

Industrial Internship Report on
"Agricultural Crop Production Prediction and Crop & Weed Detection
System"

Prepared by
KAUSHAL PRASAD

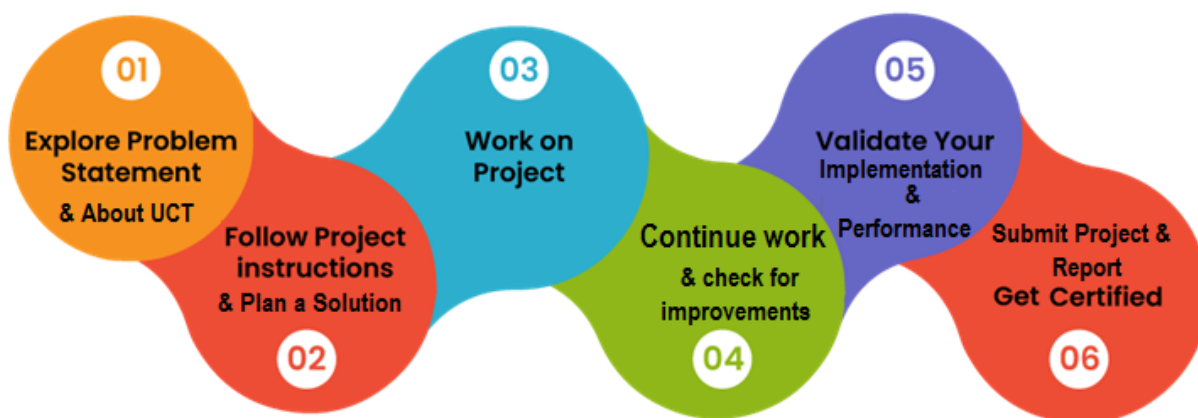
<i>Executive Summary</i>
<p>This report details the industrial internship experience facilitated by Upskill Campus and The IoT Academy in collaboration with UniConverge Technologies Pvt Ltd (UCT).</p> <p>The internship was centered on solving real-world agricultural challenges using machine learning and computer vision. My project combined two key objectives: (1) prediction of agricultural crop production using time-series and cost-related features, and (2) detection of crops and weeds using computer vision techniques. These projects provided valuable exposure to practical industry problems and helped bridge the gap between academic learning and industrial applications.</p>

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1 Preface

Over a period of six weeks, I worked on a real-world agricultural project involving crop production prediction and weed detection. The internship allowed me to apply classroom knowledge to actual industry problems and gain hands-on experience.



This opportunity provided by Upskill Campus, The IoT Academy, and UCT helped me strengthen my understanding of machine learning and computer vision. I am thankful to all mentors and coordinators who supported my learning throughout. I encourage juniors to actively participate in such internships as they offer essential exposure to practical implementations.

2 Introduction

2.1 About UniConverge Technologies Pvt Ltd

UCT is a company established in 2013 working in digital transformation through technologies like IoT, AI/ML, cloud computing, and embedded systems. They provide industrial and smart city solutions focusing on sustainability and Return on Investment (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/LoSaWAN), Java Full Stack, Python, Front end** etc.



