“Bean Care”: Design and Implementation of Diseases Diagnosis System for Beans

Project ID: TMP-2023-24-103

Project Proposal Report

H.K.A.A.S.Subasinghe

IT20299170

B.Sc. Special (Honors) Degree in Information Technology

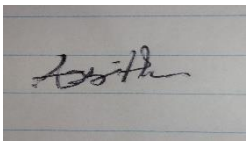
Department of Information Technology

Sri Lankan Institute of Information Technology Sri Lanka

14th August 2023

Declaration of the candidate & Supervisor

To the best of our knowledge and belief, this proposal does not contain any previously published or written by another person material, except where the acknowledgement is made in the text. We declare that this is our own work, and this proposal does not incorporate without acknowledgment any material previously submitted for a degree or diploma in any other university or Institute of higher learning.

Name	Student ID	Signature
Subasinghe.H.K.A.A.S	**IT20299170**	

The supervisor/s should certify the proposal report with the following declaration.

The above candidates are carrying out research for the undergraduate Dissertation under my supervision.

……. 2023/08/23

Signature of the supervisor: Date

Abstract

This project focuses on the development of an innovative Disease Diagnosis System for bean plants, utilizing advanced image processing and machine learning techniques. By analyzing uploaded images of bean leaves, the system aims to accurately detect and classify diseases, providing farmers with timely insights for effective disease management and crop protection.

Keywords: Machine Learning, Image Recognition

Contents

List of Figures

List of Tables

1. Introduction

The health of bean crops is vital for agricultural productivity and the livelihoods of farmers. Traditional methods of disease diagnosis through manual visual inspection can be time-consuming and prone to errors. This project aims to address this challenge by leveraging machine learning to create an automated system that identifies and diagnoses diseases in bean leaves.

1.1. Motivation

The motivation behind this project is to revolutionize the way diseases in bean crops are diagnosed and managed. By providing farmers with an automated tool for disease detection, this project seeks to minimize crop losses, increase yields, and enhance the overall well-being of farmers by offering effective disease management strategies.

1.2 Importance of using a web application

Utilizing a web application as the platform for disease diagnosis offers several advantages. Farmers can conveniently access the system through their devices, making it user-friendly and accessible. Furthermore, a web application allows for real-time disease detection, enabling swift response to be emerging threats and enhancing disease control.

2. Background and Literature Survey

2.1 Background

Traditional methods of disease diagnosis often rely on subjective visual inspection, leading to inaccurate and delayed results. Leveraging machine learning and image processing techniques can significantly improve the accuracy and speed of disease detection in bean crops.

2.2 Literature Review

Studies have shown the effectiveness of machine learning models in accurately diagnosing plant diseases based on leaf images. These models leverage advanced image processing and classification algorithms to identify diseases, enabling farmers to take timely actions to prevent further spread.

3. Research Gap & Research Problem

3.1.Research Gap

Gap No	Features to be expand
1	Limited Application of Machine Learning for Disease Diagnosis in Bean Crops.
2	Insufficient Utilization of Automated Disease Diagnosis Systems in Local Agriculture.
3	Need for Accurate and Timely Disease Detection to Minimize Crop Losses.
4	Lack of User-Friendly Disease Diagnosis Platforms for Bean Farmers.

Table 3.1.1 – Features to be Expand.

3.2.Research Problem

The central research problem revolves around creating an accurate and user-friendly Disease Diagnosis System for bean plants. The system aims to bridge the gap between traditional manual diagnosis and automated machine learning-based diagnosis, ensuring that farmers receive timely and reliable disease information.

4. Objectives

4.1.Main Objective

The main objective of this project is to develop an automated Disease Diagnosis System that accurately detects and classifies diseases in bean leaves based on uploaded images..

4.2.Specific Objectives

1. Collect and curate a diverse dataset of bean leaf images with various diseases.

2. Implement image preprocessing techniques to enhance the quality and clarity of uploaded images.

3. Research and select appropriate machine learning models, such as convolutional neural networks (CNNs), for disease classification.

