

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 about Detecting crops from weed which will create a system that only sprays pesticides on weed and not on the crop Which will reduce the mixing problem with crops and reduce the waste of pesticides.

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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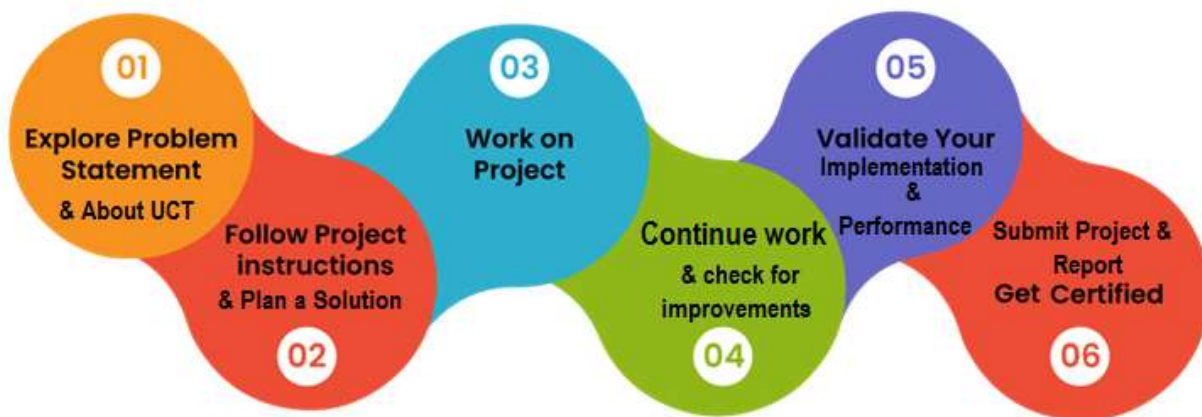
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1 Preface

I started my project on "Crop and Weed Detection" by first analyzing the dataset. The initial challenge was accessing the dataset, as it was provided in YOLO format, which required some extra work for proper handling.

For the model, I utilized a Convolutional Neural Network (CNN) to extract relevant features from the image dataset. After training the model, I was able to successfully classify the test images, achieving accurate results in detecting crops and weeds. The project aimed to create a system that identifies crops and weeds, ensuring that pesticides are sprayed only on weeds and not on the crops.

This internship was an invaluable experience for my personal growth. It not only allowed me to apply my theoretical knowledge to solve real-world problems but also helped me identify my strengths and areas for improvement.



I am truly grateful to Uni-Convergence Technologies Pvt Ltd (UCT) and Upskill Campus (USC) for providing me with this golden opportunity.

This internship contributed to my learning significantly. It helped me grow in a professional as well as in a personal way. I became more proficient in my field of study i.e., Data Science and Machine Learning. I thank all my co-mentors and the internship organizer for giving me this opportunity to work on my skills and help me in my career growth. I thereby give small advice to all my juniors and peers that no matter how tough it gets to manage your time to complete all the weekly assignments, keep working hard and do not give up. Since the result will be very fruitful.

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.



