10 10 NK	🔖 ECYUDA-9 10 MD	

	OCT	NOV	DEC
Sprints	ECYU...	ECYU... ECYU... ECYU...	

⌄ ⚡ ECYUDA-11 Registration	▮		
▯ ECYUDA-1 As a user, I can... DONE MERLIN W...	▮		
▯ ECYUDA-2 As a user, I will r... DONE MERLIN W...	▮		
▯ ECYUDA-3 As a user, I can... DONE NIVETHA K...	▮		
⌄ ⚡ ECYUDA-12 login	▮		
▯ ECYUDA-4 As a user, I can l... DONE VARSHINI B	▮		
⌄ ⚡ ECYUDA-13 Working with Dataset		▮	
▯ ECYUDA-5 Importing the d... DONE NIVETHA K...		▮	
⌄ ⚡ ECYUDA-14 Data Visualization chart		▮	
▯ ECYUDA-6 After importing t... DONE MERLIN W...		▮	
▯ ECYUDA-7 Building visualiz... DONE VARSHINI B		▮	
▯ ECYUDA-8 Building visualiz... DONE VARSHINI B		▮	
⌄ ⚡ ECYUDA-15 Creating Dashboard		▮	
▯ ECYUDA-9 Creating the das... DONE MERLIN W...		▮	
⌄ ⚡ ECYUDA-16 Exporting the Analytics		▮	
ECYUDA-10 Exporting t... IN REVIE... NIVETHA K...		▮	

7. CODING AND SOLUTIONING

7.1 Feature 1

Registration

The new user should register with username, password and Email-id to access the website. After registering, user's login credentials will be stored in the database.

Coding

```
<html>
<head>
  <title>Register</title>
  <link rel="stylesheet" type="text/css" href="style.css">
</head>
<body>
  <br>
  <center><h1>Registration Form</h1></center>
  <section id="form-details" class="section-p1">
    <center>
    <form action="register.php" method="post" name="form1">
    <table width="100%">
      <tr>
        <td><label class="l1">Name</label></td>
```

```html
      <td><input type="text" name="name" required></td>
    </tr>
    <tr>
      <td><label class="l1">Email</label></td>
      <td><input type="email" name="email" required></td>
    </tr>
    <td><label class="l1">Password</label></td>
    <td><input type="password" name="password" required></td>
    </tr>
    <tr>
      <td></td>
    <td><input type="submit" class="normal" name="register"
value="Register"></td>
    </tr>
  </table>
  <a href="/ibm/" class="brd">Login</a>
  <?php
  //including the database connection file
  include_once("db-config.php");


  // Check If form submitted, insert user data into database.
  if (isset($_POST['register'])) {
```

```php
$name     = $_POST['name'];

$email    = $_POST['email'];

$password = $_POST['password'];


// If email already exists, throw error

$email_result = mysqli_query($mysqli, "select 'email' from users where
email='$email' and password='$password'");


// Count the number of row matched

$user_matched = mysqli_num_rows($email_result);


// If number of user rows returned more than 0, it means email already
exists

if ($user_matched > 0) {

    echo "<br/><br/><div id='msg'><strong>Error: </strong> User
already exists with the email id </div>";

} else {

    // Insert user data into database

    $result   = mysqli_query($mysqli, "INSERT INTO
users(name,email,password) VALUES('$name','$email','$password')");


    // check if user data inserted successfully.

    if ($result) {
```

```php
        echo "<br/><div id='msg'><h3>User Registered
successfully.</h3></div>";

        } else {

        echo "<br/><div id='msg'><h3>Registration error. Please try
again." . mysqli_error($mysqli)."</h3></div>";

        }

      }

    ?>

  </form>

  </center>

  <div class="imgsec">

    <div>

      <img class="a1" src="img/reg.jpg">

    </div>

  </div>

</section>

</body>

</html>
```

Login

Once registered, the user can directly login to the website by using their login credentials. There is no need to register each and every time the user tries to access the website.

