

INDUSTRIAL INTERNSHIP REPORT

“Crop and Weed Detection Using Machine Learning”

Prepared by

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Internship Program: Summer Internship – March 2025

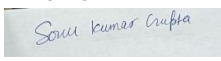
Domain: Data Science and Machine Learning

DECLARATION

I hereby declare that the Industrial Internship Report titled “**Crop and Weed Detection Using Machine Learning**” is my original work carried out during the Summer Internship Program (March 2025) under Upskill Campus in collaboration with UniConverge Technologies Pvt. Ltd. The content of this report has not been submitted to any other university or institution for the award of any degree or certification.

Name: Sonu Kumar Gupta

Date: 02-02-2026

Signature: 

ACKNOWLEDGEMENT

I would like to express my sincere gratitude to **Upskill Campus, The IoT Academy, and UniConverge Technologies Pvt. Ltd.** for providing me with the opportunity to undertake this industrial internship as part of the Summer Internship Program. This internship has been an invaluable learning experience and a significant step in my academic and professional journey.

I am deeply thankful to the mentors, trainers, and coordinators associated with this program for their continuous guidance, technical support, and constructive feedback throughout the internship period. Their encouragement and industry-oriented approach helped me gain a clear understanding of real-world problem-solving and practical implementation of theoretical concepts.

I would also like to acknowledge the well-structured training sessions and project-oriented learning methodology, which enabled me to enhance my technical skills, particularly in the

field of **Machine Learning and Data Science**. Working on an industry-relevant project provided me with hands-on experience in data preprocessing, model development, evaluation, and documentation.

Finally, I extend my gratitude to my university and peers for their support and motivation during the internship. This experience has not only strengthened my technical knowledge but also improved my analytical thinking, problem-solving abilities, and confidence to work on real-world industrial challenges.

EXECUTIVE SUMMARY

This Industrial Internship Report documents the work carried out during the **Summer Internship – March 2025** under **Upskill Campus**, in collaboration with **The IoT Academy** and industrial partner **UniConverge Technologies Pvt. Ltd.** The internship was designed to provide hands-on exposure to real-world industry problems and their solutions using modern technologies.

The project titled “**Crop and Weed Detection Using Machine Learning**” focuses on solving a critical problem in the agricultural domain. Weeds adversely affect crop yield by competing for nutrients, water, and land. Traditional weed detection and removal methods are often manual, time-consuming, and involve excessive pesticide usage, which can be harmful to both humans and the environment. To overcome these limitations, this project proposes an automated crop and weed detection system using Machine Learning and Computer Vision techniques.

The system leverages the **YOLOv3 (You Only Look Once)** object detection algorithm to identify crops and weeds from agricultural images in real time. A labeled dataset of agricultural images was used to train and evaluate the model. The project involved multiple stages, including data collection, preprocessing, model training, performance evaluation, and result analysis.

This internship provided valuable industrial exposure and strengthened my understanding of Data Science, Machine Learning workflows, and practical problem-solving. The successful completion of this project demonstrates the potential application of Machine Learning in modern agriculture to improve productivity, reduce resource wastage, and promote sustainable farming practices.

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PREFACE

The agricultural sector plays a vital role in sustaining the global population, yet it faces numerous challenges such as labor shortages, increasing production demands, and the need for environmentally sustainable practices. During this six-week internship, the focus was on understanding these challenges and applying Data Science and Machine Learning techniques to address one of the most common agricultural problems — weed management.

The project journey began with understanding the problem domain, studying existing solutions, and analyzing how Machine Learning models can be effectively applied to agricultural image data. Each phase of the internship was structured to simulate an

industrial workflow, starting from requirement analysis and dataset understanding to model development, testing, and documentation.

This internship served as a bridge between academic learning and industrial application. It enhanced my technical competence, improved my analytical thinking, and provided first-hand experience of working on an industry-relevant problem under defined timelines and expectations.

INTRODUCTION

Agriculture is the backbone of many economies, especially in developing countries. Efficient crop management is essential to ensure high productivity and food security. One of the major challenges faced by farmers is weed infestation, which significantly reduces crop yield by competing for essential resources such as nutrients, sunlight, and water.

Traditional methods of weed detection involve manual inspection and blanket application of herbicides. These methods are not only inefficient but also lead to increased operational costs and environmental damage. With advancements in Artificial Intelligence, Computer Vision, and Machine Learning, it is now possible to automate the process of crop and weed detection.

