Industrial Internship Report on

"IoT-Based Temperature & Humidity Monitoring "

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 **"IoT-Based Temperature & Humidity Monitoring"** — a real-time environmental monitoring system that uses the **DHT11 sensor** connected to an **ESP32 microcontroller** to measure temperature and humidity data. This data is transmitted over **Wi-Fi** using the **HTTP protocol** and visualized on the **ThingSpeak cloud platform**. The project aimed to provide a low-cost, scalable solution for monitoring atmospheric conditions, which can be useful in applications such as agriculture, smart homes, and industrial environments. 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

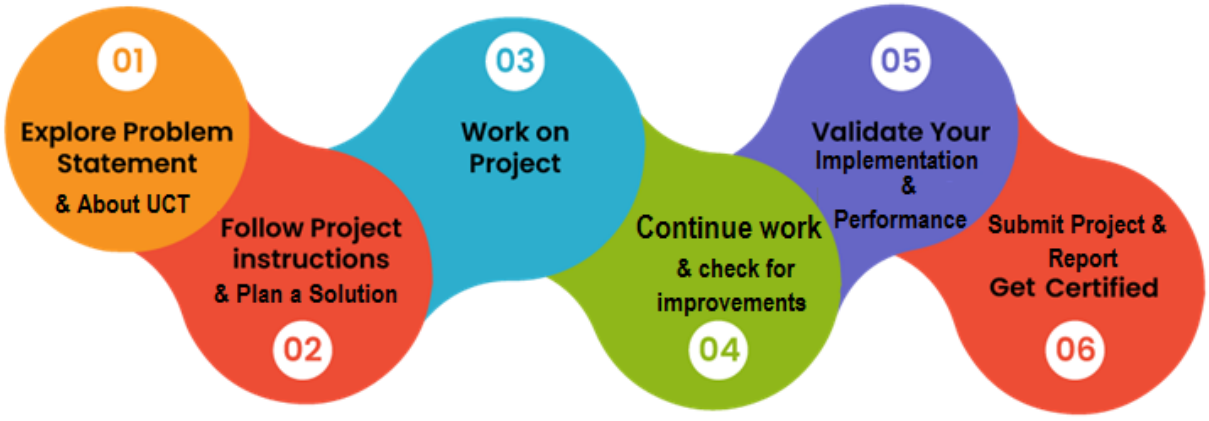
This report presents the summary of my six-week industrial internship program conducted by **Upskill Campus (USC)** and **The IoT Academy**, in collaboration with their industrial partner **UniConverge Technologies Pvt. Ltd. (UCT)**. The internship provided an excellent platform to gain real-world experience in the field of **Embedded Systems and IoT**, enabling me to work on a practical and industry-relevant project titled **"IoT-Based Temperature & Humidity Monitoring."**

In today's competitive and technology-driven landscape, hands-on industry exposure has become essential for engineering students. This internship allowed me to understand the industrial work culture, implement theoretical concepts in real-time, and develop technical and soft skills that will greatly aid my professional development.

The assigned project involved designing a real-time monitoring system using a **DHT11 sensor, ESP32 microcontroller, Wi-Fi connectivity**, and data visualization on **ThingSpeak** via **HTTP protocol**. This helped me grasp essential concepts of sensor interfacing, cloud communication, and IoT systems integration.

I would like to express my sincere gratitude to **Upskill Campus, The IoT Academy**, and **UniConverge Technologies Pvt. Ltd.** for providing me with this learning opportunity. Special thanks to the mentors and trainers who guided me throughout the program, especially **Mr. Sachin Yadav** and **Mr. Pradeep Kumar**, for their continuous support and encouragement.

This internship has significantly boosted my confidence and provided me with a solid foundation for my future career. I would strongly recommend all my juniors and peers to take full advantage of such internships as they bridge the gap between classroom knowledge and industrial practices.



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.