Coding

```php
<?php
  session_start();
// Create database connection using config file
include_once("db-config.php");
// If form submitted, collect email and password from form
if (isset($_POST['login'])) {
  $email    = $_POST['email'];
  $password = $_POST['password'];
  // Check if a user exists with given username & password
  $result = mysqli_query($mysqli, "select 'email', 'password' from users
    where email='$email' and password='$password'");
  // Count the number of user/rows returned by query
  $user_matched = mysqli_num_rows($result);
  // Check If user matched/exist, store user email in session and redirect
  if ($user_matched > 0) {
    $_SESSION["email"] = $email;
    header("location: project.php");
  } else {
    echo "<div id='msg'>User email or password is not matched <br/></div>";
  }
}
```

```
?>
<!DOCTYPE html>
<html>
<head>
    <title>Login</title>
    <link rel="stylesheet" type="text/css" href="style.css">
</head>
<body class="b1">
    <center><h1>Login Form</h1></center>
    <section id="form-details" class="section-p1">
        <center>
    <form action="index.php" method="post" name="form1">
        <table width="100%">
            <tr>
                <td><label class="l1">Email</label></td>
                <td><input type="text" name="email"></td>
            </tr>
            <tr>
                <td><label class="l1">Password</label></td>
                <td><input type="password" name="password"></td>
            </tr>
            <tr>
```

```html
            <td></td>

            <td><input type="submit" class="normal" name="login"
value="Login"></td>

        </tr>

    </table>

    <a href="register.php" class="brd">Register</a>

  </form>

  </center>

  <div class="imgsec">

    <div>

      <img class="a1" src="img/reg.jpg">

    </div>

  </div>

</section>

</body>

</html>
```

Style Coding

```css
*{

    margin: 0;

    padding: 0;

    box-sizing: border-box;
```

```css
        font-family: 'Spartan', sans-serif;

}

h1{

        font-size: 50px;

        line-height: 64px;

        color: #222;

}

h2{

        font-size: 46px;

        line-height: 54px;

        color: #222;

}

h4{

        font-size: 20px;

        color: #222;

}

h6{

        font-weight: 700;

        font-size: 12px;

}

p{

        font-size: 16px;
```

```css
        color: #465b52;

        margin: 15px 0 20px 0;

}

        .section-p1{

        padding: 40px 80px;

}

.normal{

font-size: 14px;

font-weight: 600;

padding: 15px 30px;

color: #000;

background-color: #2ddfc3;

border-radius: 4px;

cursor: pointer;

border: none;

outline: none;

transition: 0.2s;

}

#msg {

   padding: 20px 20px;

   text-align: center;

   background-color: tomato;
```

```css
    margin: 20px 300px 20px 300px;

    border-radius: 50px;

    color: antiquewhite;

}

body{

        width: 100%;

        background-image: url("img/crop1.jpg");

        background-repeat: no-repeat;

        background-size: cover;

}

.b1{

        background-image: url("img/crop2.jpg");

        background-repeat: no-repeat;

        background-size: cover;

}


.section-p1{

        padding: 40px 80px;

}

img.a1 {

    width: 100%;

}
```

```css
.imgsec {

    width: 30%;

}


.l1 {

    color: aliceblue;

}


/* Form */

#form-details{

    display: flex;

    justify-content: space-between;

    margin: 30px;

    padding: 80px;

}

#form-details form{

        width: 600px;

        display: flex;

        flex-direction: column;

        align-items: flex-start;

}
```

```css
#form-details form span{

        font-size: 12px;


}

#form-details form h2{

        font-size: 26px;

        line-height: 35px;

        padding: 20px 0;

}

#form-details form input{

        border-radius: 10px;

        width: 100%;

        padding: 12px 15px;

        outline: none;

        margin-bottom: 20px;

        border: 1px solid #e1e1e1;

}

#form-details form button{

        background-color: #088178;

        color: #fff;

}

#form-details .imgsec div{
```

```
        padding-bottom: 25px;



}
```

7.2 Feature 2

Creating Website

We are creating a website to export the created dashboard to showcase the work to others. It is done with the help of IBM Cognos and IBM Cloud.

Coding

```php
<?php
    session_start();
    if (empty($_SESSION)){
        header("location:index.php");
    }
?>
<!DOCTYPE html>
<html>
<head>
    <meta charset="utf-8">
    <title>IBM PROJECT</title>
    <link rel="stylesheet" type="text/css" href="project css.css">
</head>
```

```html
<body>

<header>

    <nav>

        <div>

            <a href="#about">About</a>

            <a href="#dataset">Dataset</a>

            <a href="#visualizations">Visualizations</a>

            <a href="#algorithm">Algorithms</a>

    </nav>

  <section>

    <div>

        <h1>Estimation Of Crop Yeild </h1>

        <h1 id="head">Using </h1>

        <h1 id="head">Data Analytics</h1>

    </div>

  </section>

</header>

<section id="about" class="section"><br>

   <div id="con">

        <h2>Data Analytics</h2><br>

        <p>Data science is the practice of mining large data sets of raw data, both
structured and
```

unstructured, to identify patterns and extract actionable insight from them. This is an

interdisciplinary field, and the foundations of data science include statistics, inference,

computer science, predictive analytics, machine learning algorithm development, and

new technologies to gain insights from big data.</p>

   <p>Data analytics is one of the fields of Data science. Data analytics is the process of exploring and analyzing large datasets to find hidden patterns, unseen trends, discover correlations, and derive valuable insights to make business predictions.</p>