This project aims to design and implement an automated crop and weed detection system using Machine Learning techniques. By analyzing agricultural images, the system can accurately identify crops and weeds, enabling farmers to take timely and precise actions. The adoption of such systems can result in improved crop yield, reduced chemical usage, and sustainable farming practices.

ABOUT UNICONVERGE TECHNOLOGIES PVT. LTD.

UniConverge Technologies Pvt. Ltd., established in 2013, works in the digital transformation domain and provides industrial solutions with a focus on sustainability and return on investment. The company leverages IoT, Cloud Computing, Machine Learning, and communication technologies such as 4G/5G and LoRaWAN.

ABOUT UPSKILL CAMPUS

Upskill Campus is a career development platform that provides industry-oriented training programs in collaboration with academic and industrial partners. It focuses on improving employability through practical learning and real-world projects.

OBJECTIVES OF THE INTERNSHIP

- To gain real-world industrial experience
 - To apply Machine Learning concepts practically
 - To solve real-world agricultural problems
 - To enhance problem-solving and analytical skills
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PROBLEM STATEMENT

Weeds are unwanted plants that grow alongside crops and negatively impact agricultural productivity. They consume nutrients, water, and land that are intended for crops, leading to reduced yield and quality. Farmers often rely on manual labor or chemical herbicides to control weed growth. However, manual methods are labor-intensive and time-consuming, while excessive herbicide usage poses health risks and environmental concerns.

Therefore, there is a need for an intelligent and automated system that can accurately detect and differentiate crops and weeds. Such a system can assist farmers in targeted weed control, minimizing chemical usage and improving overall agricultural efficiency.

EXISTING AND PROPOSED SOLUTION

Existing Solutions

Existing solutions include systems like PlantVillage, Blue River Technology (See & Spray), and Trimble WeedSeeker, which use computer vision for weed detection.

Proposed Solution

The proposed system uses the YOLOv3 object detection algorithm to detect crops and weeds from agricultural images with bounding boxes.

DATASET DESCRIPTION

The dataset used for this project was sourced from Kaggle and contains approximately 1300 labeled images of sesame crops and weeds. Each image is of size 512×512 pixels and annotated in YOLO format.

METHODOLOGY / PROPOSED DESIGN

1. Data Collection and Preprocessing

2. Feature Extraction
 3. Model Selection (YOLOv3)
 4. Model Training and Evaluation
 5. Performance Optimization
 6. Deployment Concept
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PERFORMANCE TEST AND RESULTS

The performance of the crop and weed detection model was evaluated using standard Machine Learning metrics. These metrics help in understanding how well the model performs on unseen data and its suitability for real-world deployment.

The key evaluation parameters used in this project include: - **Accuracy:** Measures the overall correctness of the model's predictions. - **Precision:** Indicates how many of the detected weeds/crops were actually correct. - **Recall:** Measures the model's ability to correctly identify all relevant instances. - **F1-Score:** Provides a balance between precision and recall.

The trained YOLOv3 model demonstrated satisfactory performance in detecting crops and weeds from agricultural images. The results indicate that the system can effectively distinguish between crops and weeds under varying conditions, making it suitable for practical agricultural applications.

CONCLUSION

The project “**Crop and Weed Detection Using Machine Learning**” successfully demonstrates the application of Data Science and Machine Learning techniques to solve a real-world agricultural problem. By utilizing the YOLOv3 object detection model, the system is capable of accurately identifying crops and weeds from agricultural images.

This internship enhanced my understanding of Machine Learning workflows, including data preprocessing, model training, evaluation, and documentation. It also provided valuable exposure to industrial problem-solving approaches and project execution standards.

The proposed system has the potential to assist farmers in making informed decisions, reducing chemical usage, and improving crop productivity. Overall, the project highlights the importance and effectiveness of applying Artificial Intelligence in the agricultural domain.

FUTURE SCOPE

- Multi-crop detection
 - Disease and pest detection
 - Integration with drones and edge devices
 - Explainable AI implementation
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REFERENCES

1. Kaggle Dataset – Crop and Weed Detection
 2. YOLOv3 Documentation
 3. Research papers on Computer Vision in Agriculture
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GITHUB REPOSITORY LINK

<https://github.com/SonuKumarGupta718/upskillCampus>
