



FINAL YEAR PROJECT REPORT

**LEAFINSIGHT: A SMART DETECTION OF
VEGETABLE DISEASES
USING DEEP VISION**

**In fulfillment of the requirement
For degree of
BS (COMPUTER SCIENCES)**

By

**ABDUL SAMAD
SHALAL BAKHTIAR
ANAS AHMED QURESHI**

**78982 (BSCS)
79904 (BSCS)
79245 (BSCS)**

SUPERVISED

BY

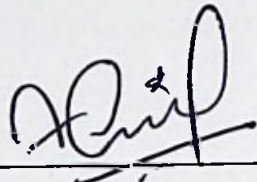
MS. FATIMA BASHEER

BAHRIA UNIVERSITY (KARACHI CAMPUS)

SPRING-2025

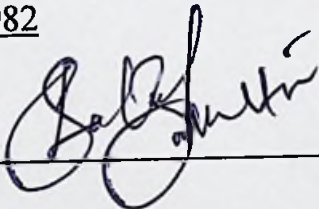
DECLARATION

We hereby declare that this project report is based on our original work except for citations and quotations which have been duly acknowledged. We also declare that it has not been previously and concurrently submitted for any other degree or award at Bahria University or other institutions.

Signature: _____

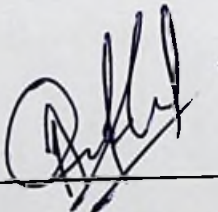
Name : Abdul Samad

Reg No. : 78982

Signature: _____

Name : Shalal Bakhtiar

Reg No. : 79904

Signature: _____

Name : Anas Ahmed Qureshi

Reg No. : 79245

Date : 26/05/25_____

APPROVAL FOR SUBMISSION

We certify that this project report entitled **"LEAFINSIGHT: A SMART DETECTION OF VEGETABLE DISEASES USING DEEP VISION"** was prepared by **ABDUL SAMAD, SHALAL BAKHTIAR, ANAS AHMED QURESHI** has met the required standard for submission in partial fulfilment of the requirements for the award of **Bachelor of Sciences in Computer Science** at Bahria University.

Approved by,

Signature :

Supervisor: Fatima Bashir

Date :

The copyright of this report belongs to Bahria University according to the Intellectual Property Policy of Bahria University BUORIC-P15 amended on April 2019. Due acknowledgement shall always be made of the use of any material contained in, or derived from, this report.

© 2019 Bahria University. All right reserved.

LEAFINSIGHT: A SMART DETECTION OF VEGETABLE DISEASES USING DEEP VISION

ABSTRACT

In the modern agricultural world, early detection of plant diseases is critical for growing healthy crop and reducing losses. Old and traditional methods to identify a plant disease are often time consuming and requires a expert knowledge, which makes them less accessible to regular farmers and people. This project focuses on the development of a mobile based disease detection system that uses an advanced deep vision techniques to accurately identify diseases in vegetable plants very specifically Potato, Tomato, and Bell Pepper (*Capsicum*) crops. This system focuses on key leaf diseases, including Late Blight and Early Blight of Potatoes, Tomato Mosaic Virus of Tomatoes, and Bacterial Spot of Bell Peppers. We studied various Convolutional Neural Network (CNN) architectures, like MobileNetV2, VGG16, ResNet50, EfficientNetB0, and InceptionV2 to select model that is suitable for our project and gain good knowledge about the overall model accuracy, efficiency, and behaviour. This deep analysis significantly contributed to our understanding of machine learning and deep vision techniques. Based on our findings, we used MobileNetV2 model which is suitable for mobile application. Our model achieved an accuracy of 95.5%. This allows plant disease detection from many different Environmental conditions. This model communicates with the custom mobile application we developed through fastAPI, which allows users to scan plant leaves for diseases using their smartphone cameras. The mobile app, along with the FastAPI based backend, is deployed on a cloud service to make sure smooth, reliable, and efficient system performance.

