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Crop Recommendation And Plant Leaf Disease Prediction Using CNN

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INTRODUCTION

In today's ever-evolving agricultural landscape, the integration of technology is revolutionizing the way we approach crop cultivation and disease management. "Crop Recommendation and Plant Leaf Disease Prediction" is a cutting-edge project at the intersection of agriculture and technology. It seeks to address the pressing challenges faced by farmers by providing them with data-driven solutions.

This project is divided into two crucial components. The first component focuses on crop recommendation, utilizing historical data, soil analysis, and weather information to advise farmers on the best crop choices for their specific region. The second component involves plant leaf disease prediction, employing image recognition and predictive modeling to detect and forecast disease outbreaks in their early stages.

PROBLEM STATEMENT

The challenge at hand involves the crucial tasks of crop classification and plant disease prediction within the realm of agriculture. Accurate and timely classification of crops is essential for effective farm management, as different crops thrive in specific environmental conditions and soils. Similarly, the outbreak of plant diseases poses a significant threat to agricultural productivity and food security. Farmers often face losses due to diseases caused by pests, pathogens, and environmental factors, impacting crop yields and economic stability.

This solution aims to develop robust models for crop classification, leveraging techniques such as Convolutional Neural Networks (CNNs), while concurrently integrating predictive models to identify plant diseases through image recognition and data analysis. The goal is to equip farmers and agricultural stakeholders with a powerful toolset that enhances crop management, optimizes resource allocation, minimizes losses, and ultimately contributes to global food security.

PROPOSED WORK

- Import the dataset.
- Explore the data to figure out what they look like.
- Pre-process the data.
- Split the data into attributes and labels.
- Divide the data into training and testing sets.
- Train the CNN algorithm.
- Make some predictions.

LITERATURE REVIEW

Sr.no	Title	Author	Description
1	A Systematic Literature Review on Plant Disease Detection: Motivations, Classification Techniques, Datasets, Challenges, and Future Trends	Wasswa Shafik Ali Tufail, Abdallah Namoun, Liyanage Chandratilak De Silva , Rosyzie Anna Awg Haji Mohd Apong (2023)	In this study, we conduct a systematic literature review and present a detailed survey of the studies employing data collection techniques and publicly available datasets.
2	Crop Prediction Based on Characteristics of the Agricultural Environment Using Various Feature Selection Techniques and Classifiers	S. P. Raja, Barbara Sawicka, Zoran Stamenkovic, And G. Mariammal (2022)	This systematic review in the past, farmers were able to decide on the crop to be cultivated, monitor its growth, and determine when it could be harvested. Today, rapid changes in environmental conditions have made it difficult for the farming community to continue to do so.

LITERATURE REVIEW

Sr.no	Title	Author	Description
3	An Analytical Approach for Soil and Land Classification System using Image Processing	Prof. A. V. Deorankar (2021)	This paper has proposed the study of current researches, the problems it addressed, and its prospects. The emphasis is focused on the analytical study of various advanced and efficient classification mechanisms and techniques. Here, it has been attempted to study the factors these approaches have addressed to improve the accuracy of the classification.
4	Expert System for Diagnosis Mango Diseases Using Leaf Symptoms Analysis	Chutinan Trongtorkid,Part Pramokchon (2020)	his work is to construct a model for testing the soil fertility. It also suggests the crop which has to be planted depending upon the value obtained from the sensor. It also provides the regional wise information about the crop in the form of graph. We have farmer chat where the farmers can share and get idea from the expert by registering in this application. It also suggests the fertilizer which has to be added to the soil in order to increase the crop productivity.

LITERATURE REVIEW

Sr.no	Title	Author	Description
5	Plant Leaf Disease Classification And Detection System Using Machine Learning	M.M. Gunarathna (2021)	The four stages include preprocessing, leaf segmentation, feature extraction and classification. To remove the noise we are doing the pre-processing and to part the affected or damages area of the leaf, image segmentation is used. The k-nearest neighbors (KNN) algorithm, which is a guided, supervised and advance machine learning algorithm, is implemented to find solutions for both the problems related to classification and regression.
6	Plant Disease Detection Using Image Processing and Machine Learning	Pranesh Kulkarni Atharva Karwande Tejas Kolhe Soham Kamble Akshay Joshi Medha Wyawahare (2020)	This paper proposes a smart and efficient technique for detection of crop disease which uses computer vision and machine learning techniques. The proposed system is able to detect 20 different diseases of 5 common plants with 93% accuracy

MATHEMATICAL MODEL

Let S represent the entire system, where S = I, P, O. where;

- I represents the input, which consists of image data.
- P represents the procedures or operations applied to the input, using I to make predictions.
- O represents the output, which includes the system's predictions related to crop selection and plant leaf disease.

