Industrial Internship Report on

”Crop and weed detection”

Prepared by

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Executive Summary
This report provides details of the Industrial Internship provided by upskill Campus and The IoT Academy in collaboration with Industrial Partner UniConverge Technologies Pvt Ltd (UCT). This internship was focused on a project/problem statement provided by UCT. We had to finish the project including the report in 6 weeks’ time. My project was (Tell about ur Project) This internship gave me a very good opportunity to get exposure to Industrial problems and design/implement solution for that. It was an overall great experience to have this internship.

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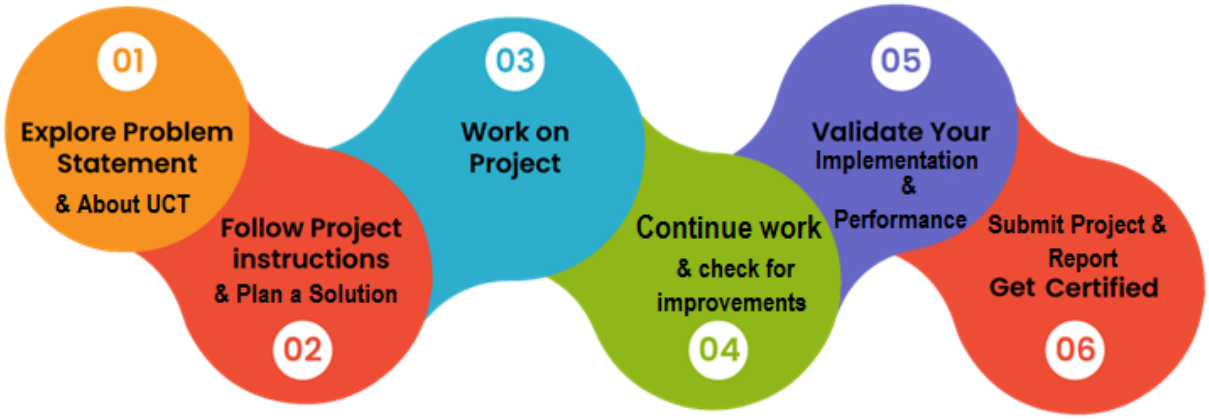
1 Preface

I embarked on the “Crop and Weed Detection” project by first analyzing the dataset, which posed a challenge as it was provided in YOLO format. After overcoming that hurdle, I trained a CNN model to effectively distinguish between crops and weeds, successfully extracting relevant features from the image dataset. Ultimately, my trained model demonstrated strong accuracy in classifying the test images.

This internship not only contributed to my personal growth but also helped me identify my strengths and areas for improvement. Internships play a crucial role in one's career development.

My project aimed to create a system that selectively sprays pesticides on weeds, avoiding crops, which minimizes pesticide contamination and reduces waste. I am grateful for the opportunity provided by Uni-Convergence-Technology Ltd. (UCT/USC), which allowed me to develop my skills fully and complete my tasks successfully. The program was meticulously planned and executed.



This internship greatly enhanced my learning and contributed to my professional and personal growth. I became more proficient in my field of study—Data Science and Machine Learning. I want to express my gratitude to all my co-mentors and the internship organizers for providing me with this valuable opportunity to refine my skills and support my career development.

2 Introduction

2.1 About UniConverge Technologies Pvt Ltd

A company established in 2013 and working in Digital Transformation domain and providing Industrial solutions with prime focus on sustainability and RoI.

For developing its products and solutions it is leveraging various **Cutting Edge Technologies e.g. Internet of Things (IoT), Cyber Security, Cloud computing (AWS, Azure), Machine Learning, Communication Technologies (4G/5G/LoRaWAN), Java Full Stack, Python, Front end** etc.