4. Develop and train the selected machine learning model using the preprocessed image dataset.

5. Methodology

5.1.Functional Requirements

5.1.1. Overall System Overview

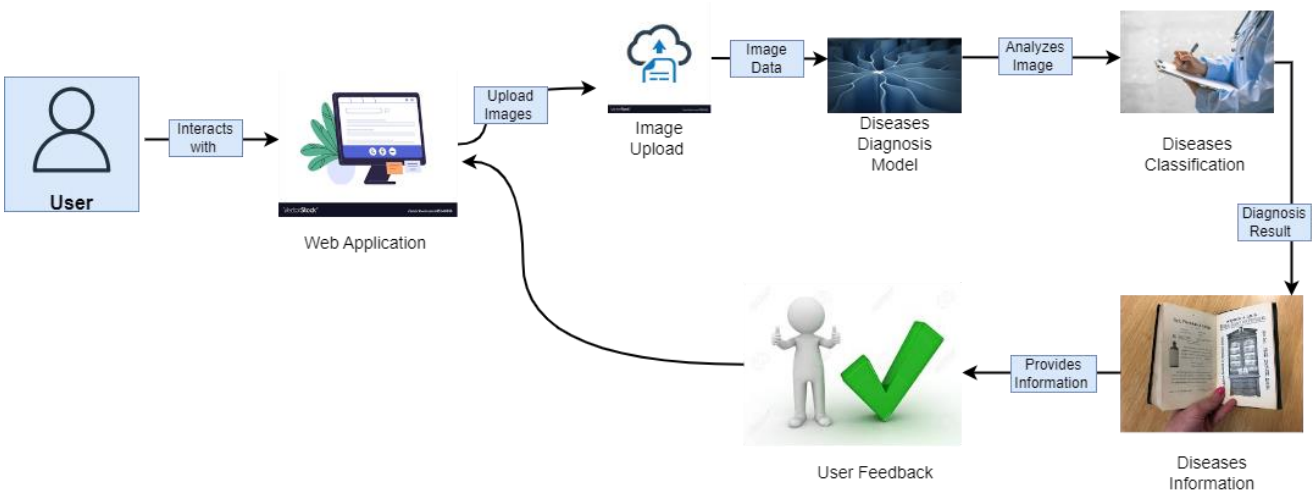


Figure 5.1.1.1 **System Overview**

1. User (A): Represents the end-user, usually a farmer, who interacts with the system.

2. Web Application (B): This is the user interface through which users interact with the system. They upload images of bean leaves that they suspect are diseased.

3. Image Upload (C): Users upload images of bean leaves through the web application. These images are then sent to the Disease Diagnosis Model for analysis.

4. Disease Diagnosis Model (D): This is the core of my part. The model has been trained on a dataset of images of healthy and diseased bean leaves. It uses Machine learning techniques to analyze the uploaded images and diagnose whether the leaves are healthy or diseased.

5. Disease Classification (E): The Disease Diagnosis Model classifies the uploaded images into different categories, such as specific diseases or healthy leaves.

6. Disease Information (F): Once the classification is done, the system provides information about the diagnosed disease. This could include details about the disease, its symptoms, and possible management strategies.

7. User Feedback (G): The system also allows users to provide feedback, which could help improve the accuracy of the diagnosis model over time.

