**ARECANUT DISEASE DETECTION**

## A PROJECT REPORT

***Submitted by,***

**Akash – 20211CSD0116**

**Prajwal A B - 20211CSD0105**

**Sushmashree P S -20211CSD0069**

**Kavyashree V Shetty- 20211CSD0099**

**Dr.Yamanappa**

***in partial fulfillment for the award of the degree of***

**BACHELOR OF TECHNOLOGY**

**IN**

**COMPUTER SCIENCE AND ENGINEERING, COMPUTER ENGINEERING, INFORMATION SCIENCE AND ENGINEERING Etc.**

**At**



**PRESIDENCY UNIVERSITY**

**BENGALURU**

**DECEMBER 2024**

**PRESIDENCY UNIVERSITY**

**SCHOOL OF COMPUTER SCIENCE ENGINEERING**

**CERTIFICATE**

This is to certify that the Project report **“ARECANUT DISEASE DETECTION”** being submitted by “Prajwal A B, Akash, Kavyashree V Shetty, Sushmashree P S” bearing roll number(s) “20211CSD0105,20211CSD0116,20211CSD0099,20211CSD0069” in partial fulfillment of the requirement for the award of the degree of Bachelor of Technology in Computer Science and Engineering is a bonafide work carried out under my supervision.

|  |  |
| --- | --- |
| **Dr.Yamanappa**  Asst.Professor  School of CSE&IS  Presidency University | **Dr. Saira Bhanu**  HoD  School of CSE&IS  Presidency University |

|  |  |  |
| --- | --- | --- |
| **Dr. L. SHAKKEERA**  Associate Dean  School of CSE  Presidency University | **Dr. MYDHILI NAIR**  Associate Dean  School of CSE  Presidency University | **Dr. SAMEERUDDIN KHAN**  Pro-Vc School of Engineering  Dean -School of CSE&IS  Presidency University |

**PRESIDENCY UNIVERSITY**

**SCHOOL OF COMPUTER SCIENCE ENGINEERING**

**DECLARATION**

We hereby declare that the work, which is being presented in the project report entitled **ARECANUT DISEASE DETECTION** in partial fulfillment for the award of Degree of **Bachelor of Technology** in **Computer Science and Engineering**, is a record of our own investigations carried under the guidance of **Dr.Yamanappa, Asst.Professor,** **School of Computer Science Engineering & Information Science, Presidency University, Bengaluru.**

We have not submitted the matter presented in this report anywhere for the award of any other Degree.

**Prajwal A B - 20211CSD0105**

**Akash Kobal -20211CSD0116**

**Kavyashree V Shetty - 20211CSD0099**

**Sushmashree P S -20211CSD0069**

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**ABSTRACT**

Arecanut, also known as betel nut, is a vital tropical crop, with India being the second-largest producer and consumer globally. Despite its economic importance, arecanut plants are vulnerable to a variety of diseases affecting their roots, trunk, and foliage throughout their growth cycle. Traditional disease detection relies on manual observation, a process that is both labor-intensive and prone to inaccuracies. This study presents a novel system utilizing Convolutional Neural Networks (CNNs) to automate the identification of arecanut diseases and provide actionable remedies. CNNs, a class of deep learning models, analyze input images, learn significant features, and classify them with high accuracy. For this research, a custom dataset of 620 images, capturing both healthy and diseased samples, was developed and divided into training and testing sets in an 80:20 ratio. The CNN model was trained using categorical cross-entropy as the loss function, the Adam optimizer for optimization, and accuracy as the performance metric over 50 epochs. The proposed approach achieved a disease detection accuracy of 88.46%, demonstrating its effectiveness as a reliable tool for farmers to manage and maintain crop health efficiently.

Keywords: Arecanut, Crop Health Monitoring, Convolutional Neural Networks, Deep Learning.

**ACKNOWLEDGEMENT**

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**Prajwal A B**

**Akash Kobal**

**Kavyashree V Shetty**

**Sushmashree P S**

**LIST OF TABLES**

|  |  |  |  |
| --- | --- | --- | --- |
| **Sl. No.** | **Table Name** | **Table Caption** | **Page No.** |
| 1 | Table 1.1 | Software modules versus Reusable components | 5 |

**LIST OF FIGURES**

|  |  |  |  |
| --- | --- | --- | --- |
| **Sl. No.** | **Figure Name** | **Caption** | **Page No.** |
| 1 | Figure 1.1 | Software modules versus Reusable components | 5 |

**TABLE OF CONTENTS**

|  |  |  |
| --- | --- | --- |
| **CHAPTER NO.** | **TITLE** | **PAGE NO.** |
|  | **ABSTRACT ACKNOWLEDGMENT**  **…** | **i**  **ii**  **…** |
| **1.** | **INTRODUCTION** | 1 |
|  | 1.1 GENERAL | 1 |
|  | 1.2 . . . . . . . . . . . . | 2 |
|  | 1.2.1 General | 5 |
|  | 1.2.2.1 General | 8 |
|  | 1.2.2.2 . . . . . . . . | 10 |
|  | 1.2.2 | 12 |
|  | 1.3 . . .. . . . . . .. . . . . . . | 13 |
|  | 1.4 . . . . . . . . . . . . . . . . | 15 |
| **2.** | **LITERATURE REVIEW** | **16** |
|  | 2.1 GENERAL | 17 |
|  | 2.2 . . . . .. | 19 |
|  | 2.2. | 20 |

**CHAPTER-1**

**INTRODUCTION**

* 1. **Sub topic-1**
     1. **Sub topic-1 of Sub topic-1**

Include the content here with font family Times New Roman. Chapter Name font size should be 16. Sub topic font size should be 14. Further sub topics & Body text font size should be 12. Line spacing 1.5.

