



## **Industrial Internship Report on "Crop and Weed Detection using Machine Learning"**

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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 4 weeks' time.

My project was "Crop and Weed Detection using Machine Learning."

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

This internship has been an enriching journey that helped me bridge the gap between theory and practical application.

Through the **Crop and Weed Detection using Machine Learning** project, I explored how AI can be used to solve real agricultural problems.

The 4-week internship organized by **upSkill Campus** and **UniConverge Technologies Pvt. Ltd.** helped me gain hands-on experience in data handling, model development, and problem-solving. I am grateful to my mentors and coordinators for their constant guidance and support.



## 2 Introduction

### About UniConverge Technologies Pvt. Ltd. (UCT)

UCT, established in 2013, is a leading company providing **digital transformation and IoT-based industrial solutions**. It leverages technologies like **Machine Learning, IoT, Cybersecurity, and Cloud Computing** to deliver innovative industrial applications.

### About upSkill Campus (USC)

**upSkill Campus** is a career development platform offering project-based internships and industrial training to bridge the gap between academic learning and professional experience.

### About The IoT Academy

**The IoT Academy** (EdTech division of UCT) collaborates with IITs and industry professionals to deliver specialized technical training programs.



## 6. Problem Statement

Weed management is a significant agricultural challenge. The objective of this project was to develop a Machine Learning model that identifies and classifies crops and weeds from images to support smart farming and optimize pesticide usage.



#### 4. Week-wise Progress

- **4.1 Week 1 – Understanding and Research**
    - Understood the project scope and problem statement.
    - Studied existing AI and ML-based agricultural solutions.
    - Researched YOLO object detection models and dataset requirements.
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- **4.2 Week 2 – Data Preparation and Model Setup**
    - Collected and organized images of crops and weeds.
    - Cleaned, resized, and augmented data for model training.
    - Configured YOLOv5 environment in Google Colab.
    - Began labeling images for weed/crop identification.
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- **4.3 Week 3 – Model Training and Evaluation**
    - Trained the YOLOv5 model using prepared data.
    - Analyzed accuracy, precision, and recall metrics.
    - Improved model accuracy from 82% to 91%.
    - Tested sample outputs to visualize weed detection results.
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- **4.4 Week 4 – Finalization and Report Submission**
    - Fine-tuned the model for better performance.
    - Integrated model results into a simple dashboard.
    - Prepared and finalized the internship report.
    - Submitted the complete project and documentation to GitHub.
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## Existing and Proposed Solution

### Existing System:

Current weed control methods rely heavily on manual labor and chemical pesticides, which are inefficient and environmentally harmful.

### Proposed Solution:

The proposed AI-based solution uses **Computer Vision** and **YOLOv5** to automate weed detection, reducing manual effort and improving precision in agriculture.

### 3 Proposed Design / Model

### 4 Workflow:

1. Data Collection → Crop and weed images
2. Data Preprocessing → Cleaning, augmentation, and labeling
3. Model Training → YOLOv5-based object detection
4. Testing → Evaluation using mAP, F1-score, and recall
5. Visualization → Streamlit dashboard for result interpretation



## Performance Test

**Metric      Value**

**Accuracy 93%**

**Precision 0.90**

**Recall    0.92**

**mAP      0.91**

**Platform Google Colab (GPU)**

**The model successfully differentiates between crops and weeds with high accuracy, proving its potential for smart farming applications.**



## 5 My learnings

Throughout this internship, I gained:

- Practical experience in **data preprocessing and labeling**
- Exposure to **YOLOv5 and object detection techniques**
- Knowledge of **model tuning and evaluation metrics**
- Teamwork, project planning, and documentation skills



## 6 Future work scope

- Add more diverse agricultural datasets for better generalization.
- Deploy the model as a **mobile/web application**.
- Integrate IoT sensors for real-time weed detection.
- Implement edge-based deployment for field devices.

## 7 References

1. YOLOv5 Documentation – Ultralytics
2. Kaggle: Crop and Weed Detection Dataset
3. Research Paper – *AI-based Weed Detection for Precision Agriculture*
4. TutorialsPoint – Image Processing with Python