5.1.2. System Overview for Instruction / Treatments Releasing.

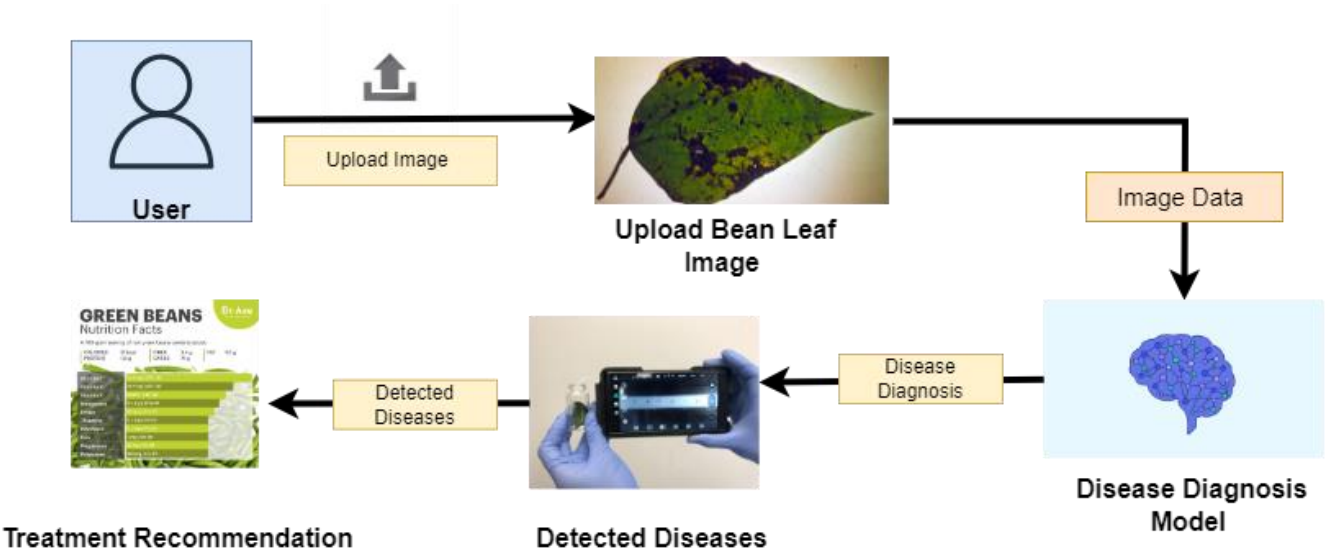


Figure 5.1.2.1 **System Overview for Instruction / Treatments**

This component focuses on providing accurate disease-related information and treatment recommendations to users based on the identified disease. The system will classify diseases and suggest appropriate actions to manage and control the spread.

5.2.Application of Key Pillars

The application of key pillars involves the integration of image processing, machine learning, and user interaction. Image preprocessing enhances the quality of uploaded images, machine learning models accurately diagnose diseases, and the user interface facilitates seamless interaction.

5.3.Tools and Technologies

Tools and Technologies	Explanation
Python	Programming language for model development and data analysis.
Flask	Web framework for building the user interface and handling data.
Pandas, NumPy	Libraries for data manipulation and analysis.
Scikit-learn	Machine learning library for model development.
HTML/CSS/JavaScript	Front-end technologies for the web application..