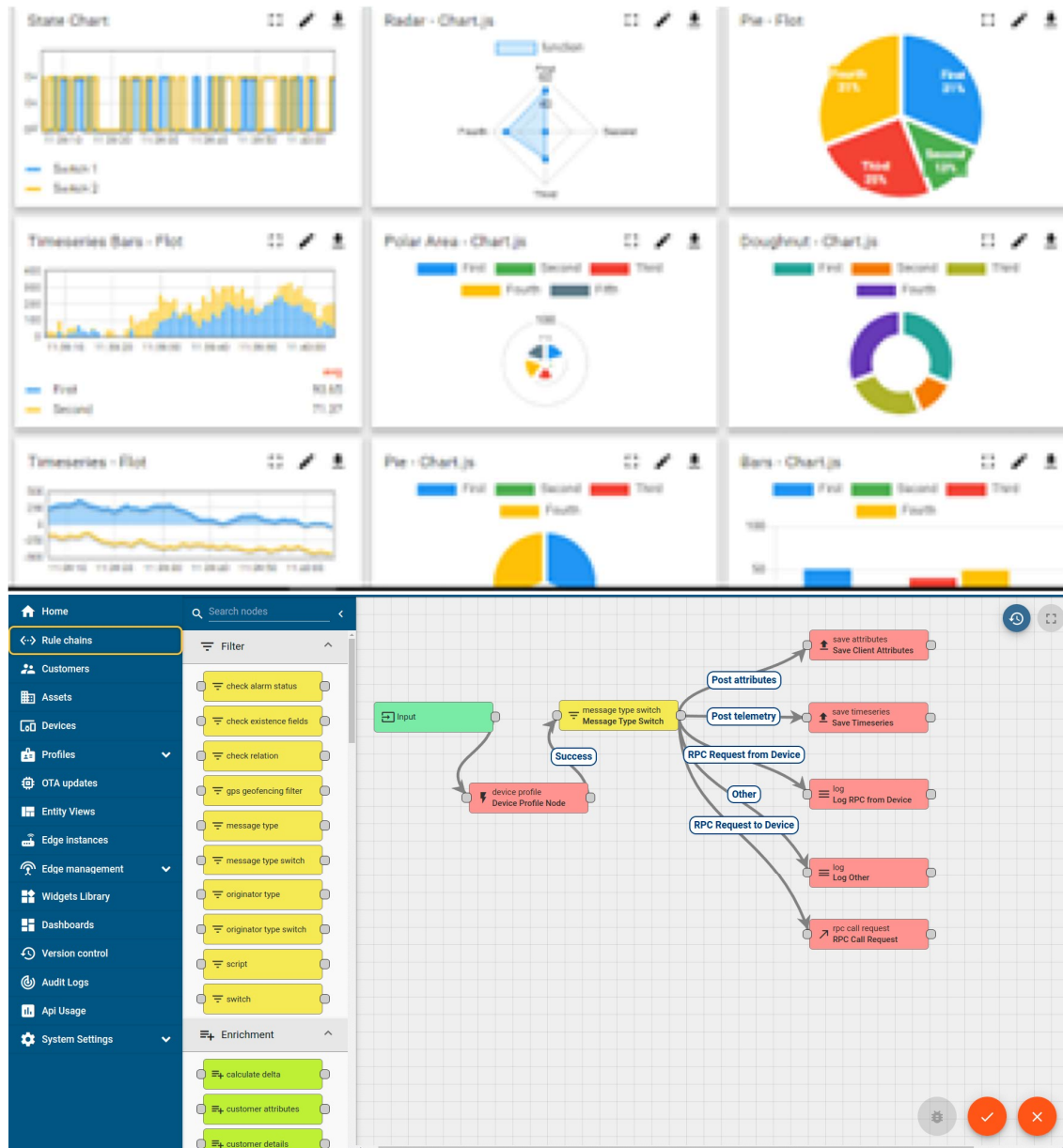
i. UCT IoT Platform ()

UCT Insight 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



FACTORY WATCH

ii. Smart Factory Platform ()

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 unleash 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 want 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



