Industrial Internship Report on

Agriculture pivotal, IoT aids

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 Agriculture is pivotal for our nation's progress, yet persistent issues hinder its development. We propose a smart agriculture IoT project to aid farmers with real-time data on temperature, humidity, soil moisture, and temperature. This initiative aims to enhance environment monitoring, empowering farmers to boost yield and product quality.

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1 Preface

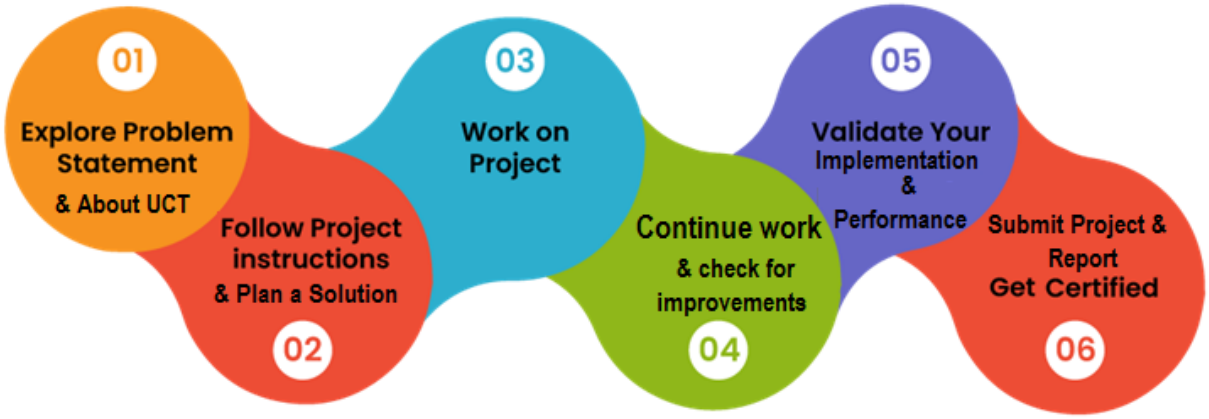
Summary of the whole 6 weeks' work.

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.

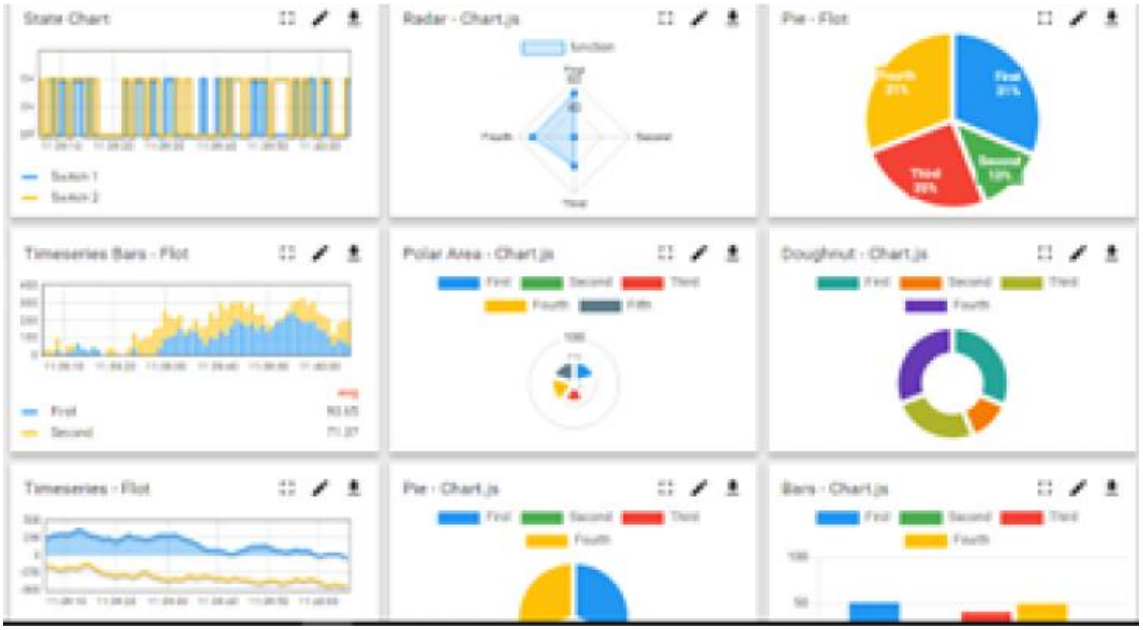
i. UCT IoT Platform (UCT Insight)

