**Paddy Diseases Monitor**

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**Faculty of Computing**

**Riphah International University, Islamabad**

Date: [date of final presentation]

**Final Approval**

This is to certify that we have read the report submitted by **AmaarIftikhar(35441),SamerAbbas (24297)**for the partial fulfillment of the requirements for the degree of the Bachelors of Science in Computer Science (BSCS). It is our judgment that this report is of sufficient standard to warrant its acceptance by Riphah International University, Islamabad for the degree of Bachelors of Science in Computer Science (BSCS).

**Committee:**

|  |  |
| --- | --- |
| **1** | Mr. Zeeshan Ali  (Supervisor) |
|  |  |
| **2** | Mr. Musharraf  (Head of Department/chairman) |

**Declaration**

We hereby declare that this document “**Paddy Diseases Monitor**” neither as a whole nor as a part has been copied out from any source. It is further declared that we have done this project with the accompanied report entirely on the basis of our personal efforts, under the proficient guidance of our teachers, especially our supervisor **Mr. Zeeshan Ali**. If any part of the system is proved to be copied out from any source or found to be reproduction of any project from anywhere else, we shall stand by the consequences.

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**Dedication**

This project is lovingly dedicated to the farmers of Pakistan-true stewards of the earth whose endless efforts and sacrifices keep our nation running. There unyielding spirit in times of adversity drives us towards solutions that would pay the right tribute to our effort and bring a glimmer of hope to their fields.

To our families, whose love and faith have been the guiding factors in the darkest of times, and to our mentors, who never lost faith in us even when we had lost faith in ourselves, this work stands as testimony to their support and encouragement.

May this be a small step toward easing the burdens of those who nurture the land and sow the seeds of life for all of us.

**Acknowledgement**

With hearts full of gratitude, we would first and foremost like to acknowledge the blessings of **Almighty Allah**, whose wisdom and strength perfectly provided the ability to embark upon and bring into fruition this journey. Without His blessings, it would not have been possible.

To our **parents** and **family**, you have been the anchors in which we belong, the strongest pillars for support, and a major source of our inspiration. The countless sacrifices, love, and encouragement you gave us, became our light on the way, especially through the most difficult and trying moments of our journey. As much as this is our success, it is also yours.

For this, we would like to extend our heartfelt thanks to our supervisor **Sir Zeeshan Ali**, whose patience, wisdom, and encouragement know no bounds. Your faith in us and constant mentorship have not only shaped this project but us as well.

We are equally indebted to the faculty at **Riphah International University**, as they installed within us a passion for vision, creativity, and imagination. We also consider the time spent at your service, some of whose mentorship has left us indelible marks throughout this journey of our academic as well as personal growth.

Finally, we would like to humbly dedicate this acknowledgment to the **farmers of Pakistan**, whose struggles and resilience moved us deeply. You are the unsung heroes, feeding the nation with your tireless efforts. This project is our small tribute to you, with the hope that it brings even a fraction of the care and dedication you pour into the land.

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

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**Abstract**

Rice being the second significant crop is the backbone of the economy in Pakistan, and diseases destroy the rice, which annually causes huge losses for farmers. Rice growing in Pakistan faces the same problems regarding the control of diseases year after year, as different diseases infect the rice at any stage. The conventional detection methodologies include either a manual inspection carried out by an agricultural officer or a laboratory test. All these techniques are time-consuming, costly, and full of human errors, thus delaying timely interventions. Moreover, the lack of available technological tools leaves farmers with no reliable solutions for protecting their crops, especially those living in rural areas.

The following work, therefore, Paddy Disease Monitor, tries to address the issues by proposing an AI-enabled mobile application that revolutionizes rice disease detection and management.

It uses state-of-the-art deep learning models to enable farmers to diagnose diseases from images of paddy leaves with remarkable accuracy. The user-friendly interface of the app allows uploading photos of affected crops, providing instant feedback on the diagnosis and actionable treatment recommendations. This innovative solution greatly reduces dependency on traditional methods by offering an efficient, cost-effective alternative that is easily accessible. This involves collecting a diverse dataset of rice plant images, training models for optimal classification accuracy, and integrating the models into a mobile application. Rigorous testing is performed to ensure reliability under a variety of conditions, thus making the solution robust and practical for real-world usage. The Paddy Disease Monitor equips farmers with how they can minimize economic losses, as well as improve productivity, hence economically and socially contributing to most agricultural communities through this innovative tool.