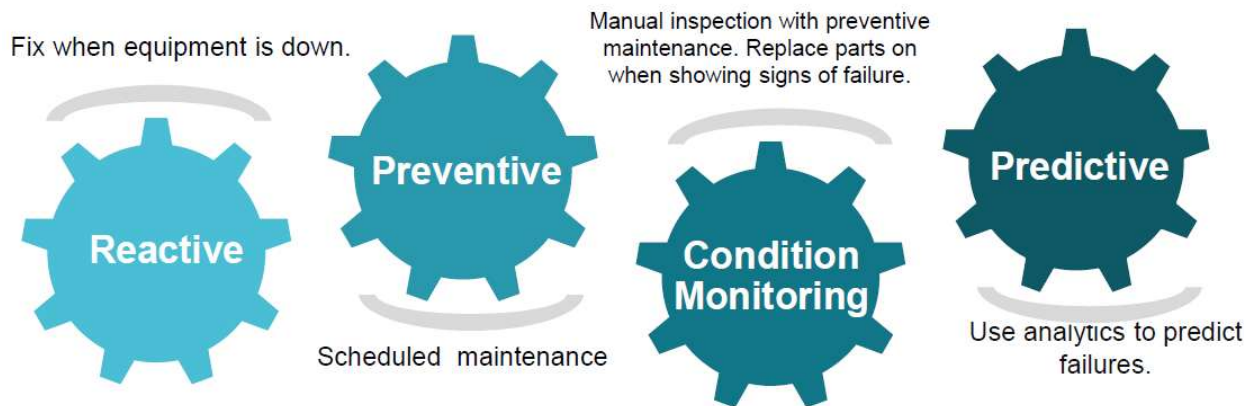


iii. LoRaWAN based Solution

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

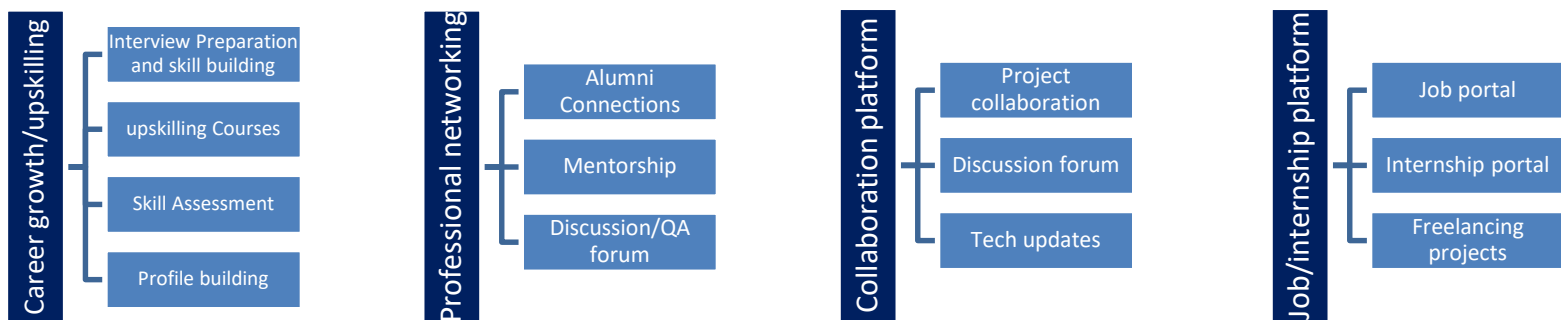
UCT is providing Industrial Machine health monitoring and Predictive maintenance solution leveraging Embedded system, Industrial IoT and Machine Learning Technologies by finding Remaining useful life time of various Machines used in production process.



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] <https://www.diva-portal.org/smash/get/diva2:1447357/FULLTEXT01.pdf>

[2]

https://www.researchgate.net/publication/356914203_WEED_DETECTION_USING_IMAGE_PROCESSING

2.6 Glossary

Terms		Acronym
Convolutional Neural Network		CNN
You Only Look Once		YOLO
Deep Learning		DL

3 Problem Statement

In the assigned problem statement, I had to create a system for detecting crops from weed that only sprays pesticides on weed and not on the crop which will reduce the mixing problem with crops and reduce the waste of pesticides. Weed is an unwanted thing in agriculture. Weed use the nutrients, water, land and many more things that might have gone to crops. Which results in less production of the

required crop. The farmer often uses pesticides to remove weed which is also effective but some pesticides may stick with crop and may causes problems for humans. For this purpose this system of detection of crop and weed is created.

4 Existing and Proposed solution

Earlier solutions provided previously was basically trying to solve the same problem but the accuracy obtained in solving the problem was low and sometimes the model could not classify the crop and weed correctly. I have proposed in severely training my model in such a way that the CNN model will be able to provide correct classification when tested on test images.

4.1 Code submission (Github link)

<https://github.com/Nashrasaniya/upskillcampus>

4.2 Report submission (Github link) :

https://github.com/Nashrasaniya/upskillcampus/blob/main/Crop-Weed-Detection_MohammedNashraSaniya_USC_UCT.pdf

5 Proposed Design/ Model

Design Flow of The Solution

The starting stage of the model is preprocessing the images for training. Then the model is prepared for training to detect the weeds. The model is then trained using CNN. Then the predictions are made using the deep learning model.

