Industrial Internship Report on

"Crop and Weed Detection"

"Traffic Forecasting"

Prepared by

Hirali Desai

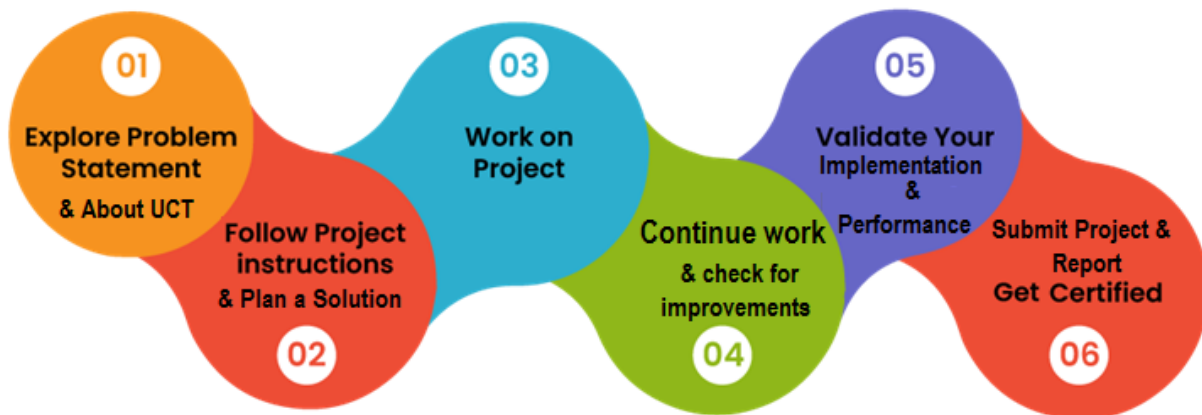| Executive Summary |
|---|
| This report provides details of the Industrial Internship provided by upskill Campus and The IoT Academy in collaboration with Industrial Partner UniConverge Technologies Pvt Ltd (UCT). |
| This internship was focused on a project/problem statement provided by UCT. We had to finish the project including the report in 6 weeks' time. |
| My project was: |
| **Crop and Weed Detection Project:** This project identifies crops and weeds from agricultural images using machine learning techniques. It helps farmers reduce unnecessary pesticide usage by detecting weeds accurately. |
| **Traffic Forecasting Project**: This project predicts traffic volume using machine learning and statistical analysis. It helps in understanding traffic patterns and supports better traffic planning. |
| 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. |

TABLE OF CONTENTS

1 Preface

Summary of the whole 6 weeks' work.

About need of relevant Internship in career development.

Brief about Your project/problem statement.

Opportunity given by USC/UCT.

How Program was planned

Your Learnings and overall experience.

Thank to all (with names), who have helped you directly or indirectly.

Your message to your juniors and peers.

