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**COMSATS University Islamabad (CUI) Attock Campus**

Software Requirement Specification  
(SRS DOCUMENT)

For

Drone-based Wheat Crop Disease Detection and Monitoring

Version 1.0

***By***

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Revision History

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Application Evaluation History

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# Abstract

This project aims to develop a web application for crop monitoring using drone footage and data science techniques. The application will focus on detecting and analyzing three major wheat diseases: rust, Fusarium head blight (FHB), and powdery mildew. The application will allow users to upload drone footage, and through the use of machine learning models and data visualization techniques, provide a comprehensive analysis of crop health. The application will be developed using Python and various libraries such as OpenCV, TensorFlow, and Flask. The project will provide an efficient and cost-effective solution for crop monitoring and disease detection, helping farmers increase their crop yield and profits.

# Introduction

The Wheat Disease Detection and Monitoring System is a project that leverages the capabilities of drones and data science to detect and monitor diseases in wheat crops. The system utilizes aerial imagery captured by drones and applies data science techniques such as computer vision and machine learning to identify and classify different types of diseases. This project aims to provide farmers with an efficient and accurate tool for detecting and monitoring crop diseases, allowing them to take timely and appropriate actions to protect their crops and maximize yields.

## Purpose

The purpose of the project is to provide accurate and timely information about wheat crop health, identify disease outbreaks, and help farmers take proactive measures to protect their crops. The system will also provide real-time data to farmers and agricultural researchers, enabling them to make informed decisions and improve crop yields.

## Scope

The scope of a project on wheat disease detection and monitoring system using drone and data science can be quite broad, but some of the main aspects to consider are:

Identification of wheat diseases, Drone-based data collection, Image processing and data analysis, Data visualization and reporting, Integration with existing systems.

Overall, the scope of the project would involve designing, building, and testing a complete system for wheat disease detection and monitoring using drones and data science, with a focus on accuracy, reliability, and practicality for use in real-world agricultural settings.

## Modules

The project "Wheat Disease Detection and Monitoring System Using Drone and Data Science" involves the use of drones and data science to detect and monitor diseases in wheat crops. The following are the modules of the project:

Drone-based Data Acquisition, Data Preprocessing, Disease Detection, Disease Mapping, Disease Monitoring, Reporting and Visualization

Overall, the project aims to use drone-based data acquisition and data science techniques to improve the detection and monitoring of diseases in wheat crops. This will help farmers to take timely and effective measures to control the spread of the disease and improve their crop yield.

## Overview

The project aims is to develop a software application that provides farmers with real-time information on the health of their wheat crops. The application will utilize publicly available drone footage datasets of wheat crops infected with different diseases such as stem rust, Fusarium head blight (FHB), and powdery mildew. The application will enable farmers to identify and monitor disease outbreaks and take preventive measures to protect their crops. The application will provide farmers with an easy-to-use interface and detailed and interactive visualizations of the data.

# Overall Description

Overall, building a project that uses drones footages and data science to identify and track wheat diseases in real-time. The drones are equipped with high-resolution cameras that capture images of the wheat fields, which are then processed using computer vision algorithms to detect any signs of disease. The system can provide farmers with early warnings of disease outbreaks and help them take appropriate measures to prevent crop losses.

## Product Perspective

The context of this project is a technological solution designed to identify and track potential diseases in wheat crops. As time passed the things are getting modernize and different came up for different use so this system provides farmers with real-time data on the health of their crops, allowing for timely intervention and increased yields. Overall, the system aims to improve crop management, reduce losses due to disease, and increase food security.

## User classes and characteristics

The project would have various user classes, including:

Farmers: The system would benefit farmers by enabling them to detect diseases in their crops earlier, thus improving their yield and profitability.

Agronomists: Agronomists could use the system to monitor crop health and provide targeted recommendations for fertilization, pesticide application, and other interventions.

Researchers: Researchers could use the system to collect large amounts of data on wheat diseases, which could be used to develop more effective treatments and preventive measures.

Data scientists: Data scientists would be responsible for analyzing the data collected by the system to develop algorithms for detecting and predicting wheat diseases.

However, they will all share a common goal of improving their products and services based on working of the software.

## Operating Environment

The web application will be hosted on a web server and can be accessed through a web browser. The application will be compatible with modern web browsers such as Google Chrome, Firefox, and Safari

## Design and Implementation Constraints

The main constraint for the application is the availability and quality of drone footage and data sets. The application's accuracy and performance will depend on the quality of the data sets used to train and test the machine learning models. Another constraint is the computational resources required to process the drone footage and run the machine learning algorithms. The application should be designed to optimize resource utilization and minimize processing time.

# Requirement Identifying Technique

The requirement identifying technique for this project can be the following:

1. Interviews: Conducting interviews with potential users of the application to gather their requirements and expectations.
2. Surveys: Creating a survey to be filled out by potential users to identify their needs and requirements.
3. Use cases: Identifying use cases for the application to determine its functionality and features.
4. Prototyping: Creating a prototype of the application to gather feedback from users and identify any necessary changes.
5. Brainstorming: Brainstorming sessions with project team members and stakeholders to identify requirements and features.
6. Research: Conducting research to identify industry standards and best practices for similar applications.

For instance,

# Functional Requirements

Functional requirements describe the specific features and functionality that the system must provide in order to meet the needs of its users. For a drone-based crop monitoring web application, some possible functional requirements are:

1. User registration and login: Users should be able to register for an account and log in to access the system.
2. Image upload: Users should be able to upload drone images of their crops for analysis.
3. Disease detection: The system should be able to detect diseases in the crops from the uploaded images and provide information about the type of disease, its severity, and its location in the field.
4. Data visualization: The system should be able to provide data visualizations of the detected diseases in the form of charts, graphs, and maps.
5. Notification system: The system should be able to send notifications to users when a disease is detected in their crops.
6. Data management: The system should be able to store and manage the uploaded images and their analysis results.
7. Reporting: The system should be able to generate reports summarizing the analysis results for the user.

## Functional Requirement X

Fusarium head blight (FHB) detection,

Powdery mildew detection,

3D Visualization,

Crop yield prediction,

These are just a few examples of the functional requirements that could be included in a drone-based crop monitoring web application. The specific requirements will depend on the needs and goals of the users and stakeholders, as well as the available technology and resources.

# Non-Functional Requirements

The system shall be user-friendly and easy to use for individuals and organizations without a background in machine learning or NLP. The system shall be scalable to handle a large volume of reviews and users. The system shall be secure and protect user data and information from unauthorized access. The system shall be compatible with a variety of e-commerce websites and APIs.

## Reliability

The web application should be available to users 24/7 with minimal downtime, and should be able to handle a large number of concurrent users.

## Usability

The web application should have an intuitive and easy-to-use interface, with clear instructions and feedback for users.

## Performance

The web application should be able to process and display data in real-time, with minimal latency and delays. It should also be able to handle large datasets efficiently.

## Security

# The web application should have robust security measures in place to protect against data breaches and unauthorized access. This includes data encryption, secure authentication and authorization mechanisms, and regular security audits.