5.1 High Level Diagram

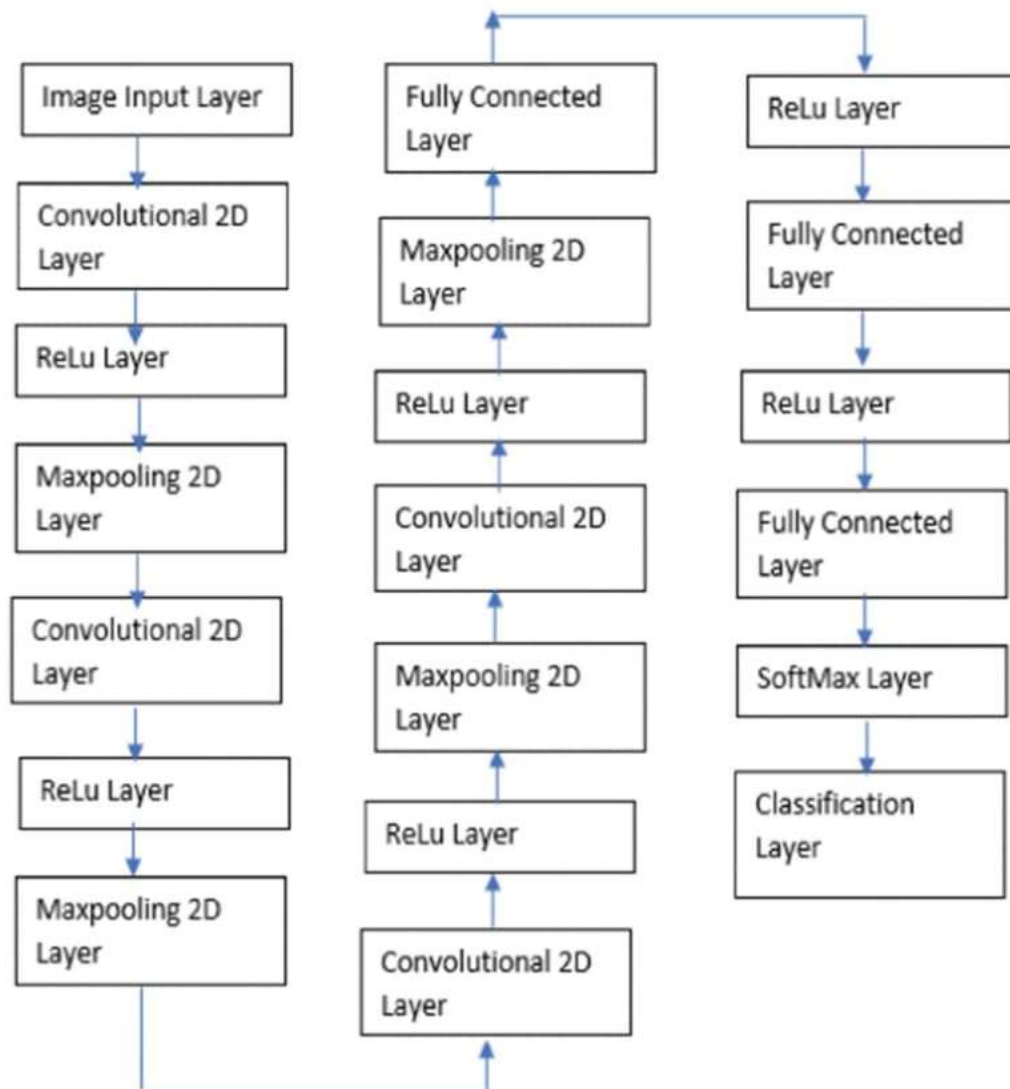
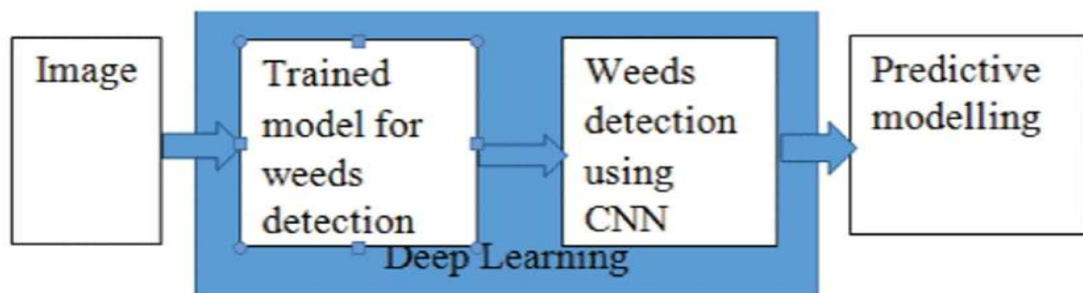


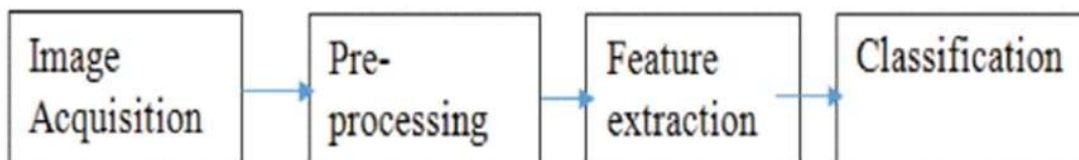
Figure 1: HIGH LEVEL DIAGRAM OF THE SYSTEM

5.2 Low Level Diagram



5.3 Interfaces (if applicable)

Block Diagram



6 Performance Test

Performance test plays a major role and defines why this work is meant of Real industries, instead of being just academic project.