Input (I) : I is composed of image data, which serves as input to the system.

Procedures (P) : P consists of the operations performed using the input (I) to make predictions. These operations include the assessment of the image data to determine both crop predictions and plant leaf disease predictions.

Output (O) : represents the system's predictions, which include crop recommendations and the detection of plant leaf disease

SYSTEM ARCHITECTURE

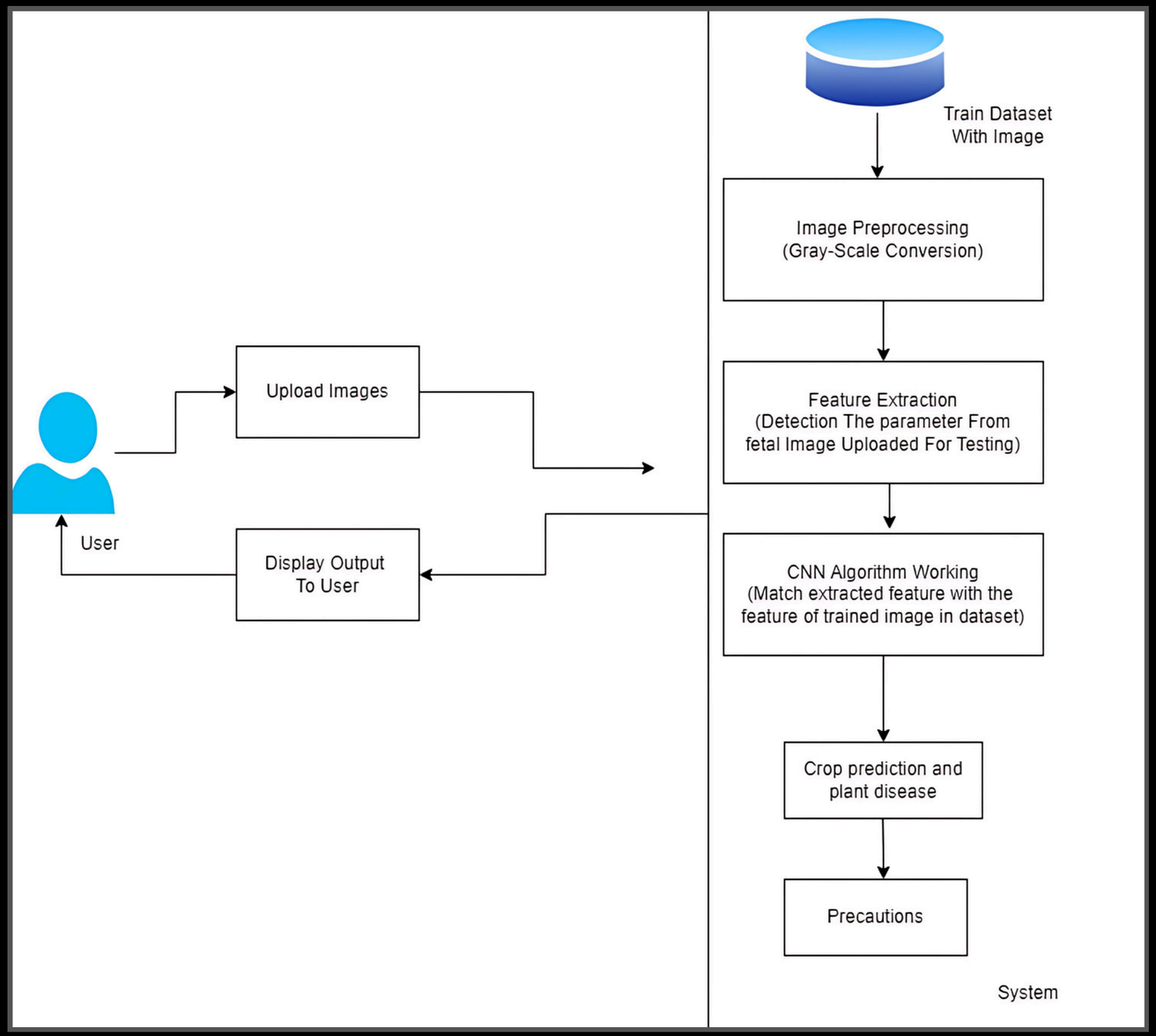

Fig.1: Architecture

ALGORITHM

- A Convolutional Neural Network (CNN) is a type of deep learning algorithm that is particularly well-suited for image recognition and processing tasks.