   <P>In this project, we are going to estimate the crop yeild using Data analytics. Crop production in India is one of the most important sources of income and India is one of the top countries to produce crops. As per this project we will be analyzing some important visualization, creating a dashboard and by going through these we will get most of the insights of Crop production in India. This website will be useful for farmers to make better decisions related to agriculture.</P>

   </div>

</section>

<section id="dataset" class="section">

    <h2>Dataset</h2>

    <p>A Dataset is a set or collection of data. This set is normally presented in a tabular pattern. Every column describes a particular variable. And each row corresponds to a given member of the data set.</p>

<p>The dataset, we are working with, has 2,46,092 data points (rows) and 6 features (columns) describing each crop production related details. Let's understand the data we're working with and give a brief overview of what each feature represents or should represent State Name - All the Indian State names, District Name -Different District names, Crop Year- contains the crop years, Season – Different seasons for crop production, Area- Total number of areas covered, Production- production of crops.</p>

<center><img src="Dataset.jpg" width="800"></center>

<p>Link for Dataset : Dataset</p>

</section>

<hr>

<section id="visualizations" class="section">

<h2>Data Visualization</h2>

<p style="text-align: justify;">Data visualization is the practice of translating information into a visual context, such as a map or graph, to make data easier for the human brain to understand and pull insights from. The main goal of data visualization is to make it easier to identify patterns, trends and outliers in large data sets.</p>

<p>Using the Crop production in Indian dataset, we plan to create various graphs and charts to highlight the insights and visualizations.</p>

<ul id="indent">

```html
      <li>Build a Visualizaiton to showcase Average Crop Production by
Seasons.</li>

      <li>Showcase the Yearly usage of Area in Crop Production.</li>

      <li>Build a visualization to show case top 10 States in Crop Yeild
Production by Area.</li>

      <li>Build the required Visualization to showcase the Crop Production
by State.</li>

      <li>Build Viusal analytics to represent the Sates with Seasonsal Crop
Production using a Text representation.</li>

    </ul><br><br>


  <iframe
src="https://us3.ca.analytics.ibm.com/bi/?perspective=dashboard&amp;pathRef
=.my_folders%2FSprint2&amp;closeWindowOnLastView=true&amp;ui_appba
r=false&amp;ui_navbar=false&amp;shareMode=embedded&amp;action=view
&amp;mode=dashboard&amp;subView=model000001845cd66489_00000003"
width="1200" height="1000" frameborder="0" gesture="media"
allow="encrypted-media" allowfullscreen=""></iframe>

</section>

<section id="algorithm" class="section">

      <div id="con">

      <h2>Algorithms</h2><br>

      <p>An Algorithm in Data analytics is a set of heuristics and calculations
that creates a model from data. To create a model, the algorithm first analyzes
the data you provide, looking for specific types of patterns or trends. There are
```

several algorithms available in Data analytics. Choosing the best algorithm to use for a specific analytical task can be a challenge. Each algorithm produces a different result, and some algorithms can produce more than one type of result. Some of them are,</p>

<b style="font-size: 1.5em;">Linear Regression Algorithm:

<p>Linear regression is one of the easiest and most popular Machine Learning algorithms. It is a statistical method that is used for predictive analysis. Linear regression makes predictions for continuous/real or numeric variables. </p>

<b style="font-size: 1.5em;">Logistic Regression Algorithm:

<p>Logistic regression is one of the most popular Machine Learning algorithms, which comes under the Supervised Learning technique. It is used for predicting the categorical dependent variable using a given set of independent variables. Therefore the outcome must be a categorical or discrete value. </p>

<b style="font-size: 1.5em;">K-Nearest Neighbor(KNN) Algorithm:

<p>K-nearest neighbors (kNN) is a supervised machine learning technique that may be used to handle both classification and regression tasks and is also frequently used in missing value imputation. It is based on the idea that the observations closest to a given data point are the most "similar" observations in a data set, and we can therefore classify unforeseen points based on the values of the closest existing points.</p>

<b style="font-size: 1.5em;">Decision Tree Algorithm:

<p>Decision Tree is a supervised machine learning algorithm where all the decisions were made based on some conditions. The decision tree has a root

node and leaf nodes extended from the root node. These nodes were decided based on some parameters like Gini index, entropy, information gain.</p>

    </div>

</section>

<footer>

    <div class="footer">

                Related Data Analytics Project Ideas

                Advanced Project Ideas

                Beginners Project Ideas


```html
                        For Dataset Refer</li><br>

                <li>

                    <a href="https://www.kaggle.com/datasets">Kaggle
Site</a>

                </li>

                <li>

                    <a href="https://data.gov.in/">Government Site</a>

                </li>

        </ul><br>

    </div>

</footer>

</body>

</html>
```