**1.2 Sub topic-2**

**1.3 Sub topic-3**

**CHAPTER-2**

**LITERATURE SURVEY**

Recent studies have explored disease detection in plants, including arecanut, using image processing and machine learning techniques. For instance, Dhanuja K C (2020) developed a system for arecanut disease detection using texture-based grading and K-nearest neighbor (KNN) algorithm with a dataset of 144 samples.

Similarly, Manpreet Sandhu et al. (2020) employed machine learning algorithms for leaf image classification to detect spots or rot on leaves, utilizing drone-captured images. Ashish Nage et al. (2019) created an Android application for plant disease identification using convolutional neural networks (CNN).

Swathy Ann Sam et al. (2020) compared the performance of CNN, KNN, SVM, and Decision Trees in plant disease detection, achieving 86% accuracy with CNN. These studies primarily focused on general plant leaves, employing image processing and machine learning algorithms like SVM, CNN, KNN, and Decision Trees.

This research builds upon existing studies by focusing on arecanut disease detection using CNN and open-source datasets, expanding the scope to include trunk and fruit analysis in addition to leaf-based detection.

**CHAPTER-3**

**RESEARCH GAPS OF EXISTING METHODS**

Our CNN-based disease detection in arecanut having several research gaps persist. Data-related limitations include small and imbalanced datasets, inadequate representation of diverse arecanut varieties and diseases, and poor data quality. The Methodological shortcomings encompass overfitting/underfitting, limited feature extraction, and ineffective transfer learning. Our model will be based on Performance-wise, existing models often struggle with accuracy, speed, and robustness.

To improve disease detection in arecanut plants, future research should prioritize collecting more diverse and high-quality data, developing better models and training methods, and adapting existing models for arecanut disease detection. Enabling real-time disease detection and integrating versatile models with existing farming systems are also crucial. By addressing these areas, researchers can significantly enhance disease detection accuracy, efficiency, and practicality, ultimately benefiting arecanut farmers and the industry.

Key research gaps:

- Data limitations on bases of size, diversity, quality.

- Methodological shortcomings on overfitting, feature extraction, transfer learning

**CHAPTER-4**

**PROPOSED MOTHODOLOGY**

The authors have used the dataset of healthy and disease leaf to detect different diseases of leaves. The images were taken from using a digital camera at a distance of half-meter from the plant. The diseased and healthy arecanut images are taken from the arecanut plantations in Shimoga District, Karnataka, India. Inputs from researchers in the area of arecanut and farmers were taken into consideration while taking the photographs. The images taken consist of both healthy and diseased leaf, trunk, and nuts.

They had been explored the application of Convolutional Neural Network(CNN) on bases arecanut Disease detection. A CNN model is trained on large dataset of image of healthy and diseased arecanut leaves, learning to identify the visual patterns associated with different diseases. When presented with a new image, the network can classify it as either healthy or diseased, and eventually identify the disease present.

They can be processed with an automated system for detecting disease using leaf image classification. The presence of spots or rotting areas in the plant leaf will be detected automatically by using CNN algorithms. Here the dataset is created for training a neural network for image classification. The dataset was collected manually from the field. In this paper to get better feature extraction, image reprocessing, which includes intensity normalization, and masking portions of the image. Then, using these processed images, a deep convolutional neural network model was trained to classify the images and CNN model will be operated for desired output.

To train and test the models, a diverse range of images of both healthy and diseased specimens are utilized. Due to the dataset's limited size, data augmentation techniques are employed to generate new training data through rotations, zooming, shifting, and flipping, artificially expanding the dataset. The model undergoes 50 epochs of training to optimize performance, achieving high validation and test accuracy while minimizing loss.

This project works on uploading a captured image of sample to the system and algorithm will detect weather the sample is affected by any diseases or not, if it is affected by any disease, it will print the detected disease, for this detection we had used CNN which gave an accurate desired output

**CHAPTER-5**

**OBJECTIVES**

The primary goal of this research is to design a robust, automated system for the early detection, classification, and management of arecanut diseases, leveraging advanced machine learning and image processing techniques. Arecanut is a vital crop, especially in regions like India, where it plays a significant role in the agricultural economy. However, diseases affecting arecanut pose a major challenge, causing substantial losses if not addressed early. This study aims to revolutionize disease detection by introducing technology-driven solutions that are efficient, accurate, and accessible to farmers.