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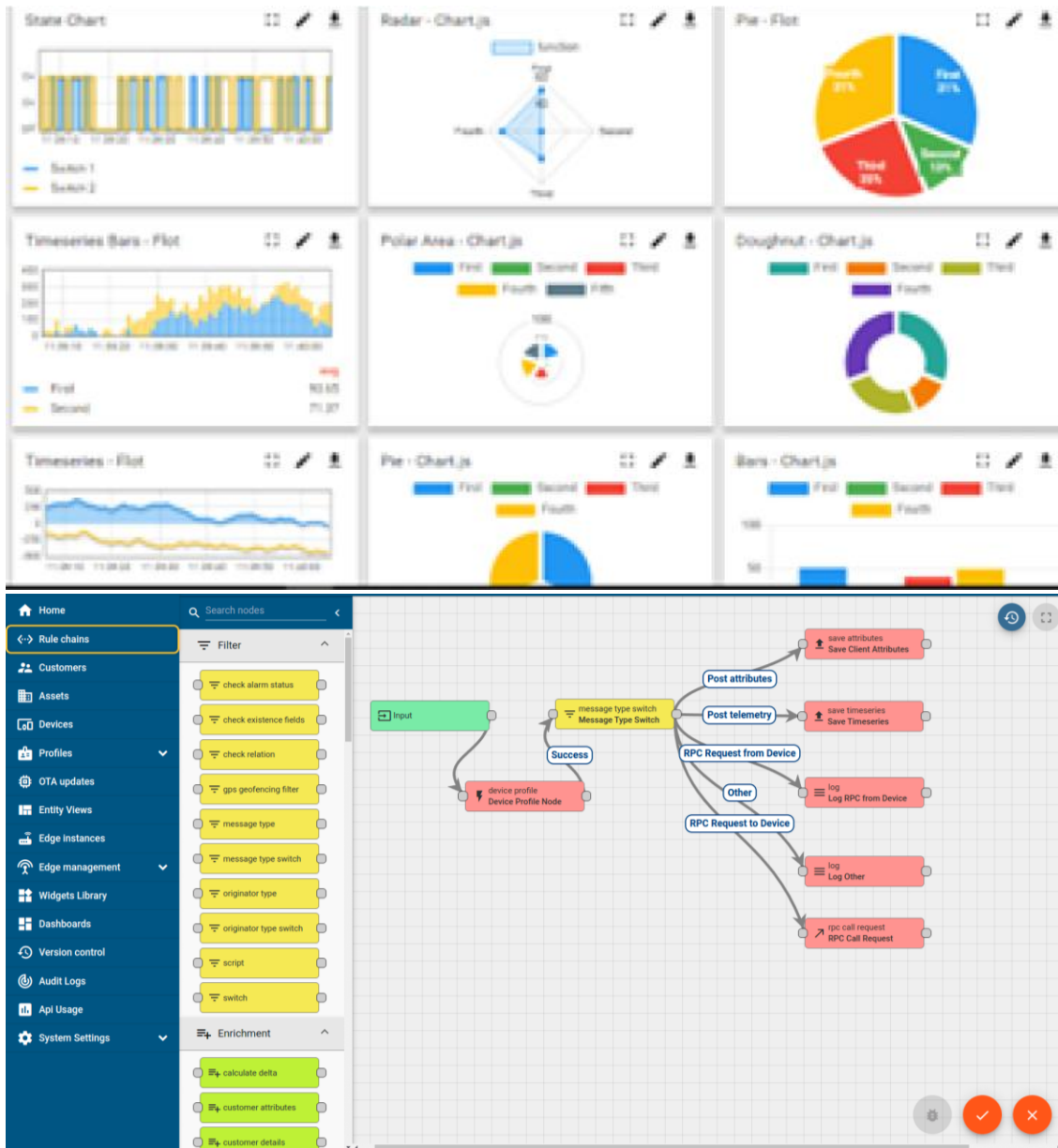
UCT Insight is an IOT platform designed for quick deployment of IOT applications on the same time providing valuable "insight" for your process/business. It has been built in Java for backend and ReactJS for Front end. It has support for MySQL and various NoSql Databases.

- 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.