Constraints in my project was accuracy and speed with which output is generated. In my design I trained my model several times with various machine learning algorithms like Decision tree, random forest to find the algorithm which is best suitable to produce highest accuracy.

The test results were significantly improved compared to those of the work done by other projects. Identification of constraints plays a major role in training a model for a real-life application.

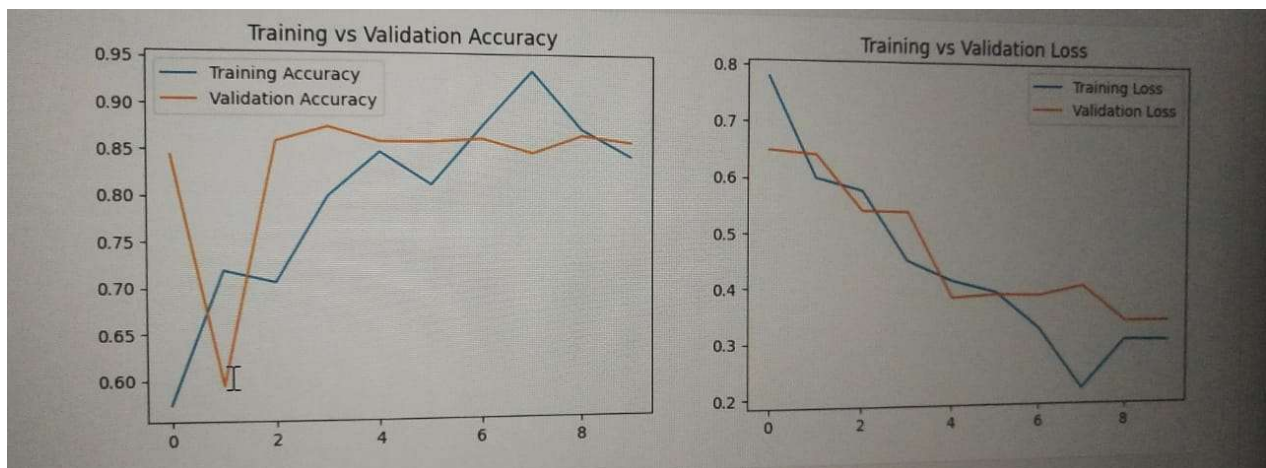
6.1 Test Plan/ Test Cases

My main testing plan involved in testing the already trained model with various images so that model could become equipped with how to classify the crop and weed.

6.2 Test Procedure

First step was to train the model with epoch using the CNN. Then the images not used in training was used to test the accuracy of the model in the classification task

6.3 Performance Outcome



7 My learnings

Throughout this internship, I learned the significance of machine learning libraries and how they play a crucial role in solving real-world problems. The problem statement, which focused on classifying crops and weeds, holds great practical value and can be applied by farmers worldwide to enhance their agricultural practices.

The knowledge and skills I gained during this internship have equipped me for future success, both professionally and personally. This experience has been instrumental in shaping my understanding of machine learning and its application in solving meaningful, real-life challenges.

8 Future work scope

Future Scope of Crop and Weed Detection Project

The Crop and Weed Detection System has the potential to transform precision agriculture through AI and automation.

1. Improved Model Accuracy

Enhancing the model with advanced architectures (EfficientNet, YOLO) and larger datasets will improve detection precision and adaptability.

2. Real-Time Detection

Integrating with IoT devices, drones, or edge computing (Raspberry Pi, Jetson Nano) can enable real-time weed detection, reducing manual effort.

3. Automated Weed Removal

Pairing the system with robotic weeders or smart spraying can automate weed control, cutting pesticide use and improving sustainability.

4. Cloud & IoT Integration

A cloud-based system can store weed detection data, provide real-time alerts, and enable remote monitoring for smarter decision-making.

5. Mobile & Web App Deployment

A mobile/web app will allow farmers to scan fields, detect weeds instantly, and receive real-time recommendations.