This project addresses one of the current problems in agriculture and paves the way for future technological improvements of AI-driven farming technologies for sustaining and making agriculture more resilient.

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# Abstract

Rice is the backbone of the agricultural economy of Pakistan and, like other agricultural crops, its production is vulnerable to various diseases that reduce yield and hence cause economic loss to the farmers. All the traditional methods of disease detection involve manual inspection and/or laboratory testing, which is inefficient, error-prone, and beyond the reach of many rural farmers. Following that, the Paddy Disease Monitor proposes a mobile application powered by AI for the efficient and effective detection and diagnosis of rice diseases. It will be powered with deep learning models trained on diverse datasets of images of rice plants for instant feedback on crop health and actionable treatment recommendations via a user-friendly interface.

The project involves collecting data, in-depth pre-processing of the dataset, advanced machine learning model training, and embedding those models into the mobile platform. The results prove this approach will increase the overall speed and accuracy of detection of diseases compared to traditional methods. It provides farmers with timely, actionable information to reduce crop loss and increase productivity. The Paddy Disease Monitor thus addresses not only the very immediate challenges faced by rice farmers but also contributes to pushing the boundaries of technological innovation in agriculture toward smarter and more sustainable forms of farming.

# Introduction

**Overview of the Problem**

Agriculture is the backbone of the economy, contributing a sizeable share to the GDP and addressing the food requirements of the people. Rice is one of the important crops grown in Pakistan and is the second more important staple, feeding millions and catering to the export requirements of a country. However, rice farmers face challenges in maintaining crop health due to the prevalence of diseases that threaten yields and livelihoods. The timely detection and diagnosis of these diseases remain a critical problem. Traditional methods of disease identification rely heavily on either manual inspections or laboratory tests; both are time-consuming, expensive, and prone to human error. The inefficiencies lead to delayed interventions, which cause crop quality reduction with significant economic loss.  
  
**Background**

In Pakistan, the absence of sophisticated technological solutions and awareness at the rural farmer level is further deteriorating the disease management situation. Farmers usually depend on their limited expertise or external agricultural officers for identification, which is neither scalable nor accurate. Since rice plays a staple role in the economy and also supplying food to the nation, we need a remedy that, when given to farmers, can expedite the process quickly and can pinpoint the diseases with precisions, just so that on this account farmers may take quicker action on their self-help. With advancements in various fronts of artificial intelligence and more particularly in deep learning-based applications, newer ways have presented themselves for revolutionizing mana­gement of diseases under rice husbandry.

## Goals and Objectives

**Goals**

Basically, this project would be focused on developing a technological aid to enhance the detection and diagnosis skills among crop ailments for rice farmers in the most appropriate, effective, and financially viable means. The AI-powered deep learning-based work aspires to empower farmers with actionable inputs that would help minimize their crop loss and improve productivity, ultimately elevating living standards.

**Objectives**

1. **Create a user-friendly mobile application**: Design an intuitive mobile application interface that will allow farmers to share paddy leaf images with our system for instant disease analysis and diagnosis.
2. **Train deep learning models using disease detection:** Build and optimize AI models that can classify multiple rice diseases with high precision and reliability.
3. **Provide actionable treatment recommendations:** Include verified disease treatment suggestions in the app by experts to help farmers undertake effective crop management.
4. **Ensure that real-time performance**: The application should ensure it's optimized to quickly detect the disease for effective feedback that can enable farmers to take necessary actions on time. Test and verify under real-life circumstances: Assess the accuracy and usability of this application under global diverse farming conditions to ensure its praxis and effectiveness.

## Scope of the Project

The scope of the project involves the development of an AI-powered mobile application to assist rice farmers in early detection and diagnosis of common paddy diseases. Paddy Disease Monitor will make use of advanced deep learning models for accurate real-time disease identification and treatment recommendations based on images of rice leaves uploaded by users.

The key aspects involved in the project include:

1. **Dataset Collection and Preparation**: A wide selection of rice plant image data considering both healthy and diseased information would be collected from openly existing resources and research publications. Preprocess the dataset to uniform it by cleaning, resizing, and augmenting the images for better model robustness.
2. **Development and Training of AI Models**: Train deep learning models that can classify different kinds of paddy diseases like Bacterial Leaf Blight, Brown Spot, and Leaf Blast. Assess various architectures to identify the model with the best performance, taking accuracy and efficiency into consideration.
3. **Mobile Application Development:** Design and implement a mobile app interface that is user-friendly, considering the farmers, most of whom have limited technological literacy. Incorporate the trained AI model in this application for smooth real-time disease detection.
4. **Testing and Validation**: Perform extensive testing on the app for functionality, usability, and performance in various environments with different image qualities.
5. **Treatment Recommendations**: Provide disease-specific treatment recommendations that are expert-verified to help farmers take the best course of action. Future Expansion Potential Lay the foundation such that in the future, the app is able to detect other crops' diseases and also include some predictive analytics to estimate the yield by incorporating future versions.