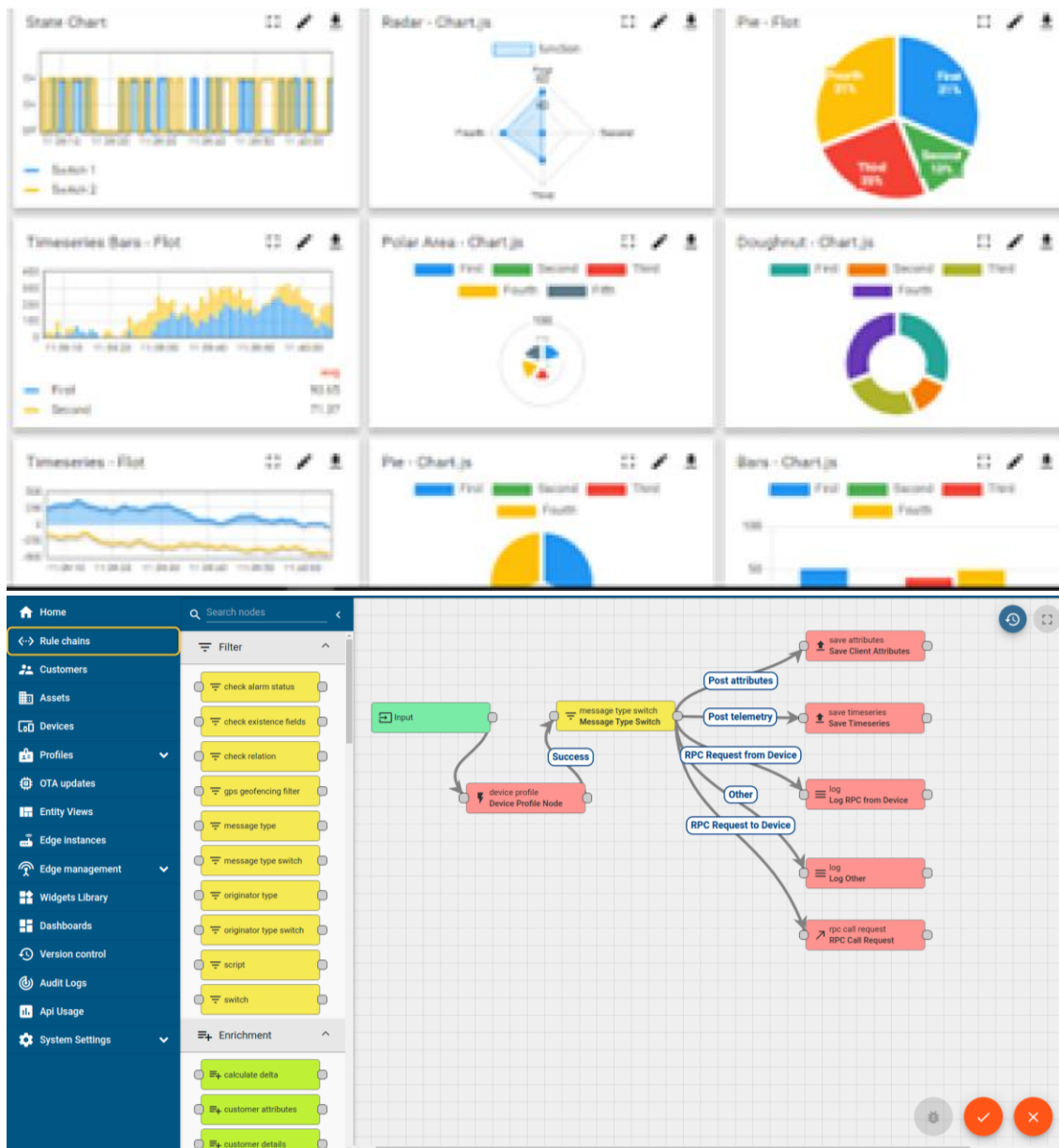
i. UCT IoT Platform ()