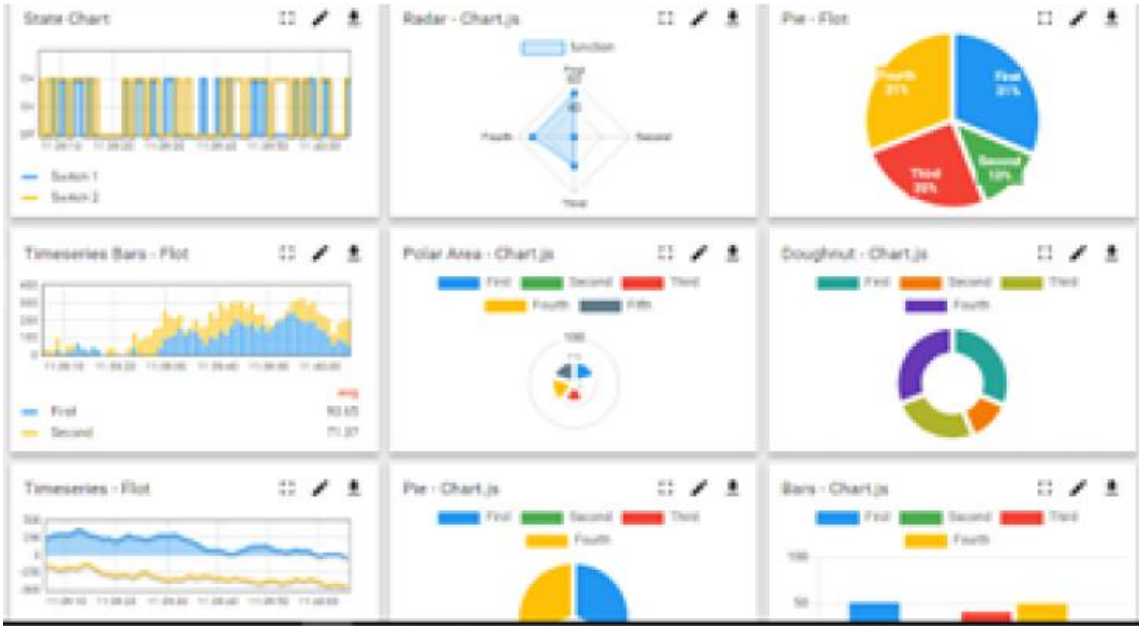
i. UCT IoT Platform (UCT Insight)

UCT Insight is an IOT platform designed for quick deployment of IOT applications on the same time providing valuable "insight" for your process/business. It has been built in Java for backend and ReactJS for Front end. It has support for MySQL and various NoSql Databases.

- It enables device connectivity via industry standard IoT protocols - MQTT, CoAP, HTTP, Modbus TCP, OPC UA
- It supports both cloud and on-premises deployments.

It has features to

- Build Your own dashboard
- Analytics and Reporting
- Alert and Notification
- Integration with third party application(Power BI, SAP, ERP)
- Rule Engine



ii. Smart Factory Platform (FACTORY WATCH)

Factory watch is a platform for smart factory needs.

It provides Users/ Factory

- with a scalable solution for their Production and asset monitoring
- OEE and predictive maintenance solution scaling up to digital twin for your assets.
- to unleased the true potential of the data that their machines are generating and helps to identify the KPIs and also improve them.
- A modular architecture that allows users to choose the service that they what to start and then can scale to more complex solutions as per their demands.

Its unique SaaS model helps users to save time, cost and money.

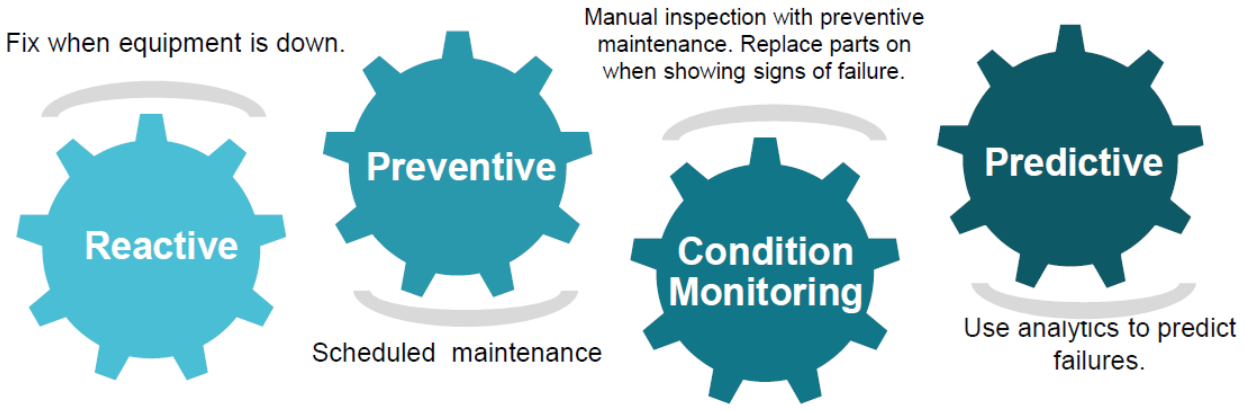
Machine	Operator	Work Order ID	Job ID	Job Performance	Job Progress		Output		Rejection	Time (mins)				Job Status	End Customer
					Start Time	End Time	Planned	Actual		Setup	Pred	Downtime	Idle		
CNC_S7_81	Operator 1	WO0405200001	4168	58%	10:30 AM		55	41	0	80	215	0	45	In Progress	i
CNC_S7_81	Operator 1	WO0405200001	4168	58%	10:30 AM		55	41	0	80	215	0	45	In Progress	i

iii. LoRaWAN based Solution

UCT is one of the early adopters of LoRAWAN teschnology and providing solution in Agritech, Smart cities, Industrial Monitoring, Smart Street Light, Smart Water/ Gas/ Electricity metering solutions etc.