# Literature Review

**For each related work provide a paragraph of introduction and in the end a paragraph of conclusions.** Give a page break after the chapter ends. **This chapter is mandatory.**

For development projects describe related or similar work done by other teams and details of their methods/algorithms. For a research project a detailed literature survey is expected.

## Introduction

## Background and Problem Elaboration

## Detailed Literature Review

### Definitions

### Related Research Work 1

### Related Research Work 2

## Literature Review Summary Table

The columns in the table depend upon your problem and should be specific to your project.

Table 1: History of Computing Devices

The summary of various computing devices invented in the past from 1833-1901 is presented here.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| No. | Name, reference | Inventor | Year | Input | Output | Description |
| 1. | Analytical Engine, [1] | Charles Babbage | 1833 | Punch cards | Printer, curve plotter, bell | First general purpose computer that had an arithmetical logic unit and could compute using conditional branching and loops. Also incorporated integrated memory. |

## Research Gap

## Problem Statement

# Requirements and Design

Describe all modules of requirements and design in clear English text along with the necessary diagram and figures. Anyone reading your report should be able to reproduce your system/results after reading it.

**For each chapter provide a paragraph of introduction and in the end a paragraph of conclusions.** Make sure no heading/subheading is blank. Write text to introduce each section as well.

Introduce sub-heading as:

## Requirements

### Functional Requirements

### Non-Functional Requirements

### Hardware and Software Requirements

## Proposed Methodology

## System Architecture

## Use Cases

### Sample Use Case Name Here

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name | | Sample Use Case Name Here | | |
| Actors | | Admin, Business Owner, Store Manager | | |
| Summary | | The user shall provide their email and password on the login form and after successful verification, redirect the user to the home page. | | |
| Pre-Conditions | | The user must be in the database records either added by any of the authorized users or added manually by a developer.  The user must not already be logged in. | | |
| Post-Conditions | | The user’s session is successfully established and shall be redirected to the home page. | | |
| Special Requirements | | None | | |
| Basic Flow | | | | |
| Actor Action | | | **System Response** | |
| 1 | The user opens the login page. | | 2 | The login page is displayed asking for email and password. |
| 3 | The user enters valid email and password. | | 4 | The system verifies the email and password, establishes a session for the user and redirects the user to the home page. |
| **Alternative Flow** | | | | |
| 3 | The user enters invalid email or password. | | 4-A | The system responds with an error message: *Incorrect email or password entered.* |

## Database Design *(Optional)*

## Class Diagram (*Optional)*

## Sequence diagram *(Optional)*

## Any Other Artifact…

## GUI Graphical User Interfaces (*Optional)*

This section should give the GUI dumps of each screen, with reference to the user. The navigation flow of each user is also required, and each GUI should mark the functionality/use case that it covers.

# Implementation and Test Cases

**For each chapter provide a paragraph of introduction and in the end a paragraph of conclusions.**

## Implementation

Whatever implementation that you have done so far, please elaborate here.

Give clear details of the algorithms that were implemented along with the platform and the APIs which were used. **For FYP-1, this chapter can be changed to description of prototype developed.**

### Implementation of First Component/Algorithm

Write implementation of first component of your system here.

## **Test case Design and description**

**This section will be added in FYP-II.** Summarize the common attributes of test cases. This may include input constraints that must be true for every input in the set of associated test cases, any shared environmental needs, any shared special procedural requirements, and any shared case dependencies. The following scheme is recommended for describing test cases in detail.

### Sample Test case No.1

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **<Software component Name>** | | | | | |
| **<Reference>** | | | | | |
| Test Case ID: | | *Reference Number* | Test Date: | | *Date* |
| Test case Version: | | *Version number* | Use Case Reference(s): | | *Relation to use cases* |
| Revision History: | | *Refer to previous test case identity (if any)* | | | |
| Objective | | *Need and scope of the testing* | | | |
| Product/Ver/Module: | | *Refer to overall system being built and the place of this test case in it.* | | | |
| Environment: | | *Necessary and desired properties of the test environment. (hardware/software)* | | | |
| Assumptions: | | *Assumptions that might affect the testing process.* | | | |
| Pre-Requisite: | | *Necessary condition that needs to be fulfilled prior to the test case.* | | | |
| Step No. | Execution description | | | Procedure result | |
|  | *Events being tested.* | | | *Mention software response.* | |
| Comments: | | | | | |
| *Passed* *Failed* *Not Executed* | | | | | |

### Sample Test case No.2

.