- It is made up of multiple layers, including convolutional layers, pooling layers, and fully connected layers. A convolutional neural network (CNN or ConvNet) is a network architecture for deep learning that learns directly from data.

- CNNs are particularly useful for finding patterns in images to recognize objects, classes, and categories. They can also be quite effective for classifying audio, time-series, and signal data.

SVM ALGORITHM

Support Vector Machine (SVM) is a supervised machine learning algorithm used for both classification and regression. Though we say regression problems as well it's best suited for classification. The main objective of the SVM algorithm is to find the optimal hyperplane in an N-dimensional space that can separate the data points in different classes in the feature space. The hyperplane tries that the margin between the closest points of different classes should be as maximum as possible. The dimension of the hyperplane depends upon the number of features. If the number of input features is two, then the hyperplane is just a line. If the number of input features is three, then the hyperplane becomes a 2-D plane.

UML DIAGRAMS

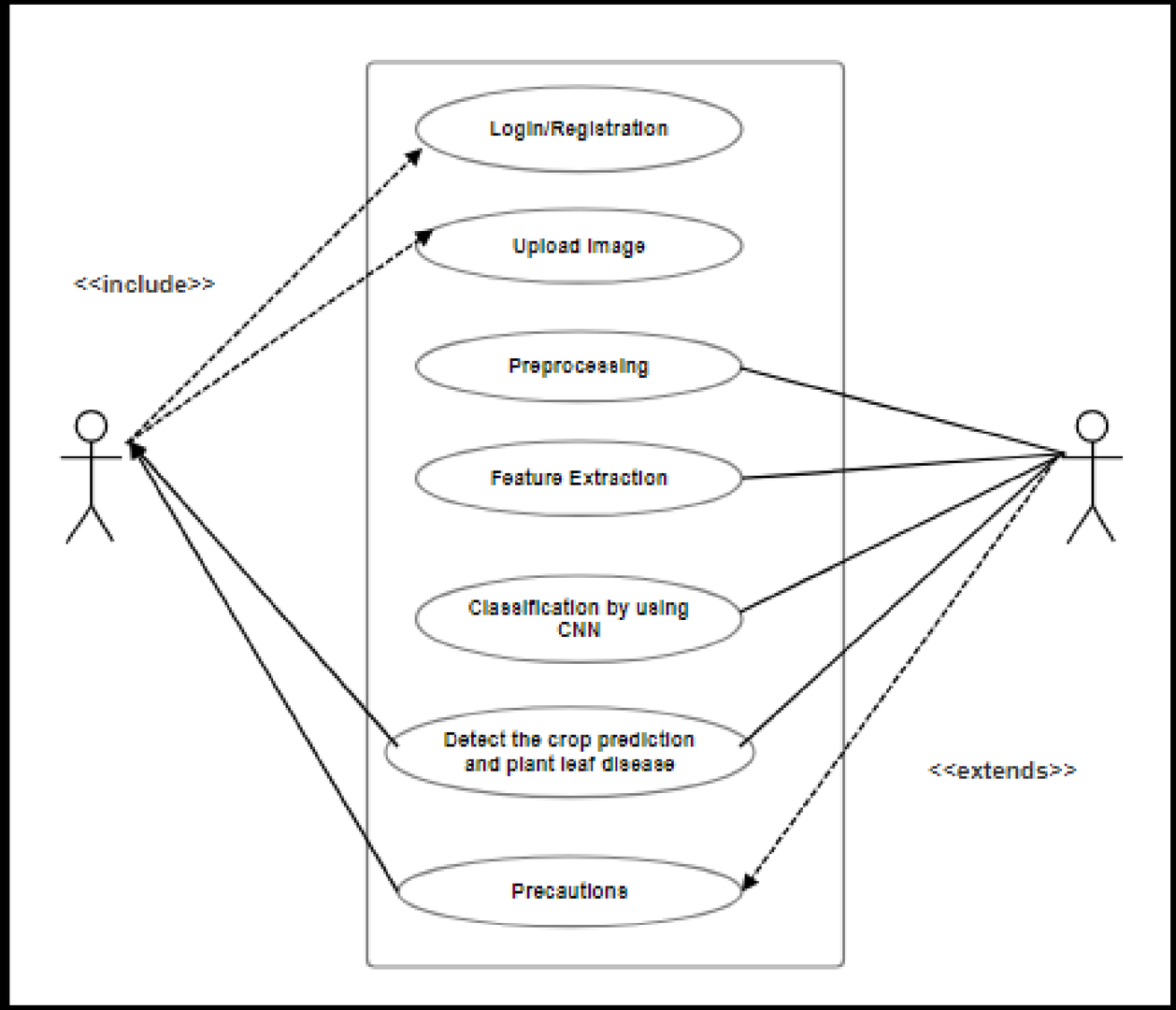

Fig.2: Usecase

LEVEL 0 & 1 DATA FLOW DIAGRAM

Fig.3: Level O DFD

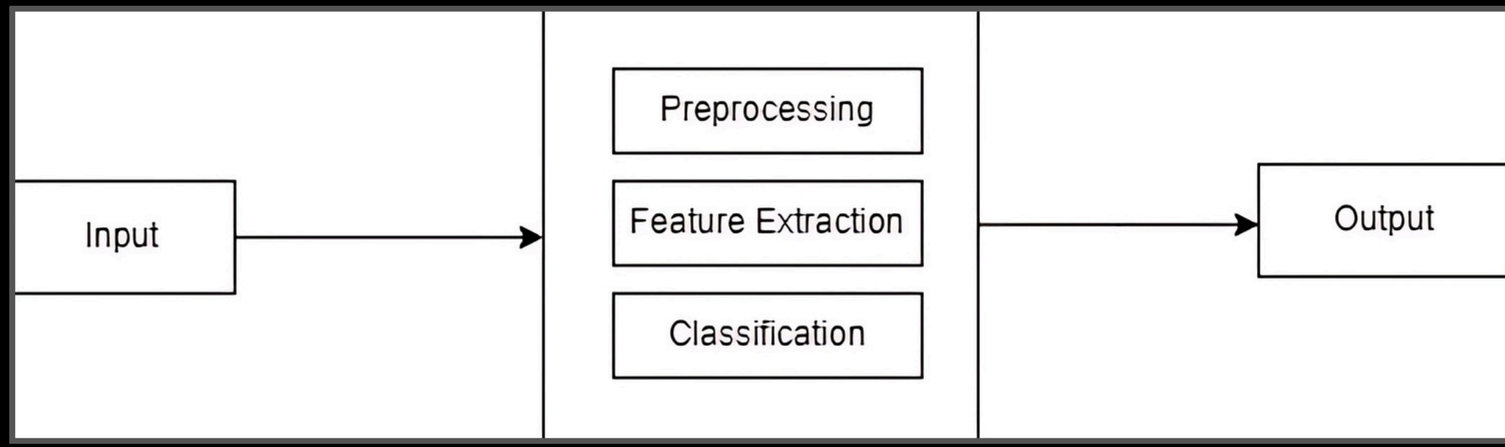

Fig.4: Level 1 DFD