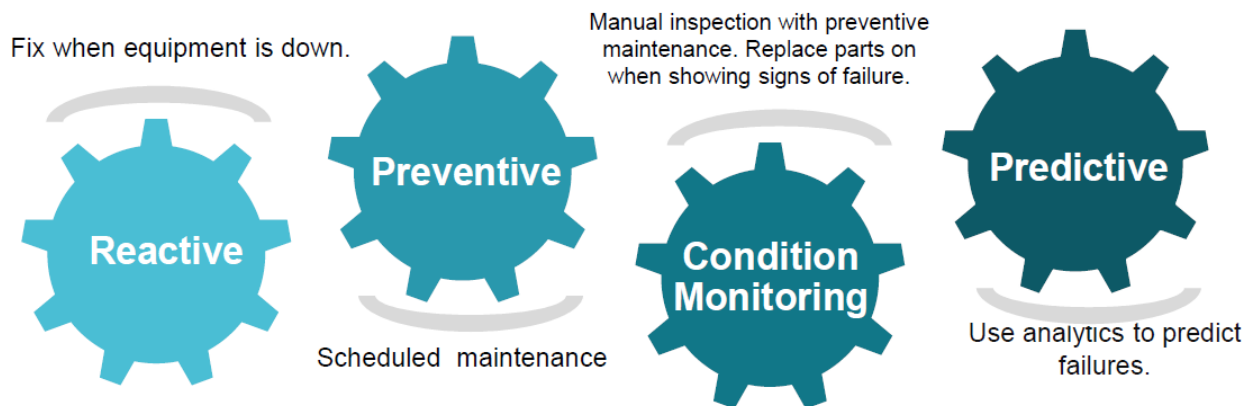| Machine	Operator	Work Order ID	Job ID	Job Performance	Job Progress		Output		Rejection	Time (mins)				Job Status	End Customer
					Start Time	End Time	Planned	Actual		Setup	Pred	Downtime	Idle		
CNC_S7_81	Operator 1	WO0405200001	4168	58%	10:30 AM		55	41	0	80	215	0	45	In Progress	i
CNC_S7_81	Operator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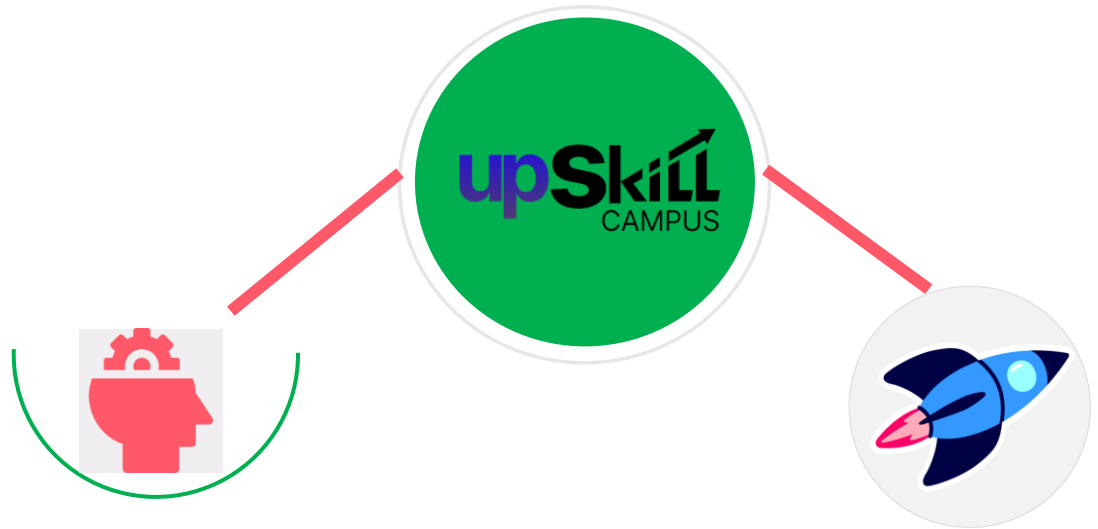
iv. Predictive Maintenance

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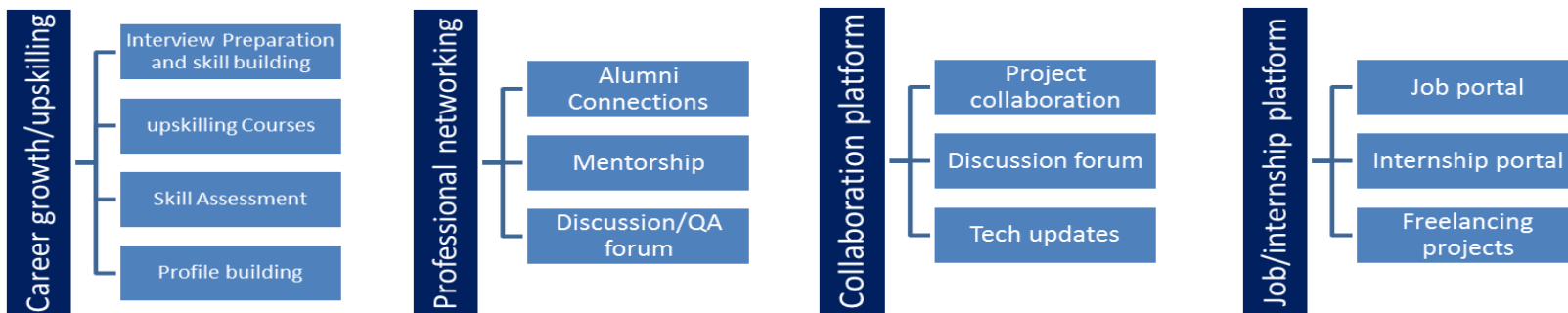
USC is a career development platform that delivers **personalized executive coaching** in a more affordable, scalable and measurable way.