.

.

## Test Metrics

Summarize here the common ground of attributes of test case metrics.

### Sample Test case Matric.No.1

|  |  |
| --- | --- |
| Metric: | Purpose |
| Number of Test Cases: | Total number of test cases that you have developed for your system. |
| Number of Test Cases Passed: | The number of test cases that successfully passed |
| Number of Test Cases Failed: | The number of test cases that failed |
| Test Case Defect Density: | (No of test cases failed \* 100)  No of test cases executed |
| Test Case Effectiveness: | No of defects detected using test cases \*100  Total number of defects detected |
| Traceability Matrix: | Traceability is the ability to determine that each feature has a source in requirements and each requirement has a corresponding implemented feature. |

### Sample Test case Metric.No.2

### Sample Test case Metric.No.3

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# Experimental Results and Analysis

**This chapter will be added in FYP-II.** Give proper analysis and discussion of experimental results (in plain English text) along with tables of results. **For each chapter provide a paragraph of introduction and in the end a paragraph of conclusions.**

# Conclusion and Future Directions

**This chapter is mandatory.** Give conclusions and summary of the work done. What were your findings and what were the results? Discuss in detail whether the scope of your project was entirely covered or not and whether the objectives of the project were met or not. What challenges did you face and what has been left out and why?

Sum up all the conclusions of all the chapters here to make a conclusion chapter. Do not repeat any text, just summarize it in different words.

Give recommendations for future work also. How your project can be further enhanced or improved? Future recommendations if someone wants to work on it. **For FYP-1 it is mandatory to list down a plan of the work to be done for FYP-2.**

# References

List all important sources of information which have been consulted for this project

# Appendix

## Appendix A: Guidelines

This section should include all supporting information from the project that was not included in the body of the report.  You should include surveys, complex statistical calculations, certain detailed tables and other such information in an appendix.  The information presented in this section is important to support the work presented in the body of the report but would make it more difficult to read and understand if presented within the body of the report.

Cite the appendix items in the report narrative (write "see Appendix A") and organize appendices (e.g., Appendix A, Appendix B,

Any tables, figures, forms, or other materials that are not totally central to the analysis but that need to be included are placed in the Appendix.

## Appendix B: Heading of Sample Appendix B

Following is a sample code with “code” style format.

Void SampleFunction(){

Print “Hello World.”;

}

# Formatting Guidelines

This document also serves as style guide for final year project reports. In order to give a similar high-quality appearance to all final year software project reports this template uses a collection of predefined Microsoft Word formatting styles. **These styles should be used without modification or replacement.** Font in the document is ***“Time New Roman”.*** This template provides following styles:

* **Title** – the main title style
* **Title2** – the subtitle style
* **Body Text** – style for paragraphs
* **Caption** – the style for a figure or table caption
* **Table Description** – the style for description of table, it must be added after caption.
* **Figure Description** - the style for description of figure, it must be added after caption.
* **Code** – the style for program source code

**int x** = 10; // Writing important code

* **Table Header Row** – Style for the header row of table
* **Table Grid** – the style for the data rows in the tables
* **Reference** – The style for references
* **Bullets** – The style for the bullet lists
* **Numbered** **List**– Style for numbered lists

All Heading styles with different level numbers are listed below.

# Heading 1

## Heading 2

### Heading 3

#### Heading 4

##### Heading 5

###### Heading 6

Heading 7

Heading 8

Heading 9

## Tables and Figures

Tables and figures should be centered horizontally. The caption button should be used to insert caption for both the figures and tables. All figures and tables must be numbered properly. Always refer to tables and figures according to their numbers. A table or figure can be cited as follows: ‘see Table1’ or ‘as shown in Table1’. The caption of table should be centered above the table and figure caption should be centered below the figure. Place the tables/figures close to their reference. Use “Table Header Row” and ‘Table Grid’ style for table’s header and data rows respectively. It is compulsory to provide brief description of table/figure after its caption. Styles for table and figure descriptions are “Table Description” and “Figure Description” respectively.