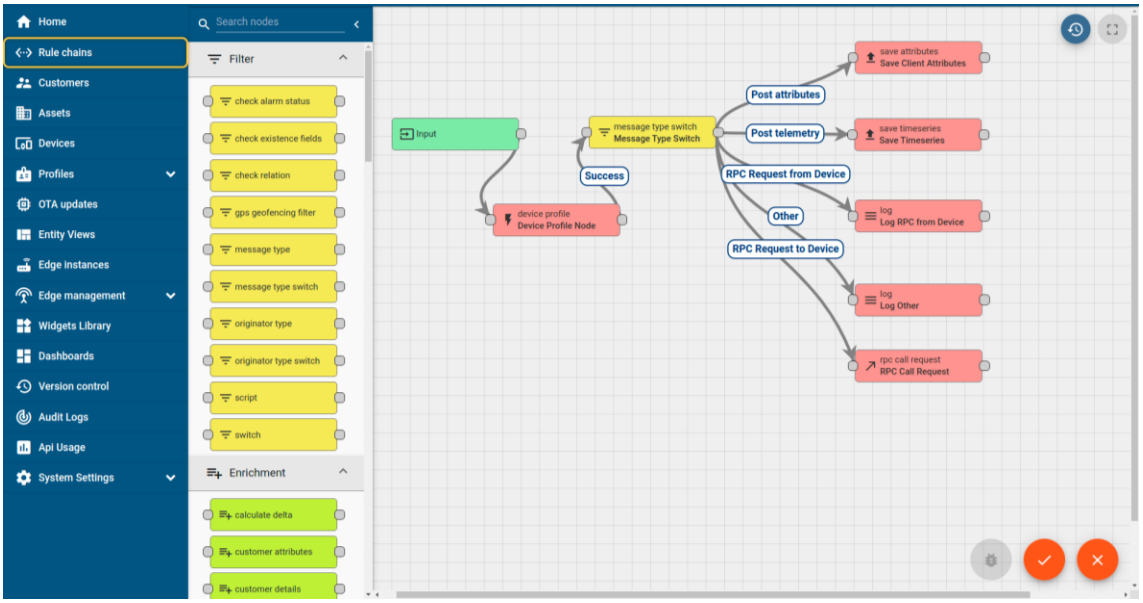
UCT Insight is an IOT platform designed for quick deployment of IOT applications on the same time providing valuable "insight" for your process/business. It has been built in Java for backend and ReactJS for Front end. It has support for MySQL and various NoSql Databases.

- 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.

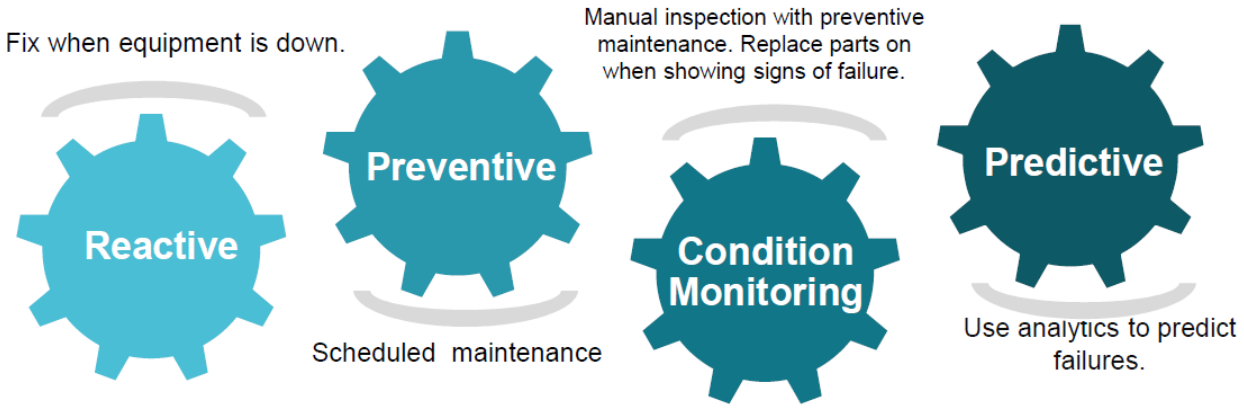
Machine	Operator	Work Order ID	Job ID	Job Performance	Job Progress		Output		Rejection	Time (mins)				Job Status	End Customer
					Start Time	End Time	Planned	Actual		Setup	Pred	Downtime	Idle		
CNC_S7_81	Operator 1	WO0405200001	4168	58%	10:30 AM		55	41	0	80	215	0	45	In Progress	i
CNC_S7_81	Operator 1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