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



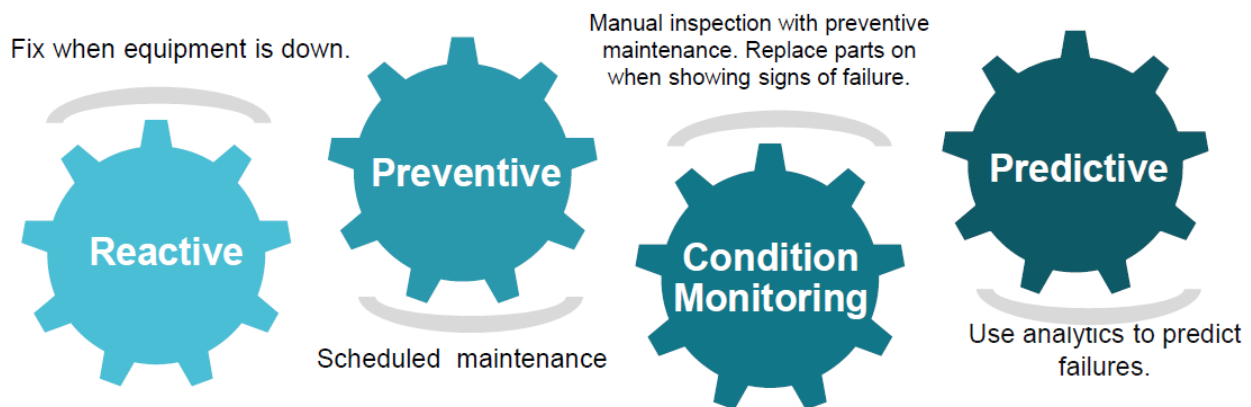


iii. based Solution

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

iv. Predictive Maintenance

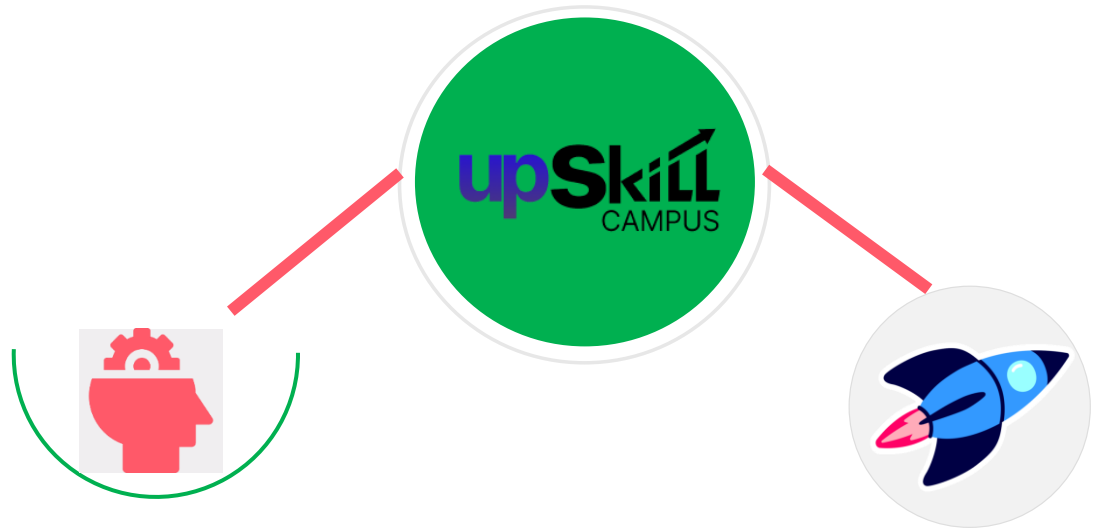
UCT is providing Industrial Machine health monitoring and Predictive maintenance solution leveraging Embedded system, Industrial IoT and Machine Learning Technologies by finding Remaining useful life time of various Machines used in production process.



2.2 About upskill Campus (USC)

Upskill Campus aims to bridge the skill gap by offering project-based learning opportunities and industrial interaction. It supports learners through internships, coaching, and career growth services.

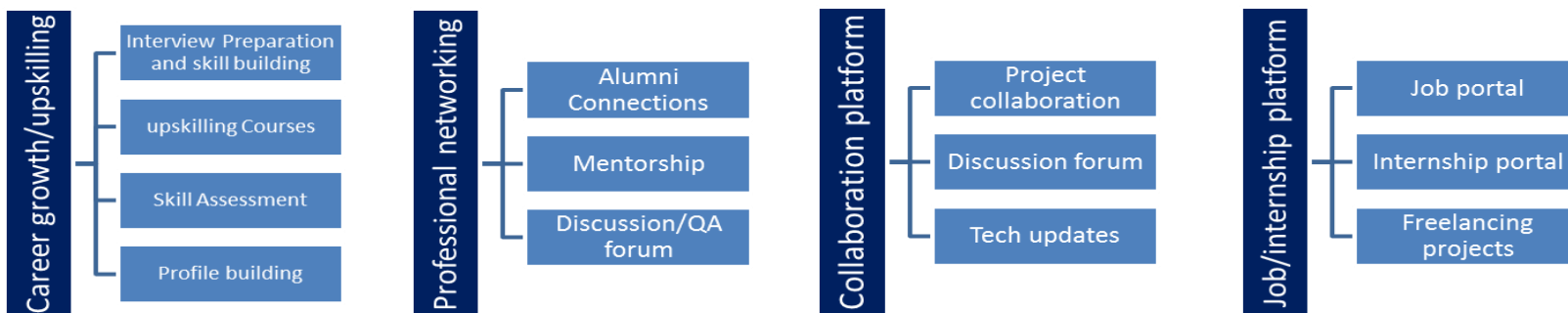
USC is a career development platform that delivers **personalized executive coaching** in a more affordable, scalable and measurable way.