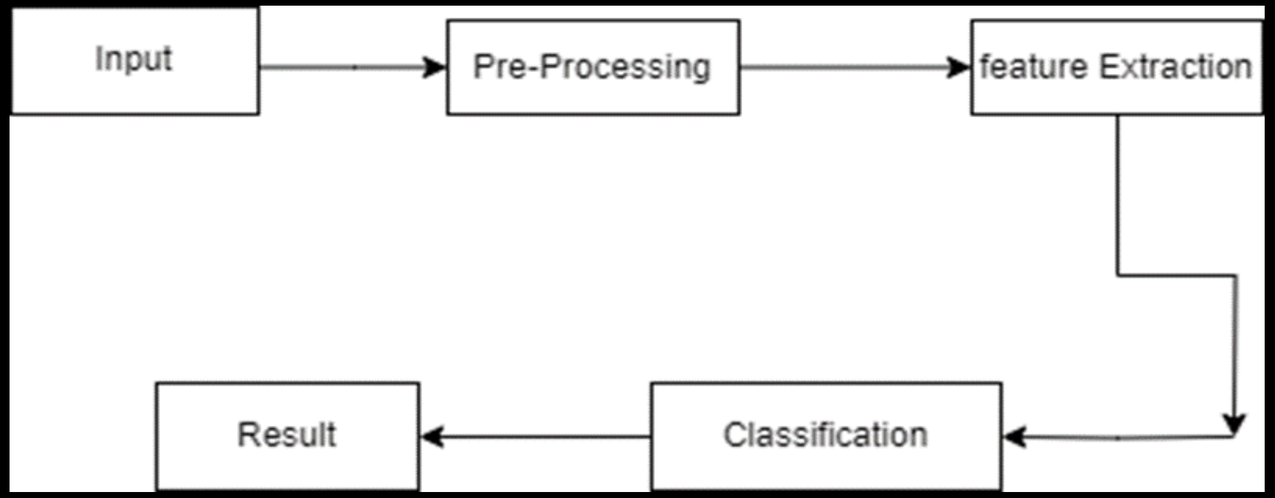

Fig.5: Level 2 DFD

SEQUENCE DIAGRAM

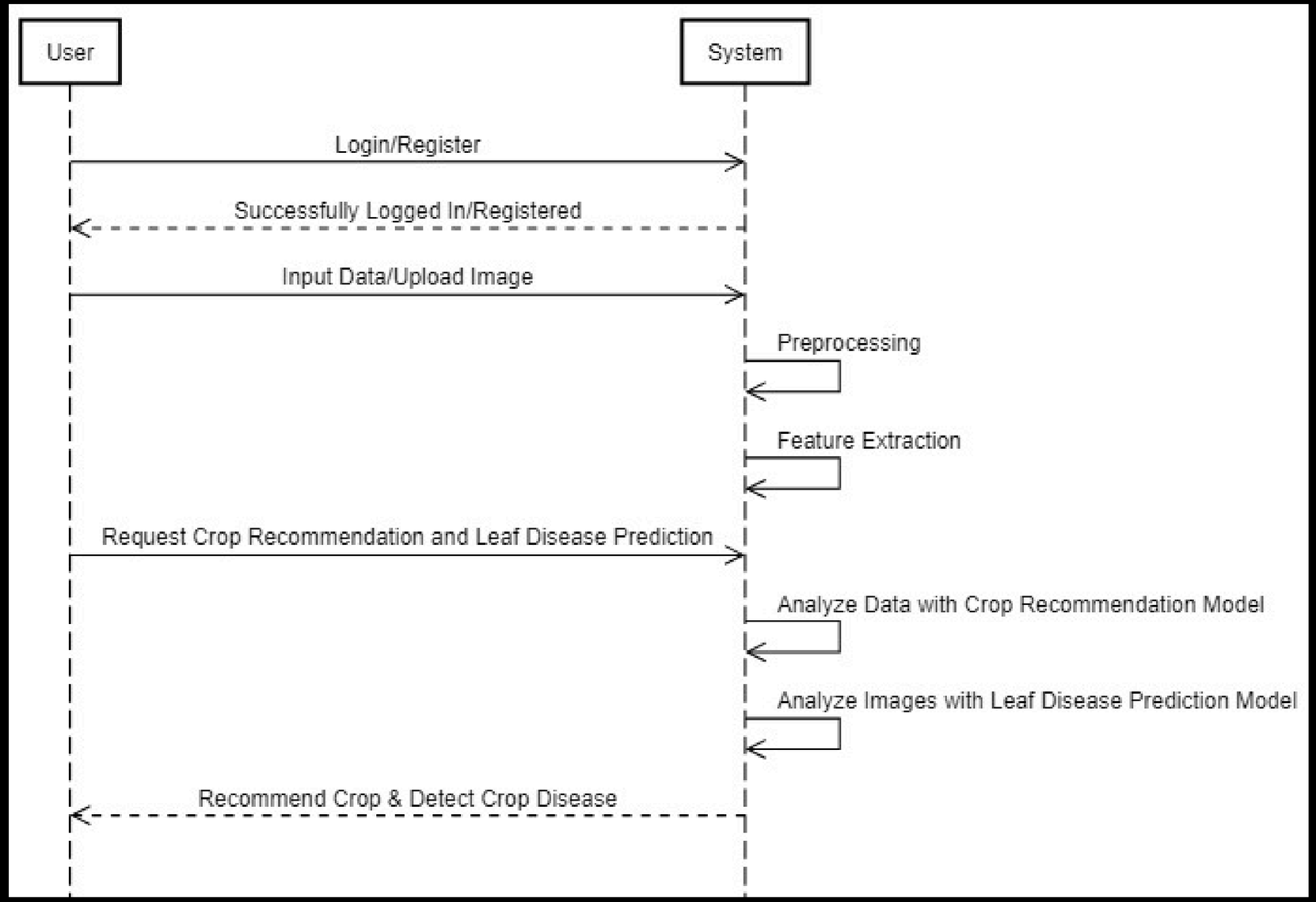

Fig.6: Sequence Diagram

GUI TEST CASES

Test Case ID	Test Case	Test Case I/P	Actual Result	Expected Result	Status
001	Login Screen-Sign up	Click on sign up button then check all required mandatory fields with leaving all fields blank	All required/mandatory fields should display Instruction line** field(s) are mandatory" is displayed	All required /mandatory fields should display Instruction line** field(s) are mandatory" is displayed	Pass
002	Create a Password >>Text Box	Confirm Password >>>Text Box	Check the validation message for Password and Confirm Password field.	Correct validation message should be displayed accordingly or "Password and confirm password should be same" in place of "Password mismatch".	Pass

REGISTRATION TEST CASES

Test Case ID	Test Case	Test Case I/P	Actual Result	Expected Result	Status(P/F)
001	Enter the number in username, middle name, last name Field	Number	Error Comes	Error Should Comes	Pass
002	Enter the character in username, middle name, last name Field	Character	Accept	Accept	Pass
003	Enter the invalid email id format in email id field	Kkgmail,com	Error comes	Error Should Comes	Pass
004	Enter the valid email id format in email id field	kk@gmail.com	Accept	Accept	Pass