Style Coding

```css
*{

    margin: 0;

    padding: 0;

}

header{

    background-image: url("Agriculture.jpg");

    background-repeat: no-repeat;
```

```css
        background-size: cover;

        overflow-x: hidden;

        overflow-y: hidden;

        width: 100%;

        height: 100vh;

}

header h1{

        text-align: center;

        text-transform: capitalize;

        font-size: 3em;

        padding-top: 25vh;

}

#head{

        text-align: center;

        text-transform: capitalize;

        font-size: 3em;

        padding-top: 1vh;

}

header p{

        text-align: center;

        text-transform: capitalize;

        font-size: 1.5em;
```

```css
        padding-top: 10vh;

        padding-left: 30vh;

        padding-right: 30vh;

    }

nav div{

        background-color: #E1C16E;

        width: 100%;

        height: 40px;

    }

nav a:hover, footer a:hover{

        background-color: #ffffff;

    }

nav a{

        color: #000;

        font-size: 1.5em;

        text-decoration: none;

        text-transform: capitalize;

        display: inline-block;

        width: 150px;

        text-align: center;

        padding: 10px 0;

    }
```

```css
footer{

    background-color: #E1C16E;

    width: 100%;

    height: 100%;


}

footer div{

    display: grid;

    grid-gap: 10px;

    grid-template-columns: repeat(3, 1fr);

    text-align: left;

  padding-left: 10vh;

}

footer a{

    font-size: 0.7em;

    color: #000000;

    text-decoration: none;

}

footer ul{

    list-style: none;

}

footer li{
```

```css
        font-size: 1.5em;

        color: #000000;

}


.section ul{

        font-size: 1.5em;

}

.section p{

        font-size: 1.5em;

}

.section h2{

        text-align: center;

        padding: 15px;

}

#about{

    background-image: url("Data Analytics.jpeg");

        background-repeat: no-repeat;

        background-size: cover;

        overflow-x: hidden;

        overflow-y: hidden;

        width: 100%;

        height: 100vh;
```

```css
        padding-right: 20vh;

         padding-left: 20vh;

         padding-top: 40px;

         padding-bottom: 40px;

      color: #ffffff;

      text-align: justify;

}

#con {

   width: 85%;

}

a.brd {

   background-color: aliceblue;

   padding: 4px;

   border-radius: 30px;

}

#dataset{

      padding-right: 10vh;

         padding-left: 10vh;

         padding-top: 40px;

         padding-bottom: 40px;

      text-align: justify;

}
```

```css
#visualizations{

    padding-right: 10vh;

        padding-left: 10vh;

        padding-top: 40px;

        padding-bottom: 40px;


}
#algorithm{

    background-image: url("Algorithm.jpg");

        background-repeat: no-repeat;

        background-size: cover;

        overflow-x: hidden;

        overflow-y: hidden;

        width: 100%;

    padding-right: 10vh;

        padding-left: 10vh;

        padding-top: 40px;

        padding-bottom: 40px;

    color: #ffffff;

    text-align: justify;

}
#indent{
```

```
        padding-left: 15vh;

}
```

7.3 Database Schema

We are using Database Connectivity to store user's login credentials.
This helps us to authenticate the user.

Coding

```php
<?php


$databaseHost    = 'localhost';

$databaseName    = 'crop_yield';

$databaseUsername = 'root';

$databasePassword = '';


$mysqli = mysqli_connect($databaseHost, $databaseUsername,
$databasePassword, $databaseName);
```

8. TESTING

8.1 Test Cases

Test case ID	Feature Type	Component	Test Scenario
LoginPage_TC_OO1	Functional	Home Page	Verify user is able to see the Login/Signup popup when user clicked on My account button
LoginPage_TC_OO2	UI	Home Page	Verify the UI elements in Login/Signup popup
LoginPage_TC_OO3	Functional	Home page	Verify user is able to log into application with Valid credentials
LoginPage_TC_OO4	Functional	Login page	Verify user is able to log into application with InValid credentials
LoginPage_TC_OO5	Functional	Login page	Verify user is able to log into application with InValid credentials

LoginPage_TC_OO6	Functional	Login page	Verify user is able to log into application with InValid credentials
LoginPage_TC_OO7	Functional	Home Page	User must be able to navigate between different sections
LoginPage_TC_OO8	Functional	Home Page	User must be able to change the visualizations according to their requirements
LoginPage_TC_OO9	Functional	Home Page	User must be able to navigate to different tabs using the given link

8.2 User Acceptance Testing

Purpose
The purpose is to briefly explain the test coverage and open issues of the project at the time of the release to User Acceptance Testing (UAT).