Table 5.3.1 **Tools and Technologies chart**

6. Evaluation Criteria

6.1.Gantt Chart

Figure 6.1.1 **Gantt chart**

6.2.Work Breakdown Structure

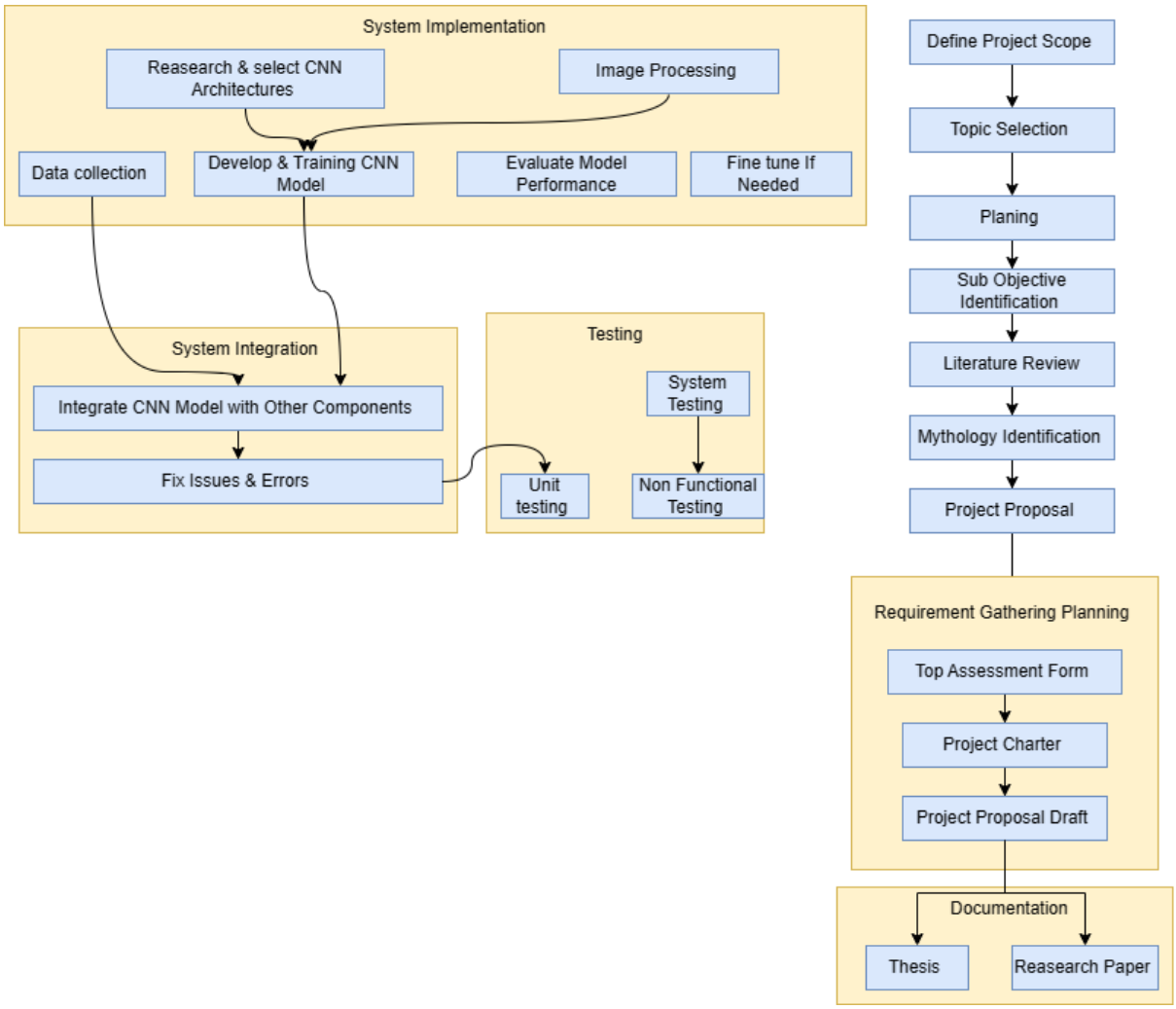


Figure 6.2.1 **Work Breakdown Structure**

7. Commercialization

The system's commercialization strategy involves offering subscriptions to farmers for access to the Disease Diagnosis System. A tiered pricing model will provide varying levels of access based on subscription plans. Revenue generated from subscriptions will sustain system maintenance, updates, and future enhancements.

8. Description of Personal and Facilities

IT Number	Member	Task
IT20299170	H.K.A.A.S.Subasinghe	Implement disease diagnosis functionality. |

Table 8.1: Description of personal and facilities

8.1.User Requirements

- User-friendly interface for image upload
- Accurate disease classification and treatment recommendations.
- Real-time disease detection and insights

8.2.Software Requirements

- Python environment for model development.
- Web framework for application development.
- Deep learning libraries for image analysis.

8.3.Functional Requirement

- Accurate disease diagnosis using machine learning models.
- Timely provision of disease information.
- User-friendly and responsive web interface.

8.4.Non-Functional requirement

- System reliability and availability
- Efficient processing of uploaded images.
- Secure data handling and user privacy.

9. Budget and Budget Justification

Up until the proposed project is tested, this budget is estimated. Depending on the choices we make throughout the project, the budget may be altered. Throughout the entire project, costs will be borne by representatives of the project community.

Activities	Amount (Rs.)
Development Resources	5000.00
Data Acquisition	4500.00
Infrastructure	4000.00
Marketing	3500.00
Maintenance	10000.00
Miscellaneous	2000.00

Table 9.1: Estimate Budget

References

1. Mohanty, S. P., Hughes, D. P., & Salathé, M. (2016). Using deep learning for image-based plant disease detection. Frontiers in Plant Science, 7, 1419.

This study demonstrates the use of deep learning techniques for image-based plant disease detection, which aligns with the objective of diagnosing diseases in bean leaves.

2. Fuentes, A., & Yoon, S. (2020). Plant disease identification using explainable 3D deep learning on hyperspectral images. Remote Sensing of Environment, 239, 111615.

This paper explores the use of deep learning on hyperspectral images for plant disease identification, which provides insights into advanced techniques for disease diagnosis.

3. Fukatsu, T., & Matsumoto, Y. (2019). Visual assessment of crop disease infection severity using convolutional neural networks. Computers and Electronics in Agriculture, 165, 104961.

This research investigates the use of convolutional neural networks for visual assessment of crop disease infection severity, which can offer valuable approaches for diagnosing diseases in bean leaves.

4. Sannakki, S. S., & Lohith, M. S. (2019). Detection of Crop Diseases Using Image Processing and Machine Learning Techniques: A Review. International Journal of Computer Sciences and Engineering, 7(12), 109-116.

This review article provides an overview of various image processing and machine learning techniques for crop disease detection, offering a comprehensive perspective on the topic.

5. Mwebaze, E., Abdel-Rahman, E. M., Luvisi, A., De Salvador, F. R., & Azzari, G. (2016). Identification of cassava diseases using image recognition technology. PloS one, 11(10), e0163781.

While this paper focuses on cassava diseases, the use of image recognition technology for disease identification is relevant and can provide insights for diagnosing diseases in bean leaves.