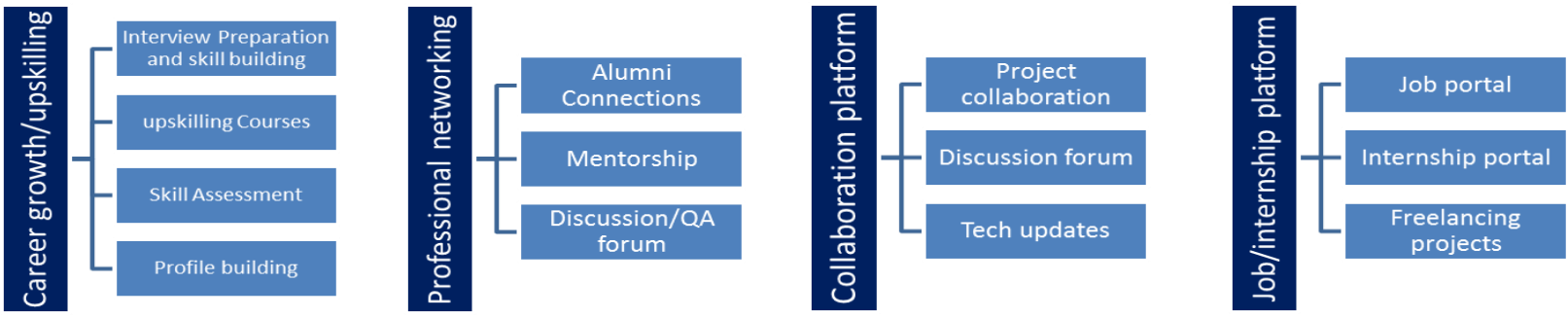
UCT is providing Industrial Machine health monitoring and Predictive maintenance solution leveraging Embedded system, Industrial IoT and Machine Learning Technologies by finding Remaining useful life time of various Machines used in production process.



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.



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] youtube

[2] brad

[3] chatgpt

2.6 Glossary

Term	Acronym
Agriculture	The practice of cultivating crops and raising livestock for human use and consumption.
Smart Agriculture	Implementation of IoT devices and technology in farming practices to enhance productivity and efficiency.
IoT	Internet of Things; a network of interconnected devices that collect and exchange data over the internet.
Temperature	The degree or intensity of heat present in the environment, critical for crop growth and livestock welfare.
Humidity	The amount of moisture present in the air, influencing plant growth and environmental conditions in agriculture.
Soil Moisture	The level of water content in the soil, essential for plant health and proper irrigation management.
Soil Temperature	The measure of heat within the soil, affecting seed germination, nutrient availability, and microbial activity.
Yield	The quantity of agricultural produce harvested per unit area, indicating the effectiveness of farming methods.
Product Quality	The standard or grade of agricultural products, influenced by various factors including environmental conditions.

3 Problem Statement

In the assigned problem statement

Problem Statement:

Despite the crucial role of agriculture in national development, persistent challenges impede its progress. Farmers lack access to real-time data on environmental factors crucial for optimizing crop yield and quality. This information gap hinders efficient decision-making and agricultural management. Therefore, there is a pressing need for a solution that integrates IoT devices to provide farmers with live data on temperature, humidity, soil moisture, and soil temperature, enabling them to make informed decisions and enhance agricultural productivity.

4 Existing and Proposed solution

Provide summary of existing solutions provided by others, what are their limitations?

What is your proposed solution?

1. **Hardware Setup**: Deploy IoT devices equipped with sensors for monitoring temperature, humidity, soil moisture, and soil temperature in agricultural fields.
2. **Data Transmission**: Utilize wireless communication protocols such as MQTT to transmit live data from the sensors to a central server or cloud platform.
3. **Cloud Integration**: Store and process the received data on a cloud-based platform like AWS or Azure, ensuring scalability and accessibility.
4. **User Interface**: Develop a user-friendly web or mobile application for farmers to access real-time data and receive alerts or recommendations based on the analyzed data.
5. **Analytics and Insights**: Implement data analytics algorithms to provide insights into environmental conditions and recommend optimal actions for improving yield and product quality.
6. **Feedback Loop**: Enable farmers to provide feedback on the recommendations provided by the system, facilitating continuous improvement and customization based on their specific needs and preferences.

What value addition are you planning?

1. **Predictive Analytics**: Implementing algorithms to analyze historical data and provide predictive insights on crop growth, pest infestations, or weather patterns, allowing farmers to make informed decisions.
2. **Mobile Application Integration**: Developing a user-friendly mobile app that allows farmers to remotely monitor their fields, receive alerts, and control IoT devices, enhancing accessibility and convenience.
3. **Machine Learning Integration**: Incorporating machine learning models to optimize resource usage, such as water and fertilizers, based on real-time environmental data, leading to more efficient farming practices.
4. **Customization and Scalability**: Designing the system to be modular and scalable, enabling farmers to customize the solution according to their specific needs and easily expand it as their operations grow.