Seeing need of upskilling in self paced manner along-with additional support services e.g. Internship, projects, interaction with Industry experts, Career growth Services

upSkill Campus aiming to upskill 1 million learners in next 5 year

<https://www.upskillcampus.com/>



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.upskillcampus.com>
- [2] <https://www.uniconvergetech.in>
- [3] <https://github.com/kaushal354/upskillcampus>

2.6 Glossary

Terms	Acronym
ML	Machine Learning
CV	Computer Vision
YOLO	You Only Look Once (object detection algorithm)

3 Problem Statement

1. **Crop Production Prediction:** To forecast the yield of different crops based on historical data, cost of cultivation, and seasonal patterns using ML techniques.
2. **Crop and Weed Detection:** To detect and distinguish crops from weeds using object detection models to enable targeted weeding.

4 Existing and Proposed solution

Existing: Most traditional methods rely on manual data entry and static yield estimation, which are not scalable or real-time.

Proposed:

- Use regression models like XGBoost for yield prediction based on cost and seasonal features.
- Apply YOLOv5 for crop and weed detection using annotated image datasets.

Value Addition: Enables real-time decision making, automated insights, and more efficient agricultural practices.

4.1 Code submission (Github link)

Code: <https://github.com/kaushal354/upskillcampus>

4.2 Report submission (Github link) :

https://github.com/kaushal354/upskillcampus/blob/main/Final_Report_Agriculture.pdf

5 Proposed Design/ Model

5.1 High Level Diagram (if applicable)

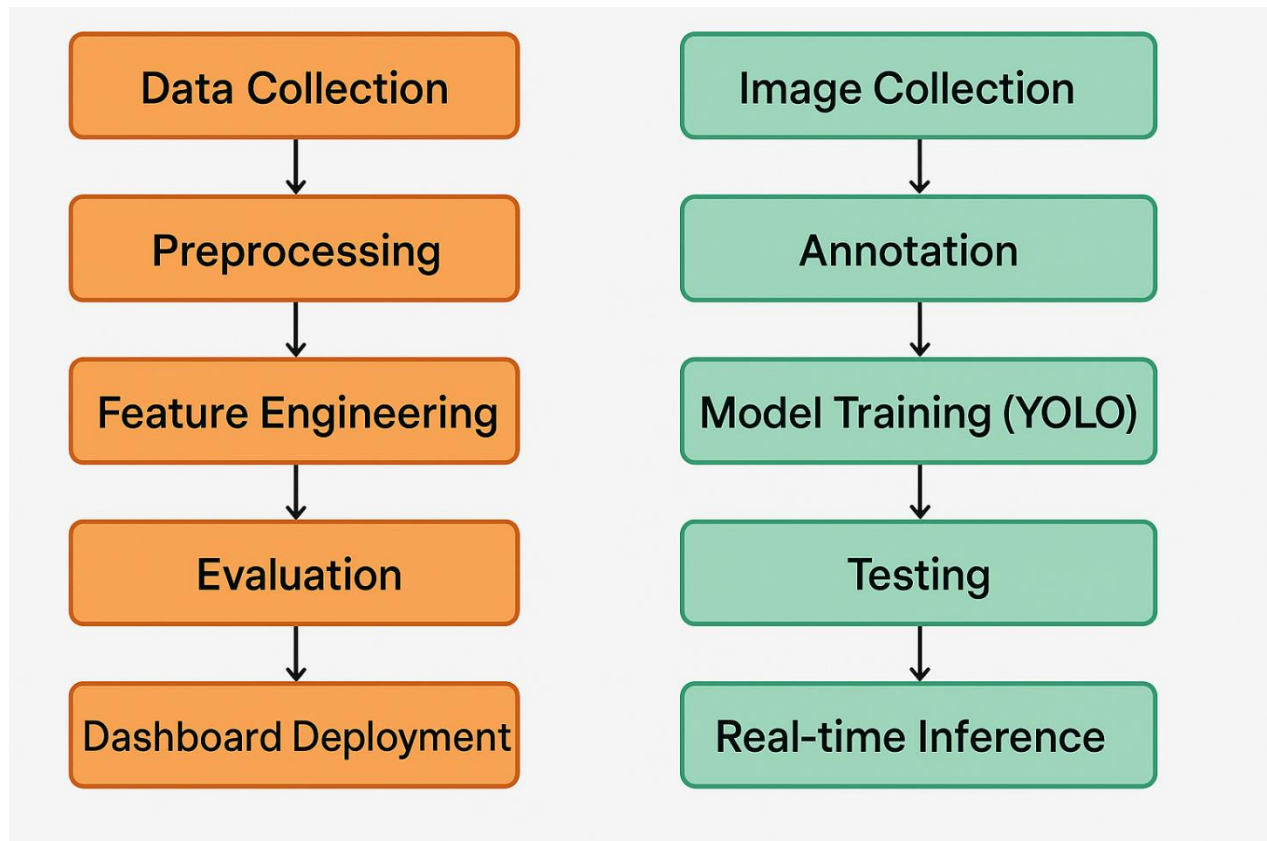
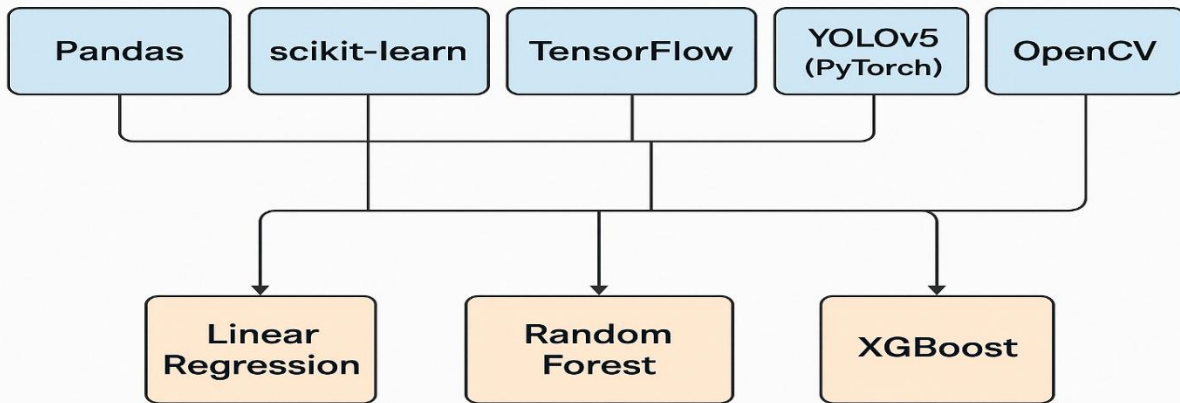