Defect Analysis
This report shows the number of 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	8	2	2	2	14
Duplicate	2	0	2	0	4
External	3	2	0	1	6
Fixed	9	1	3	17	30
Not Reproduced	0	0	0	0	0
Skipped	0	0	0	2	2
Won'tFix	0	4	1	1	6
Totals	22	9	8	23	62

Testcase Analysis

This report shows the number of test cases that have passed, failed, and untested.

Section	Total Cases	Not Tested	Fail	Pass
PrintEngine	7	0	0	7
Client Application	51	0	2	49
Security	3	0	1	2
Outsource Shipping	3	0	1	2
Exception Reporting	9	0	0	9
FinalReport Output	4	0	0	4
Version Control	2	0	1	1

9. RESULTS

9.1 Performance Metrics

S.No.	Parameter	Screenshot / Values
1.	Dashboard design	No of Visulizations / Graphs - 5
2.	Data Responsiveness	1.Seasons With Average Productions 2.With Years Usage Of Area And Production 3.Top 10 States With Most Area 4.State With Crop Production 5.States With The Crop Production Along With Season
3.	Amount Data to Rendered (DB2 Metrics)	The Dataset is trained and visualized using IBM Cognos and it is Connected to IBM Cloud
4.	Utilization of Data Filters	Visulizations are utilized inorder to filter the Data
5.	Effective User Story	No of Scene Added - 7
6.	Descriptive Reports	No of Visulizations / Graphs - 5

10. ADVANTAGES AND DISADVANTAGES

Advantages

Crop yield Estimation is essential for planning and evaluation of agricultural investments to improve the productivity and profitability of smallholder farming systems. Early detection of problems and management of that problems can help the farmers for better crop yield. This helps the farmer to understand better about the soil, weather conditions and mixed cropping, which in turn will help the farmer for better crop. Also it helps the farmers to do crop rotation to increase the crop yield. In this project, we have created an interactive dashboard, which will help farmer to make changes according to their needs.

Disadvantages

In this project, the visualizations and dashboard created are done with the limited datas. If in case the Estimation fails, then it will lead to lose for the end user. Any mismatch in the crop's climate and soil adaptations compared to the actual climate/soil conditions that it's grown in, will result in wrong prediction.

11. CONCLUSION

Data Analytics is used for the Estimation of crop yield. In this project, we are analyzing some important visualization, creating a dashboard and by going through these we will get most of the insights of Crop production in India. We visualize, analyse and gain most of the insights by creating an interactive dashboard. An interactive dashboard helps the user to make changes in the visualizations based on their requirements. Finally, we create a website and collaborate dashboard with the created website.

12. FUTURE SCOPE

Farmers can estimate yields themselves or utilize data compiled by others. The USDA's National Agricultural Statistics Service (NASS) publishes crop yield estimates in their Crop Production Reports. These estimates are national averages and based on farmer yield surveys and field data collected by the agency.

13. APPENDIX
SOURCE CODING

REGISTRATION PAGE:

```html
<html>
<head>
  <title>Register</title>
  <link rel="stylesheet" type="text/css" href="style.css">
</head>
<body>
  <br>
  <center><h1>Registration Form</h1></center>
  <section id="form-details" class="section-p1">
    <center>
  <form action="register.php" method="post" name="form1">
    <table width="100%">
      <tr>
```

```html
        <td><label class="l1">Name</label></td>

        <td><input type="text" name="name" required></td>

    </tr>

    <tr>

        <td><label class="l1">Email</label></td>

        <td><input type="email" name="email" required></td>

    </tr>

    <td><label class="l1">Password</label></td>

    <td><input type="password" name="password" required></td>

    </tr>

    <tr>

        <td></td>

        <td><input type="submit" class="normal" name="register"
value="Register"></td>

    </tr>

</table>

<a href="/ibm/" class="brd">Login</a>

<?php

//including the database connection file

include_once("db-config.php");

// Check If form submitted, insert user data into database.

if (isset($_POST['register'])) {
```

```php
$name     = $_POST['name'];

$email    = $_POST['email'];

$password = $_POST['password'];

// If email already exists, throw error

$email_result = mysqli_query($mysqli, "select 'email' from users where
email='$email' and password='$password'");

// Count the number of row matched

$user_matched = mysqli_num_rows($email_result);

// If number of user rows returned more than 0, it means email already
exists

if ($user_matched > 0) {

    echo "<br/><br/><div id='msg'><strong>Error: </strong> User
already exists with the email id </div>";

} else {

    // Insert user data into database

    $result   = mysqli_query($mysqli, "INSERT INTO
users(name,email,password) VALUES('$name','$email','$password')");


    // check if user data inserted successfully.

    if ($result) {

        echo "<br/><div id='msg'><h3>User Registered
successfully.</h3></div>";

    } else {
```

```
            echo "<br/><div id='msg'><h3>Registration error. Please try
again." . mysqli_error($mysqli)."</h3></div>";

        }

      }

    }

    ?>

  </form>

  </center>

  <div class="imgsec">

    <div>

      <img class="a1" src="img/reg.jpg">

    </div>

  </div>

</section>

</body>

</html>
```