TABLE OF CONTENTS

DECLARATION	ii
APPROVAL FOR SUBMISSION	iii
ABSTRACT	v
TABLE OF CONTENTS	vi
LIST OF TABLES	ix
LIST OF FIGURES	xi
LIST OF SYMBOLS / ABBREVIATIONS	xiii
LIST OF APPENDICES	xv

CHAPTER

1	INTRODUCTION	1
	1.1 Background	1
	1.2 Problem Statements	1
	1.3 Objectives	1
	1.4 Project Scope	2
2	LITERATURE REVIEW	3
	2.1 BACKGROUND	3
	2.2 RELATED WORK	4
	2.3 CHAPTER SUMMARY	13
3	REQUIREMENT SPECIFICATIONS	15
	3.1 FUNCTIONAL REQUIREMENTS	15
	3.1.1 Scanning Plant Leaves:	15
	3.1.2 Disease Detection:	15

3.1.3	History of Scans:	15
3.1.4	Notifications:	16
3.1.5	API Integration:	16
3.1.6	User Interface (UI):	16
3.2	NON-FUNCTIONAL REQUIREMENTS	16
3.2.1	Performance:	16
3.2.2	Scalability:	16
3.2.3	Reliability:	16
3.2.4	Compatibility:	17
3.2.5	Security:	17
3.2.6	Data Privacy:	17
3.2.7	Offline Functionality:	17
4	DESIGN AND METHODOLOGY	18
4.1	PROPOSED METHODOLOGY	18
4.1.1	Convolutional Neural Network	19
4.1.2	CNN Evaluation	19
4.1.3	MobileNetV2 Architecture	20
4.1.4	MobileNetV2 Results	21
4.2	Framework	24
4.3	Mobile application	24
4.4	PROCESS MODEL (Prototyping Iterative Model/ Hybrid model)	28
4.4.1	Iteration 1: Foundation Phase:	28
4.4.2	Iteration 2: Building the Core System	29
4.4.3	Iteration 3: Enhancing Precision and Usability	29
4.4.4	Iteration 4: Optimization and Deployment	30
4.5	MODULES DISCUSSION	32
4.5.1	Module 01: Data Acquisition Cleaning, Augmentation and Preprocessing	32
4.5.2	Module 02: Model Building and Training	34
4.5.3	Module 03: Mobile Application	36
4.5.4	Module 04:FastAPI	37

	4.5.5	Module 05: Cloud Function	37
	4.5.6	Module 07: Final Integration and Project Completion	38
5		SYSTEM IMPLEMENTATION	39
	5.1	Introduction	39
	5.2	Frontend Implementation (Mobile Application)	39
	5.2.1	Core Technologies Used	39
	5.3	Backend Implementation:	40
	5.3.1	Strapi CMS Backend:	40
	5.3.2	FastAPI Backend for Plant Disease Detection:	40
	5.4	API Integration	41
	5.5	Database Management	42
	5.5.1	Database Features	42
	5.6	Server-Side Deployment	42
	5.6.1	VPS Deployment Stack	42
	5.6.2	Deployment Strategy	42
	5.7	System Architecture Overview	42
	5.8	Screenshots of Mobile app Results	44
	5.9	Chapter Summary	44
6		SYSTEM TESTING AND EVALUATION	45
	6.1	Test Cases	45
	6.2	Testing of images and their results	49
	6.3	Summary	56
	6.3.1	Bell Pepper	56
	6.3.2	Potato:	56
	6.3.3	Tomato:	56
	6.3.4	Unknown Inputs:	56
7		CONCLUSION AND FUTURE PLAN	57
	7.1	Conclusion	57
	7.2	Future	58

7.2.1	Feature Enhancements	58
7.2.2	Backend Improvements	58
7.2.3	Machine Learning Model Enhancements	59
7.2.4	Custom Hardware and Soil-specific Systems	59
7.2.5	Security and Compliance	60
7.2.6	Deployment and Scaling	60
7.3	Final Thoughts	60
REFERENCES		61
APPENDICES		63