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

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Software Requirement Specification  
(SRS DOCUMENT)

For

Wheat Disease Detection and Monitoring

Version 1.0

***By***

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Revision History

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| **Name** | **Date** | **Reason for Changes** | **Version** |
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Application Evaluation History

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| **Comments (by committee)** | **Action Taken** |
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# Abstract

This project aims to develop a web application for wheat crop monitoring using picture of wheat leaf and data science techniques. The application will focus on detecting and analyzing two major wheat diseases: stripe rust and septoria . Currently, the wheat disease mentioned above is a major headache not only for farmers but also for plant pathologists. The application will allow users to upload picture of wheat leaf 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

Agriculture is the backbone of many economies around the world, and wheat is one of the most important cereal crops. The occurrence of various diseases on wheat plants can cause significant losses in yield and quality. The detection and management of these diseases at an early stage is critical for minimizing these losses. Therefore, this project aims to develop a system that can detect the presence of common wheat leaf diseases and suggest the nearest medicine store for the farmers to purchase the necessary medicines.

## Purpose

The purpose of this project is to develop a web application that can accurately identify the presence of wheat leaf diseases using an image dataset available on Kaggle. Additionally, the system will suggest the nearest medicine store for farmers to purchase the necessary medicines for treating the disease.

## Scope

The scope of a project on wheat disease detection and monitoring system:

* Identification of wheat diseases, Image base data collection, Image processing and data analysis, Data visualization and reporting, Integration with existing systems.
* Suggest the nearest medicine store for the farmers to purchase the necessary medicines.
* Overall, the scope of the project would involve designing, building, and testing a complete system for wheat disease detection and monitoring using computer vision and machine learning , with a focus on accuracy, reliability, and practicality for use in real-world agricultural settings and providing nearest medical store location.

## Modules

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

Image Data Acquisition, Data Preprocessing, Disease Detection, Disease Mapping, Disease Monitoring, Reporting and Visualization.

Nearest Medicine Store Suggestion Module for nearest medicine store to the farmer based on their location.

User Interface Module will provide a user-friendly interface for farmers to upload images and view the results of the disease detection.

Overall, the project aims to use image-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 imagery datasets of wheat crops infected with different diseases such as stripe rust, septora. The application will enable farmers to identify and monitor disease outbreaks and take preventive measures to protect their crops. The system will suggest the nearest medicine store for the farmer to purchase the necessary medicines. The system will be implemented as a web application accessible through any device with an internet connection. 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 footages and data science to identify and track wheat diseases in real-time. The cameras that capture images of the wheat leafs, 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 system will be a standalone web application that can be accessed by farmers to detect wheat leaf diseases and suggest the nearest medicine store for purchasing the necessary medicines. Allowing for timely intervention and increased quantity and quality yields. Overall, the system aims to improve crop management, reduce losses due to disease, and increase food security by ensuring less educated farmers to use technology easily.

## User classes and characteristics

The project would have various user classes, including:

* **Farmers**: The primary users of the system will be farmers who want to detect wheat leaf diseases and purchase the necessary medicines to treat them. These users may not have advanced technical knowledge, so the system should be easy to use and navigate , thus improving their quality and quantity 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 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 images and run the machine learning algorithms. The application should be designed to optimize resource utilization and minimize processing time

## Usage of physical mean:

In this project, drones can be used to capture high-resolution images of wheat fields, which can then be analyzed to detect and monitor the spread of diseases in the crop, enabling them to make informed decisions about disease management strategies and ultimately improving crop yield.

# Functional Requirements

* **User registration and login**: Users should be able to register for an account and log in to access the system easily only by providing basic information only.
* **Image upload**: Users should be able to upload images of their crops for analysis.
* **Disease detection**: The system should be able to detect diseases in the crops from the uploaded images and provide information about type of disease, its severity.
* **Data visualization**: The system should be able to provide data visualizations (analytics) of the detected diseases in the form of charts, graphs. The system shall be able to provide the farmer with a map displaying the route to the suggested medicine store from their current location.
* **Notification system**: The system shall be able to send email notifications to the farmer when new disease classification or medicine store suggestion data is available.
* **Data management**: The system should be able to store and manage the uploaded images and their analysis results.
* **Reporting**: The system should be able to generate reports summarizing the analysis results for the user and provide precautionary measures to tackle the disease.

For a Image-based crop monitoring web application, some possible functional requirements are:

## Functional Requirement

* Stripe Rust
* Septora
* Data Visualization
* Suggest Precautions

# Non-Functional Requirements

The system shall be user-friendly and easy to use for individuals(farmers) 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, social media platform 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.

# Supervisor:

## Mr. Waseem Khan

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