LOGIN

```php
<?php

  session_start();

// Create database connection using config file

include_once("db-config.php");
```

```php
// If form submitted, collect email and password from form

if (isset($_POST['login'])) {

    $email    = $_POST['email'];

    $password = $_POST['password'];

    // Check if a user exists with given username & password

    $result = mysqli_query($mysqli, "select 'email', 'password' from users

        where email='$email' and password='$password'");

    // Count the number of user/rows returned by query

    $user_matched = mysqli_num_rows($result);

    // Check If user matched/exist, store user email in session and redirect

    if ($user_matched > 0) {

        $_SESSION["email"] = $email;

        header("location: project.php");

    } else {

        echo "<div id='msg'>User email or password is not matched <br/></div>";

    }

}

?>
<!DOCTYPE html>

<html>

<head>

    <title>Login</title>
```

```html
    <link rel="stylesheet" type="text/css" href="style.css">

</head>

<body class="b1">

    <center><h1>Login Form</h1></center>

    <section id="form-details" class="section-p1">

        <center>

    <form action="index.php" method="post" name="form1">

        <table width="100%">

            <tr>

                <td><label class="l1">Email</label></td>

                <td><input type="text" name="email"></td>

            </tr>

            <tr>

                <td><label class="l1">Password</label></td>

                <td><input type="password" name="password"></td>

            </tr>

            <tr>

                <td></td>

                <td><input type="submit" class="normal" name="login"
value="Login"></td>

            </tr>

        </table>
```

```html
        <a href="register.php" class="brd">Register</a>

      </form>

    </center>

    <div class="imgsec">

      <div>

        <img class="a1" src="img/reg.jpg">

      </div>

    </div>

  </section>

</body>

</html>
```

STYLE

```css
*{

     margin: 0;

     padding: 0;

     box-sizing: border-box;

     font-family: 'Spartan', sans-serif;

}

h1{

     font-size: 50px;

     line-height: 64px;

     color: #222;
```

```css
h2{

        font-size: 46px;

        line-height: 54px;

        color: #222;

}

h4{

        font-size: 20px;

        color: #222;

}

h6{

        font-weight: 700;

        font-size: 12px;

}

p{

        font-size: 16px;

        color: #465b52;

        margin: 15px 0 20px 0;

}

.section-p1{

        padding: 40px 80px;

}
```

```css
.normal{

font-size: 14px;

font-weight: 600;

padding: 15px 30px;

color: #000;

background-color: #2ddfc3;

border-radius: 4px;

cursor: pointer;

border: none;

outline: none;

transition: 0.2s;

}

#msg {

    padding: 20px 20px;

    text-align: center;

    background-color: tomato;

    margin: 20px 300px 20px 300px;

    border-radius: 50px;

    color: antiquewhite;

}

body{

        width: 100%;
```

```css
        background-image: url("img/crop1.jpg");

        background-repeat: no-repeat;

        background-size: cover;

}

.b1{

        background-image: url("img/crop2.jpg");

        background-repeat: no-repeat;

        background-size: cover;

}


.section-p1{

        padding: 40px 80px;

}

img.a1 {

    width: 100%;

}


.imgsec {

    width: 30%;

}

.l1 {

    color: aliceblue;
```

```css
    }

/* Form */

#form-details{

    display: flex;

    justify-content: space-between;

    margin: 30px;

    padding: 80px;

}

#form-details form{

        width: 600px;

        display: flex;

        flex-direction: column;

        align-items: flex-start;

}

#form-details form span{

        font-size: 12px;

}

#form-details form h2{

        font-size: 26px;

        line-height: 35px;

        padding: 20px 0;

}
```

```css
#form-details form input{

    border-radius: 10px;

    width: 100%;

    padding: 12px 15px;

    outline: none;

    margin-bottom: 20px;

    border: 1px solid #e1e1e1;

}

#form-details form button{

    background-color: #088178;

    color: #fff;

}

#form-details .imgsec div{

    padding-bottom: 25px;

}
```