Press Ctrl+Shift+S to see list of styles mentioned above. Figure 1 shows the Apply Style window displaying the list of styles. Select any text then press Ctrl+Shift+S, the Apply Style window will show you the current style applied on that text and if required, you can change the style by selecting any other style from the “Style Name” dropdown.

This is brief description of above figure.

Figure 1: List of Styles

Table 1: This is Sample table caption

This is brief description of following Table.

|  |  |  |  |
| --- | --- | --- | --- |
| Header row | Header row | Header row | Header row |
| Row1 col1 | Row1 col2 | Row1 col3 | Row1 col4 |
| Row2 col1 | Row2 col2 | Row2 col3 | Row2 col4 |

Table 2: This is Sample table caption

This is brief description of following Table.

|  |  |  |  |
| --- | --- | --- | --- |
| Header row | Header row | Header row | Header row |
| Row1 col1 | Row1 col2 | Row1 col3 | Row1 col4 |
| Row2 col1 | Row2 col2 | Row2 col3 | Row2 col4 |

## Equations

Use equation editor to write equations in this report. Use last button of the custom tool bar to invoke equation editor. Similar to tables and figures, equations should also be aligned centered horizontally. Number all equations and insert them in parenthesis. Below is a sample equation and its reference number. An equation can be referenced like this: ‘it is clear from (1)’.

 (1)

## Header/Footer

Notice the headers in this document, before Introduction (i.e. the main content of this document) page numbers are in roman numerals. The page numbers of the actual content start with Arabic numerals i.e. 1, 2, 3 and so on. All of the **odd numbered pages** contain title of your project while the **even numbered pages** contain the section heading (i.e. chapter’s name) in the headers.

## Other Formatting Guidelines

* Keep 2-4 GUIs in one page. Consume as much space as possible. Do not leave most of page blank unnecessarily.
* Do not break tables (or use cases) in multiple pages unless the table is too large to fit in one page.
* Re-arrange the content i.e., text, images, and tables properly to meet above two guidelines.

## References

Always refer to the source of information by inserting the reference number in square brackets like this [5]. The reference numbers can either be added at the end of the sentence or within the sentence without changing the punctuation of sentence. A reference can also be cited as follows: ‘as Ruskey [2] mentioned’. List each source only once on your reference page.



Figure 2: IEEE Reference style

This figure represents the styling information for adding references in IEEE format

**Following is a list of sample reference for various typed of sources in IEEE format.**

1. P.M. Morse and H. Feshback, *Methods* of *Theoretical Physics*. New York: McGraw Hill, 1953. **//Format for Book**
2. S.K. Kenue and J.F. Greenleaf, “Limited angle multifrequency diffiaction tomography,” *IEEE Trans. Sonics Ultrason*., vol. SU-29, no. 6, pp. 213-2 17, July 1982. **//Format for Journal Article**
3. B. Tsikos, “Segmentation of 3-D scenes using multi-modal interaction between machine vision and programmable mechanical scene manipulation,” Ph.D. dissertation, Univ. of Pennsylvania, BCE Dept., Philadelphia, 1987. [Add if applicable: University Microfilms, Inc., University of Michigan, Ann Arbor, Michigan.] **//Format for Dissertation or thesis**
4. R. Finkel, R. Taylor, R. Bolles, R. Paul, and J. Feldman, “An overview of AL, programming system for automation,” in *Proc. Fourth Int. Joint Conf Artif. Intell*., pp. 758-765, Sept. 3-7, 1975. **//Format for Proceedings paper**
5. “Technology threatens to shatter the world of college textbooks, *The Wall Street Journal*, vol 91, pp. Al, A8, June 1, 1993. **//Format for Newspaper article**
6. R. Cox and J. S. Turner, “Project Zeus: design of a broadband network and its application on a university campus,” Washington Univ., Dept. of Comp. Sci., Technical Report WUCS-91-45, July 30, 1991. **//Format for Technical Report**
7. M. Janzen, *Instant Access Accounting*. Computer software. Nexus Software, Inc IBM-PC, 1993. **//Format for** **Software**
8. Fuminao Okumura and Hajime Takagi, “Maglev Guideway On the Yamanashi Test Line,” *http://www.rtri.or.jp/rd/maglev2/okumura.html*, October 24, 1998. **//Format for** **World Wide Web** (give author and title if named)
9. “AT&T Supplies First CDMA Cellular System in Indonesia,” http://www.att.com/press/1095/951011.nsa.html, Feb 5, 1996. **//Format for World Wide Web**