iv. Predictive Maintenance

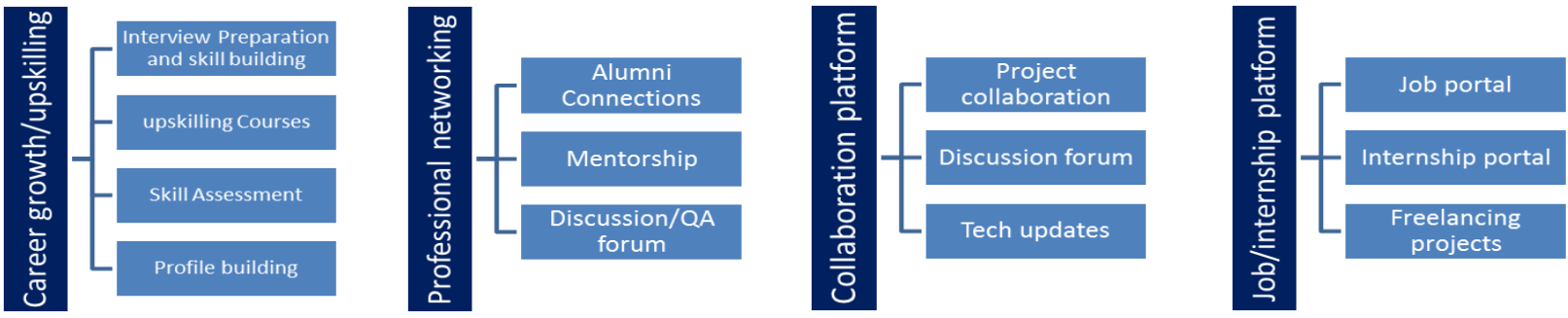
UCT is providing Industrial Machine health monitoring and Predictive maintenance solution leveraging Embedded system, Industrial IoT and Machine Learning Technologies by finding Remaining useful life time of various Machines used in production process.



2.2 About upskill Campus (USC)

upskill Campus along with The IoT Academy and in association with Uniconverge technologies has facilitated the smooth execution of the complete internship process.

USC is a career development platform that delivers **personalized executive coaching** in a more affordable, scalable and measurable way.



2.3 The IoT Academy

The IoT academy is EdTech Division of UCT that is running long executive certification programs in collaboration with EICT Academy, IITK, IITR and IITG in multiple domains.

2.4 Objectives of this Internship program

The objective for this internship program was to

- ☛ get practical experience of working in the industry.
- ☛ to solve real world problems.
- ☛ to have improved job prospects.
- ☛ to have Improved understanding of our field and its applications.
- ☛ to have Personal growth like better communication and problem solving.

2.5 Reference

[1] Zhang, C., & Zhang, H. (2020). "Deep Learning for Plant Identification and Classification: A Review." *Computers and Electronics in Agriculture*, 174, 105539.

[2] Kumar, V., & Singh, R. (2020). "A Comprehensive Review on Computer Vision Techniques in Agriculture." *Agricultural Reviews*, 41(4), 267-278

2.6 Glossary

Terms	Acronym
M**achine learning**	M**l**
You only look once	YOLO
Convolutional neural network	CNN

3 Problem Statement

In this project, my objective was to design a system for detecting crops and weeds that applies pesticides exclusively to the weeds, thereby preventing any contact with the crops. This method aims to reduce pesticide contamination and minimize waste. Weeds are problematic in agriculture as they compete with crops for vital resources like nutrients, water, and land, which can lead to decreased crop yields.

While farmers often resort to pesticides to control weeds effectively, some of these chemicals can unintentionally remain on the crops, posing risks to human health. To tackle this challenge, I developed a detection system that accurately distinguishes between crops and weeds, ensuring that pesticides are only applied where they are truly needed.

4 Existing and Proposed solution

4.1 Code submission (Github link)

4.2 Report submission (Github link) : first make placeholder, copy the link.

5 Proposed Design/ Model

The design flow of the solution begins with preprocessing the images for training, followed by preparing the model for weed detection. The model is then trained using a Convolutional Neural Network (CNN), and finally, predictions are made using the trained deep learning model.