4.1 Code submission (Github link)

https://github.com/yashwanthkumar324/upskillcampus

4.2 Report submission (Github link) :

https://github.com/yashwanthkumar324/upskillcampus/blob/main/Agriculture_pivotal%20_IoT_aids_Yashwanth_USC_UCT.pdf

5 Proposed Design/ Model

The proposed design for the smart agriculture IoT project encompasses a network of sensors strategically deployed across farmlands to monitor crucial environmental parameters. These sensors, equipped to measure temperature, humidity, soil moisture, and soil temperature in real-time, form the backbone of the system. Data collected by these sensors will be transmitted wirelessly to a central hub or cloud-based platform for processing and analysis. Through advanced algorithms and machine learning techniques, actionable insights will be generated, enabling farmers to make informed decisions regarding irrigation, fertilization, and crop management. Additionally, the system will feature a user-friendly interface accessible via mobile or web applications, providing farmers with intuitive tools to visualize data trends and receive timely alerts. This comprehensive approach to smart agriculture aims to optimize resource utilization, enhance crop yields, and improve overall agricultural productivity.

6 Performance Test

The performance test for the smart agriculture IoT project involves rigorous evaluation of its capability to provide accurate and timely data on temperature, humidity, soil moisture, and soil temperature. This test assesses the responsiveness of the IoT devices in capturing and transmitting live data, ensuring reliability under various environmental conditions. Additionally, stress testing is conducted to determine the system's capacity to handle a high volume of data requests without compromising performance. Furthermore, the project undergoes scalability testing to verify its ability to accommodate growth in the number of connected devices and users while maintaining optimal performance levels. Overall, the performance test aims to validate the project's effectiveness in facilitating efficient environment monitoring for farmers, thereby enhancing agricultural productivity and product quality.

6.1 Test Plan/ Test Cases

The test plan for the smart agriculture IoT project involves verifying the functionality and performance of the system to ensure its effectiveness in aiding farmers. Firstly, the project's user interface and navigation must be tested to ensure ease of use. Test cases should cover scenarios such as accessing live data on temperature, humidity, soil moisture, and soil temperature. Additionally, tests should be conducted to verify the accuracy and reliability of the data provided by the IoT devices. The system's ability to alert farmers in case of abnormal conditions, such as extreme temperatures or moisture levels, should also be thoroughly tested. Furthermore, performance tests should be carried out to assess the system's response time and scalability under various load conditions. Finally, compatibility testing should be performed to ensure seamless operation across different devices and platforms commonly used by farmers.

6.2 Test Procedure

The test procedure for the aforementioned project involves several steps to ensure its functionality and effectiveness. Firstly, each IoT device should be thoroughly tested individually to verify its proper operation in acquiring and transmitting data accurately. Once verified, the integration of these devices into the smart agriculture system needs validation to ensure seamless communication and data synchronization. Subsequently, simulated environmental conditions should be applied to assess the system's response and reliability under various scenarios. Additionally, field testing is essential to evaluate the system's performance in real-world agricultural settings. Finally, user acceptance testing should be conducted to gather feedback from farmers and stakeholders, allowing for any necessary adjustments to be made before full deployment.

6.3 Performance Outcome

The performance outcome for the aforementioned smart agriculture IoT project is anticipated to be highly impactful. By integrating advanced technology to provide farmers with real-time data on crucial environmental factors such as temperature, humidity, soil moisture, and soil temperature, the project aims to significantly enhance agricultural efficiency and productivity. With access to live data, farmers will be better equipped to make informed decisions regarding irrigation, fertilization, and crop management, ultimately leading to improved yield and product quality. Additionally, by facilitating more precise monitoring and control of environmental conditions, the project is expected to contribute to resource conservation and sustainability in agriculture. Overall, the performance outcome of the project is envisioned to revolutionize farming practices, leading to increased profitability and resilience in the agricultural sector.

7 My learnings

Through the development of the smart agriculture IoT project, I gained invaluable insights into the intricate relationship between technology and agriculture. The project taught me the significance of addressing persistent issues hindering agricultural development, such as access to real-time data on environmental conditions. By focusing on providing farmers with live data on temperature, humidity, soil moisture, and soil temperature, I learned how technology can empower them to make informed decisions and optimize their farming practices. This experience highlighted the potential of IoT devices in revolutionizing agriculture, ultimately contributing to increased yield and improved product quality while fostering sustainable farming practices.

8 Future work scope

Moving forward, there are several avenues for expanding and refining the smart agriculture IoT project. Firstly, integrating predictive analytics algorithms can forecast optimal planting times and crop management strategies based on collected environmental data. Additionally, incorporating remote control functionalities can enable farmers to adjust irrigation systems and environmental conditions remotely, optimizing resource usage and crop health. Furthermore, enhancing the scalability and interoperability of the system to support larger agricultural operations and compatibility with diverse IoT devices would be beneficial. Finally, exploring partnerships with agricultural research institutions and leveraging emerging technologies such as machine learning and blockchain can further advance the project's capabilities in optimizing agricultural practices and ensuring sustainable food production.