CROP YIELD WEBPAGE

```php
<?php

  session_start();

  if (empty($_SESSION)){

    header("location:index.php");

  }

?>
```

```html
<!DOCTYPE html>

<html>

<head>

    <meta charset="utf-8">

    <title>IBM PROJECT</title>

    <link rel="stylesheet" type="text/css" href="project css.css">

</head>

<body>

<header>

    <nav>

        <div>

            <a href="#about">About</a>

            <a href="#dataset">Dataset</a>

            <a href="#visualizations">Visualizations</a>

            <a href="#algorithm">Algorithms</a>

    </nav>

  <section>

    <div>

            <h1>Estimation Of Crop Yeild </h1>

            <h1 id="head">Using </h1>

            <h1 id="head">Data Analytics</h1>

    </div>
```

```html
        </section>

</header>

<section id="about" class="section"><br>

    <div id="con">

        <h2>Data Analytics</h2><br>

        <p>Data science is the practice of mining large data sets of raw data, both structured and

unstructured, to identify patterns and extract actionable insight from them. This is an

interdisciplinary field, and the foundations of data science include statistics, inference,

computer science, predictive analytics, machine learning algorithm development, and

new technologies to gain insights from big data.</p><br>

    <p>Data analytics is one of the fields of Data science. Data analytics is the process of exploring and analyzing large datasets to find hidden patterns, unseen trends, discover correlations, and derive valuable insights to make business predictions.</p><br>

    <P>In this project, we are going to estimate the crop yeild using Data analytics. Crop production in India is one of the most important sources of income and India is one of the top countries to produce crops. As per this project we will be analyzing some important visualization, creating a dashboard and by going through these we will get most of the insights of Crop production in India. This website will be useful for farmers to make better decisions related to agriculture.</P>
```

```html
    </div>

</section>

<section id="dataset" class="section">

        <h2>Dataset</h2>

        <p>A Dataset is a set or collection of data. This set is normally presented
in a tabular pattern. Every column describes a particular variable. And each row
corresponds to a given member of the data set.</p>

        <p>The dataset, we are working with, has 2,46,092 data points (rows)
and 6 features (columns) describing each crop production related details. Let's
understand the data we're working with and give a brief overview of what each
feature represents or should represent State Name - All the Indian State names,
District Name -Different District names, Crop Year- contains the crop years,
Season – Different seasons for crop production, Area- Total number of areas
covered, Production- production of crops.</p><br>

        <center><img src="Dataset.jpg" width="800"></center><br>

        <p>Link For Kaggle: <a
href="https://www.kaggle.com/datasets/abhinand05/crop-production-in-
india">Dataset</a></p>

</section>

<hr>

<section id="visualizations" class="section">

        <h2>Data Visualization</h2>

        <p style="text-align: justify;">Data visualization is the practice of
translating information into a visual context, such as a map or graph, to make
data easier for the human brain to understand and pull insights from. The main
```

goal of data visualization is to make it easier to identify patterns, trends and outliers in large data sets.</p>

      <p>Using the Crop production in Indian dataset, we plan to create various graphs and charts to highlight the insights and visualizations.</p>

        <ul id="indent">

     Build a Visualizaiton to showcase Average Crop Production by Seasons.

     Showcase the Yearly usage of Area in Crop Production.

     Build a visualization to show case top 10 States in Crop Yeild Production by Area.

     Build the required Visualization to showcase the Crop Production by State.

     Build Viusal analytics to represent the Sates with Seasonsal Crop Production using a Text representation.

  <iframe src="https://us3.ca.analytics.ibm.com/bi/?perspective=dashboard&pathRef=.my_folders%2FSprint2&closeWindowOnLastView=true&ui_appbar=false&ui_navbar=false&shareMode=embedded&action=view&mode=dashboard&subView=model000001845cd66489_00000003" width="1200" height="1000" frameborder="0" gesture="media" allow="encrypted-media" allowfullscreen=""></iframe>

</section>

<section id="algorithm" class="section">

<div id="con">

<h2>Algorithms</h2>

<p>An Algorithm in Data analytics is a set of heuristics and calculations that creates a model from data. To create a model, the algorithm first analyzes the data you provide, looking for specific types of patterns or trends. There are several algorithms available in Data analytics. Choosing the best algorithm to use for a specific analytical task can be a challenge. Each algorithm produces a different result, and some algorithms can produce more than one type of result. Some of them are,</p>

<b style="font-size: 1.5em;">Linear Regression Algorithm:

<p>Linear regression is one of the easiest and most popular Machine Learning algorithms. It is a statistical method that is used for predictive analysis. Linear regression makes predictions for continuous/real or numeric variables. </p>

<b style="font-size: 1.5em;">Logistic Regression Algorithm:

<p>Logistic regression is one of the most popular Machine Learning algorithms, which comes under the Supervised Learning technique. It is used for predicting the categorical dependent variable using a given set of independent variables. Therefore the outcome must be a categorical or discrete value. </p>

<b style="font-size: 1.5em;">K-Nearest Neighbor(KNN) Algorithm:

<p>K-nearest neighbors (kNN) is a supervised machine learning technique that may be used to handle both classification and regression tasks and is also frequently used in missing value imputation. It is based on the idea that the observations closest to a given data point are the most "similar"

observations in a data set, and we can therefore classify unforeseen points based on the values of the closest existing points.</p>

<b style="font-size: 1.5em;">Decision Tree Algorithm:

<p>Decision Tree is a supervised machine learning algorithm where all the decisions were made based on some conditions. The decision tree has a root node and leaf nodes extended from the root node. These nodes were decided based on some parameters like Gini index, entropy, information gain.</p>

</div>

</section>

<footer>

    <div class="footer">

                Related Data Analytics Project Ideas

                Advanced Project Ideas

                Beginners Project Ideas

```html
            </li>

        </ul><br>

        <ul>

            <li><br>

                For Dataset Refer

            </li><br>

            <li>

                <a href="https://www.kaggle.com/datasets">Kaggle
Site</a>

            </li>

            <li>

                <a href="https://data.gov.in/">Government Site</a>

            </li>

        </ul><br>

    </div>

</footer>

</body>

</html>
```

STYLE

```css
*{
    margin: 0;
```

```css
        padding: 0;

}

header{

        background-image: url("Agriculture.jpg");

        background-repeat: no-repeat;

        background-size: cover;

        overflow-x: hidden;

        overflow-y: hidden;

        width: 100%;

        height: 100vh;

}

header h1{

        text-align: center;

        text-transform: capitalize;

        font-size: 3em;

        padding-top: 25vh;

}

#head{

        text-align: center;

        text-transform: capitalize;

        font-size: 3em;

        padding-top: 1vh;
```

```css
        }
header p{

        text-align: center;

        text-transform: capitalize;

        font-size: 1.5em;

        padding-top: 10vh;

        padding-left: 30vh;

        padding-right: 30vh;

}

nav div{

        background-color: #E1C16E;

        width: 100%;

        height: 40px;

}

nav a:hover, footer a:hover{

        background-color: #ffffff;

}

nav a{

        color: #000;

        font-size: 1.5em;

        text-decoration: none;

        text-transform: capitalize;
```

```css
        display: inline-block;

        width: 150px;

        text-align: center;

        padding: 10px 0;

}

footer{

        background-color: #E1C16E;

        width: 100%;

        height: 100%;


}

footer div{

        display: grid;

        grid-gap: 10px;

        grid-template-columns: repeat(3, 1fr);

        text-align: left;

      padding-left: 10vh;

}

footer a{

        font-size: 0.7em;

        color: #000000;

        text-decoration: none;
```

```css
        }

footer ul{

        list-style: none;

}

footer li{

        font-size: 1.5em;

        color: #000000;

}


.section ul{

        font-size: 1.5em;

}

.section p{

        font-size: 1.5em;

}

.section h2{

        text-align: center;

        padding: 15px;

}

#about{

    background-image: url("Data Analytics.jpeg");

        background-repeat: no-repeat;
```

```css
        background-size: cover;

        overflow-x: hidden;

        overflow-y: hidden;

        width: 100%;

        height: 100vh;

    padding-right: 20vh;

        padding-left: 20vh;

        padding-top: 40px;

        padding-bottom: 40px;

        color: #ffffff;

        text-align: justify;

}

#con {

    width: 85%;

}

a.brd {

    background-color: aliceblue;

    padding: 4px;

    border-radius: 30px;

}

#dataset{

        padding-right: 10vh;
```

```css
        padding-left: 10vh;

        padding-top: 40px;

        padding-bottom: 40px;

    text-align: justify;

}

#visualizations{

    padding-right: 10vh;

        padding-left: 10vh;

        padding-top: 40px;

        padding-bottom: 40px;


}

#algorithm{

    background-image: url("Algorithm.jpg");

        background-repeat: no-repeat;

        background-size: cover;

        overflow-x: hidden;

        overflow-y: hidden;

        width: 100%;

    padding-right: 10vh;

        padding-left: 10vh;

        padding-top: 40px;
```

```css
    padding-bottom: 40px;

   color: #ffffff;

   text-align: justify;

}

#indent{

    padding-left: 15vh;

}
```

DATABASE CONNECTIVITY

```php
<?php

$databaseHost    = 'localhost';

$databaseName    = 'crop_yield';

$databaseUsername = 'root';

$databasePassword = '';


$mysqli = mysqli_connect($databaseHost, $databaseUsername,
$databasePassword, $databaseName);
```

Project Demo Link

https://cropyield.ml/vid1.html

https://youtu.be/RPZcIwl2oMU

Github

https://github.com/IBM-EPBL/IBM-Project-1986-1658422207