5.1 High Level Diagram

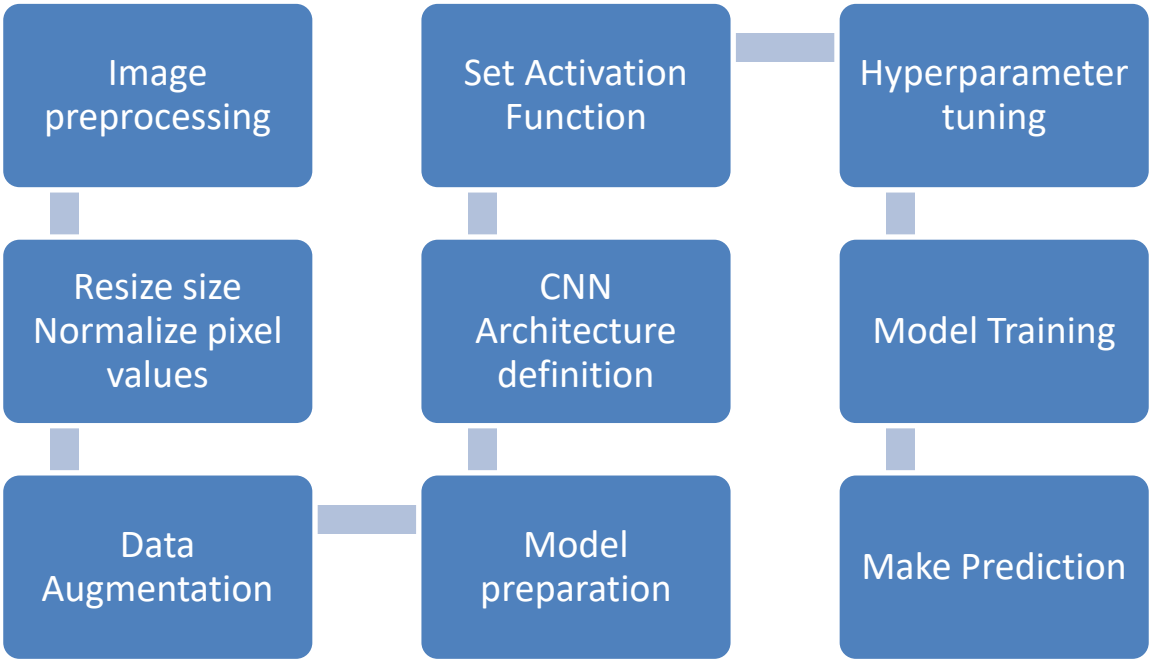
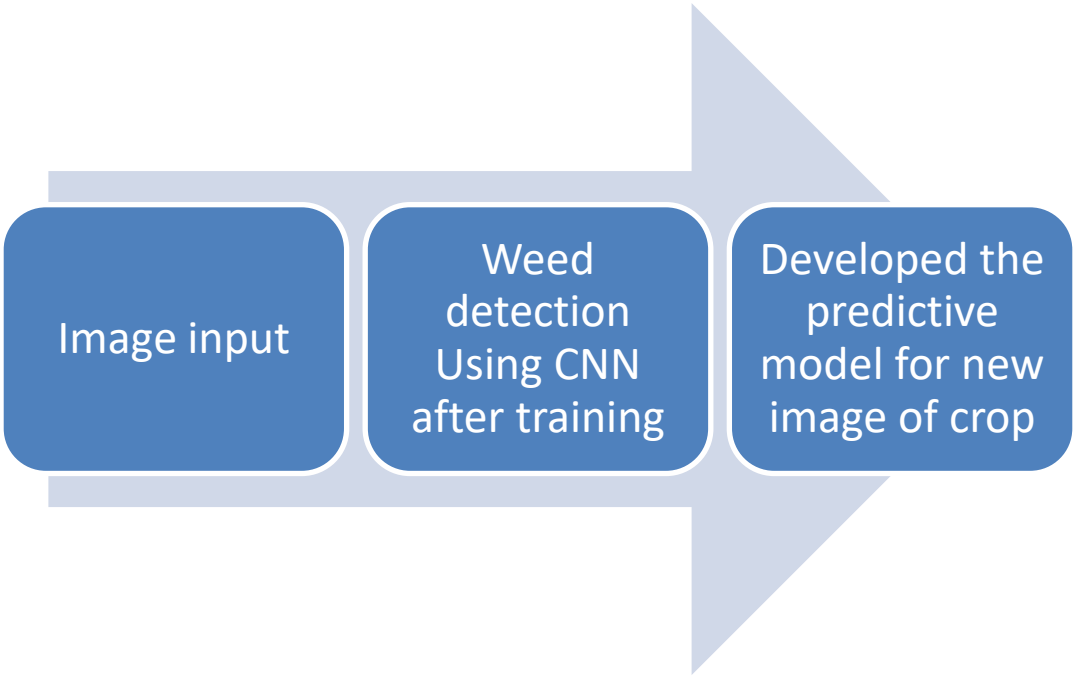