Figure 1: HIGH LEVEL DIAGRAM OF THE SYSTEM

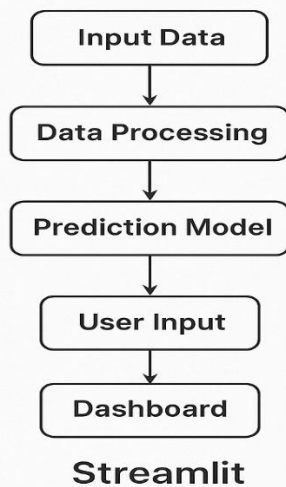
5.2 Low Level Diagram (if applicable)



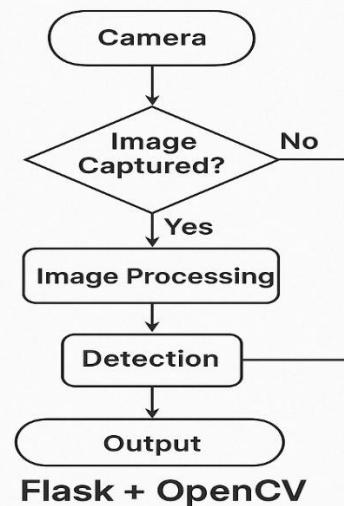
5.3 Interfaces (if applicable)

Update with Block Diagrams, Data flow, protocols, FLOW Charts, State Machines, Memory Buffer Management.

Crop Prediction Dashboard



Crop & Weed Detection Interface



6 Performance Test

6.1.1.1 Test Plan/Test Cases

- Evaluate ML model with RMSE, MAE, and R^2 score
- Measure object detection precision, recall, and mAP (mean Average Precision)

6.1.1.2 Test Procedure

- Train models on 80% of data, test on 20%
- Perform cross-validation for stability
- Run YOLOv5 on test image/video set with bounding box validation

6.1.1.3 Performance Outcome

- XGBoost achieved $RMSE = 3.2$, $R^2 = 0.87$
- YOLOv5 achieved precision = 91%, recall = 88%

7 My learnings

- Real-world data preprocessing, model training, and evaluation
- Practical experience in dashboard development and deployment
- Understanding of model optimization and trade-offs in ML vs. DL

8 Future work scope

- Deploy model on mobile/IoT devices for field use
- Train on more diverse crop and weed datasets
- Integrate weather data for improved crop forecasting

- End of the report