Comprehensive Dataset Creation:

The foundation of this research lies in the development of a well-curated dataset consisting of high-resolution images of both healthy and diseased arecanuts, including their leaves, trunks, and nuts. These images are collected with expert guidance and under controlled conditions to capture a variety of diseases such as Mahali (Koleroga), Stem Bleeding, and Yellow Leaf Spot. The dataset undergoes preprocessing steps like resizing, noise reduction, and normalization to ensure it is optimized for training deep learning models. This extensive dataset serves as the backbone for training and testing the system.

Automated Disease Detection:

The research focuses on using Convolutional Neural Networks (CNNs), a powerful deep learning algorithm, to automate the detection of arecanut diseases. CNNs are designed to process images, extract meaningful patterns, and classify diseases based on the visual features of affected crops. This approach eliminates the need for manual inspection, which is often time-consuming, labor-intensive, and less reliable. The system is designed to accurately differentiate between healthy crops and those affected by specific diseases, ensuring scalability and adaptability across diverse agricultural conditions.

Solution Recommendation System:

In addition to detecting diseases, the system includes a solution module that suggests effective remedies for the identified issues. This feature provides farmers with actionable steps to mitigate disease impact, improve crop health, and enhance yield. By integrating expert knowledge into the recommendation system, the tool becomes a practical resource for farmers seeking to address issues quickly and efficiently.

Early Intervention and Cost Efficiency:

A critical objective of this research is to enable early detection of arecanut diseases, which is essential to prevent their spread and minimize losses. The automated system reduces reliance on traditional inspection methods, which often require expensive equipment, extensive manpower, and time. This makes the solution cost-effective and accessible, especially for small-scale farmers.

Advancing Smart Farming Practices:

This research aims to promote smart farming by integrating cutting-edge technology into the agricultural workflow. The system combines advanced data augmentation techniques, optimized neural network structures, and user-friendly interfaces to create a tool that simplifies disease detection for farmers. By empowering farmers with technology, this initiative fosters sustainable farming practices and supports better decision-making to improve overall productivity.

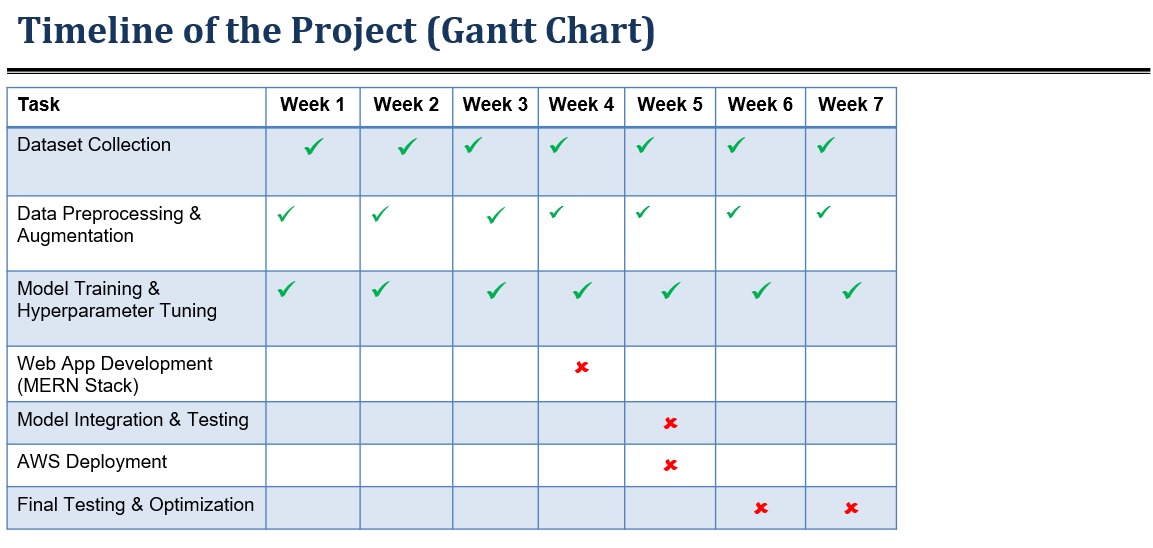
By achieving these objectives, the study contributes to a significant reduction in crop losses, promotes economic sustainability for farmers, and serves as a model for applying artificial intelligence to broader agricultural challenges.

**CHAPTER-6**

**SYSTEM DESIGN & IMPLEMENTATION**

**CHAPTER-7**

**TIMELINE FOR EXECUTION OF PROJECT**

**(GANTT CHART)**

**CHAPTER-8**

**OUTCOMES**

**CHAPTER-9**

**RESULTS AND DISCUSSIONS**

**CHAPTER-10**

**CONCLUSION**

**REFERENCES**

**APPENDIX-A**

**PSUEDOCODE**

**APPENDIX-B**

**SCREENSHOTS**

**APPENDIX-C**

**ENCLOSURES**

**1. Journal publication/Conference Paper Presented Certificates of all students.**

**2. Include certificate(s) of any Achievement/Award won in any project-related event.**

**3. Similarity Index / Plagiarism Check report clearly showing the Percentage (%). No need for a page-wise explanation.**

**4.** **Details of mapping the project with the Sustainable Development Goals (SDGs).**