Figure 1: HIGH LEVEL DIAGRAM OF THE SYSTEM

5.2 Low Level Diagram



6 Performance Test

Performance testing is crucial as it demonstrates the practical applicability of this work in real industries, rather than treating it as just an academic project. In my project, the main constraints were the accuracy of predictions and the speed of output generation. To address these challenges, I trained my model multiple times using various machine learning algorithms, such as Decision Trees and Random Forests, to determine which approach yielded the highest accuracy.

The test results showed significant improvements compared to previous projects in this domain. Identifying and addressing these constraints is essential for developing a model suitable for real-world applications.

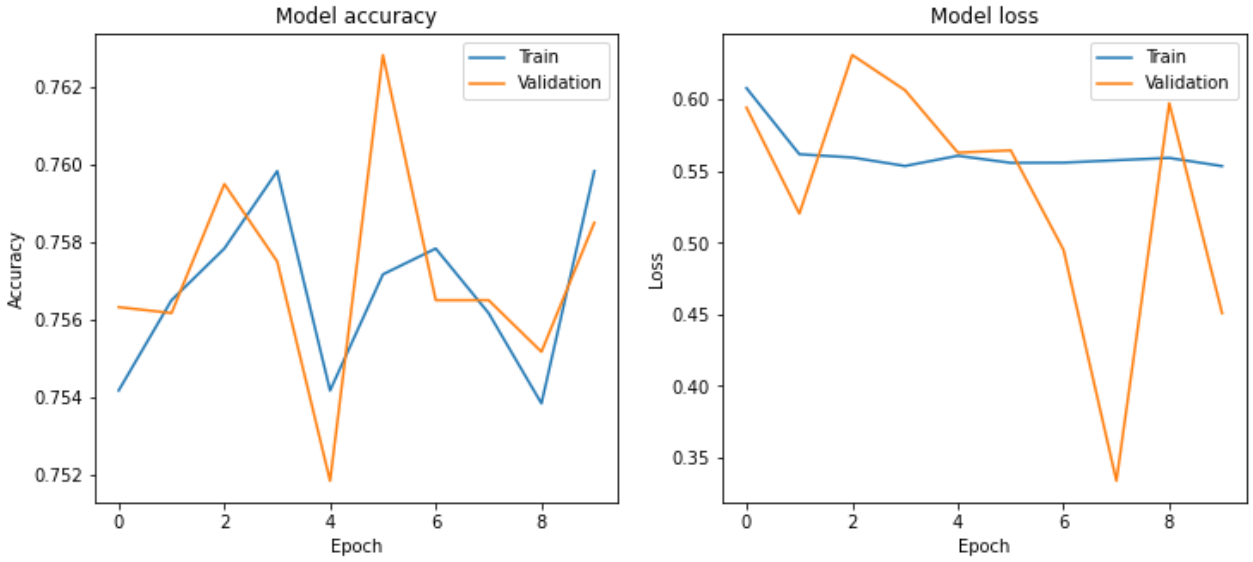
6.1 Test Plan/ Test Cases

The testing strategy centered on evaluating the trained model with a diverse range of images. This approach allowed the model to refine its ability to classify crops and weeds accurately. By incorporating various images into the testing process, the goal was to assess its performance and improve its reliability in real-world applications.

6.2 Test Procedure

The initial phase consisted of training the model over several epochs using the CNN. Once the training was complete, I used images that were not part of the training set to assess the model's accuracy in its classification task. This step was crucial for evaluating the model's performance in distinguishing between crops and weeds.

6.3 Performance Outcome



7 My learnings

I gained valuable insights into the significance of machine learning libraries and their role in addressing real-world challenges. The task of classifying crops and weeds is of great practical importance, offering potential benefits to farmers globally. The knowledge and skills I acquired during this internship will contribute significantly to my growth and development in both my professional and personal life.

8 Future work scope

I aimed to incorporate my crop and weed detection code into a web application, allowing farmers worldwide to identify crops and weeds in their fields easily. By creating an online platform, this project will enable both farmers and non-experts to utilize the tool effectively. This approach enhances accessibility and broadens the potential impact within the agricultural community.