005	Enter the invalid digit no in phone no field	99999	Error comes	Error Should Comes	Pass
006	Enter the 10 digit no in phone no field	9999999999	Accept	Accept	Pass

LOGIN TEST CASES

Test Case ID	Test Case	Test Case I/P	Actual Result	Expected Result	Staus
001	Enter valid username and password	valid username and password	Login Successfully	Login Successfully	Pass
002	Enter invalid username and invalid password	invalid username and invalid password	Loign failed	Loign should failed	Pass
003	Enter invalid username and valid password	invalid username and valid password	Loign failed	Loign should failed	Pass
004	Click on Login button	Click on Login	Redirected to next page	It should redirect us to next page	Pass
005	Click on Create Account button	Click on Create Account button	Redirected to Registration Screen	It should redirect us to Registration Screen	Pass

TEST CASES

Test Case ID	Test Case I/P	Actual Result	Expected Result	Staus
001	Crop image upload with disease	Accurate disease prediction and treatment recommendation	Accurate prediction and recommendation	Pass
002	Access crop recommendations	Recommendations displayed based on farm profile	Recommendations displayed based on farm profile	Pass
003	Access disease predictions	Disease predictions displayed for uploaded images	Disease predictions displayed for uploaded images	Pass
003	Enter all the parameters of soil such as pH, Temperature,Humidity etc	Suggest Suitable crop	Crop Recommended Successfully	Pass

CONCLUSION

The proposed methodology aims to create an advanced crop recommendation and plant leaf disease detection system to help farmers increase crop yields.

This technology allows farmers to accurately identify diseases in plants, enabling early intervention to prevent the spread of infections and protect crop yields

It uses image processing and machine learning to detect common leaf diseases like early blight, bacterial spot, and curl.

FUTURE SCOPE

1. Mobile Application: Create a mobile application for on-the-go access to crop recommendations and disease predictions, making it more convenient for farmers.

2. IoT Integration: Integrate Internet of Things (IoT) devices for real-time data collection, such as soil moisture and weather conditions, to provide more precise recommendations.

3. Geographic Expansion: Expand the project's coverage to more regions and crops, catering to a wider agricultural audience.

PAPER PUBLICATION STATUS

- **Paper Title:**
  Crop Recommendation and Plant Leaf Disease Prediction using CNN

- **Name of the Conference/Journal where paper submitted:**
  IJEAST (International Journal of Engineering Applied Science and Technology) (ISSN: 2455-2143)

- **Paper accepted/rejected:**
  Submitted and Accepted

THANK YOU