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/

Career growth/upskilling
- Interview Preparation and skill building
- upskilling Courses
- Skill Assessment
- Profile building

Professional networking
- Alumni Connections
- Mentorship
- Discussion/QA forum

Collaboration platform
- Project collaboration
- Discussion forum
- Tech updates

Job/internship platform
- Job portal
- Internship portal
- Freelancing projects

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 References

☛ Ultralytics YOLOv8 Documentation: https://docs.ultralytics.com/

☛ Probability and Statistics: Provided reference book

☛ Machine learning: Provided reference book

2.6 Glossary

☛ YOLO

☛ ML

3 Problem Statement:

Crop and Weed Detection:

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.

Traffic Forecasting:

Rapid urbanization has resulted in traffic congestion, increased fuel consumption, and pollution. Predicting traffic patterns is essential for efficient traffic management and smart city planning.

4 Existing and Proposed solution

Existing System:

Crop and Weed Detection:

In traditional agricultural practices, weed management is mostly done using manual labor or uniform pesticide spraying. Farmers either remove weeds by hand or spray pesticides over the entire crop field without distinguishing between crops and weeds.

Although these methods are commonly used, they have several drawbacks:

- Manual weeding is time-consuming and labor-intensive
- Uniform spraying leads to excessive use of pesticides
- Pesticides often mix with crops, causing health risks to humans
- Increased cost of chemicals and labor
- Lack of precision and efficiency

The traditional system does not use any intelligent mechanism to identify weeds separately from crops.

Traffic Forecasting:

Existing traffic systems mainly rely on:

- Manual observation
- Fixed-timing traffic signals
- Historical average-based decisions

These systems do not consider real-time or future traffic conditions. As a result:

- Traffic congestion increases during peak hours
- Fuel consumption rises
- Time wastage for commuters
- Increased air pollution
- Poor traffic flow management

Traditional systems lack predictive capability and adaptability

Proposed Solution

Crop and Weed Detection

The proposed system uses Computer Vision and Deep Learning to automatically detect crops and weeds from images.

Key highlights of the proposed solution:

- Uses YOLO (You Only Look Once) object detection algorithm
- Trained on labeled images of crops and weeds
- Detects weed and crop locations using bounding boxes
- Enables selective pesticide spraying only on weeds
- Reduces chemical wastage and protects crops

This system improves agricultural productivity while promoting environment-friendly farming practices.

Traffic Forecasting

The proposed traffic forecasting system uses Machine Learning models to predict traffic patterns based on historical data.

Key features of the proposed solution:

- Uses data preprocessing and feature engineering
- Applies regression and forecasting models
- Predicts future traffic volume or congestion levels
- Helps in better traffic planning and management
- Can support smart city and intelligent transport systems

This solution helps authorities make data-driven decisions and improves urban mobility.

4.1 Code submission (Github link)

https://github.com/Hd241/upskillcampus/blob/main/TrafficForecastingProject.ipynb

https://github.com/Hd241/upskillcampus/blob/main/Crop%26WeedDetectionProject.ipynb

4.2 Report submission (Github link) :

<div align="center">

Github repository link

</div>

5   Proposed Design/ Model

Crop and Weed Detection

- Input: Image (512×512 RGB)

- Output: Bounding boxes with class labels (crop/weed)

- Model: YOLOv8

- Framework: Python, Ultralytics, OpenCV

Traffic Forecasting

- Input: Historical traffic data

- Output: Predicted traffic volume

- Model: Machine Learning regression

- Framework: Python, Pandas, Scikit-learn

6 Performance Test

Performance Metrics:

Crop and Weed Detection

- Detection Accuracy

- Precision and Recall

- Confidence Score

Traffic Forecasting

- Mean Absolute Error (MAE)

- Mean Squared Error (MSE)

- Prediction Accuracy

6.1 Performance Outcome

Crop and Weed Detection

- Crop and weed detection model successfully identifies weeds in agricultural images
- Selective detection reduces unnecessary pesticide usage

Traffic Forecasting

- Traffic forecasting model effectively predicts traffic trends
- Models perform consistently on unseen data

7 My learnings

The internship successfully demonstrated the application of Machine Learning and Computer Vision in solving real-world problems. Both projects highlight how intelligent systems can improve efficiency, sustainability, and decision-making.

The Crop and Weed Detection system supports precision agriculture, while the Traffic Forecasting model contributes to smart city development. These projects enhanced practical skills and provided valuable industry exposure.

8 Future work scope

- Integration with real-time camera systems
- Deployment on edge devices (Raspberry Pi, Jetson Nano)
- Mobile and web application integration
- Real-time traffic data integration using sensors or APIs
- Cloud deployment for large-scale use