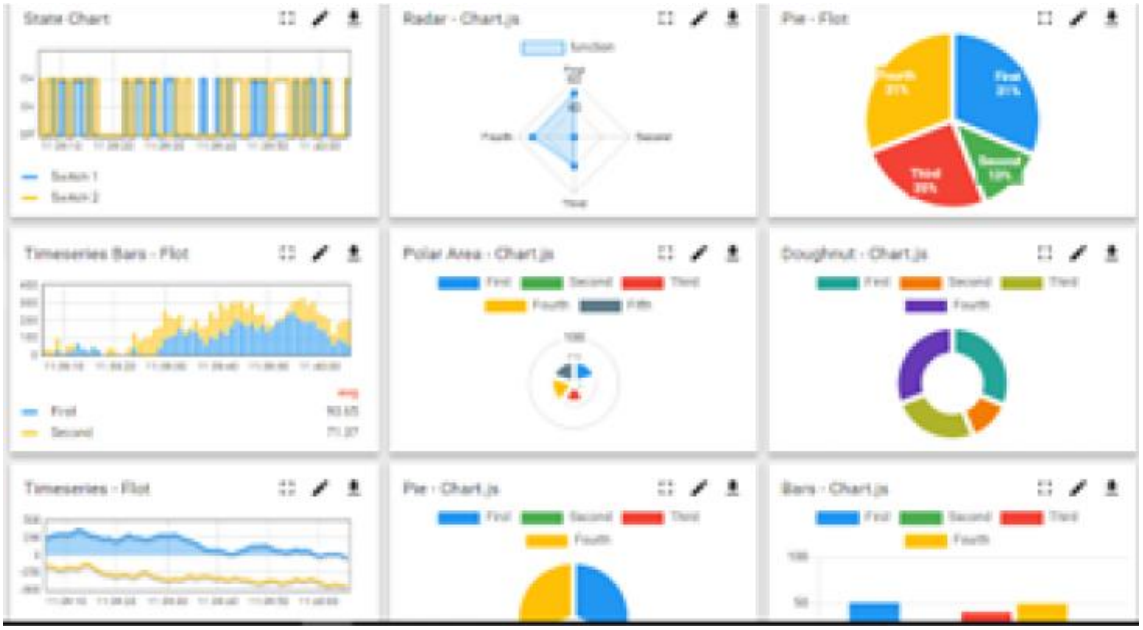
i. UCT IoT Platform (UCT Insight)

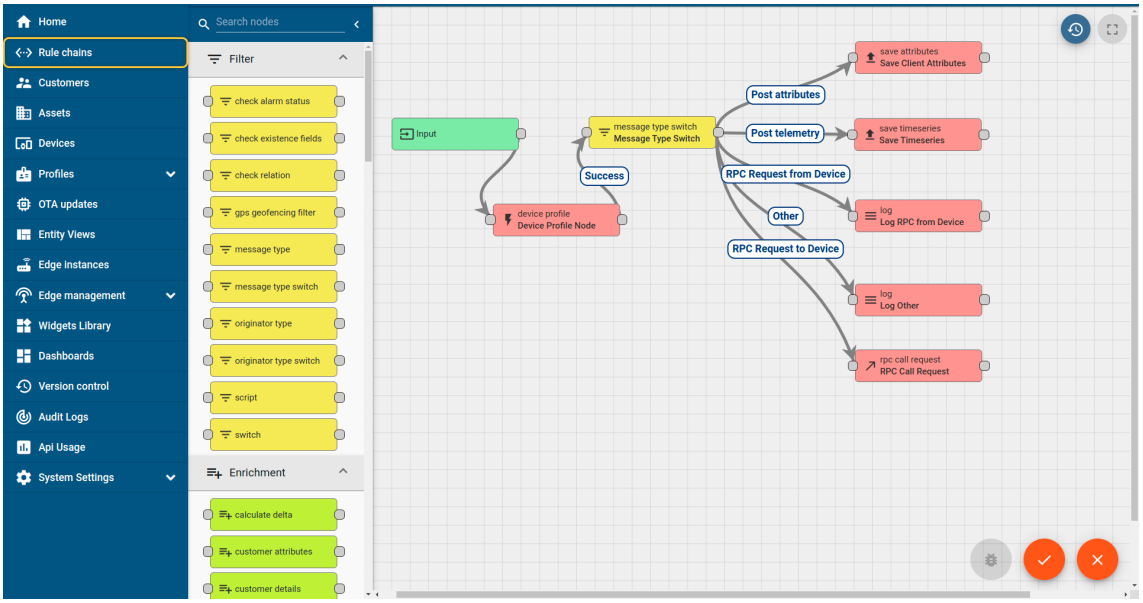
UCT Insight is an IOT platform designed for quick deployment of IOT applications on the same time providing valuable "insight" for your process/business. It has been built in Java for backend and ReactJS for Front end. It has support for MySQL and various NoSql Databases.

- 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.

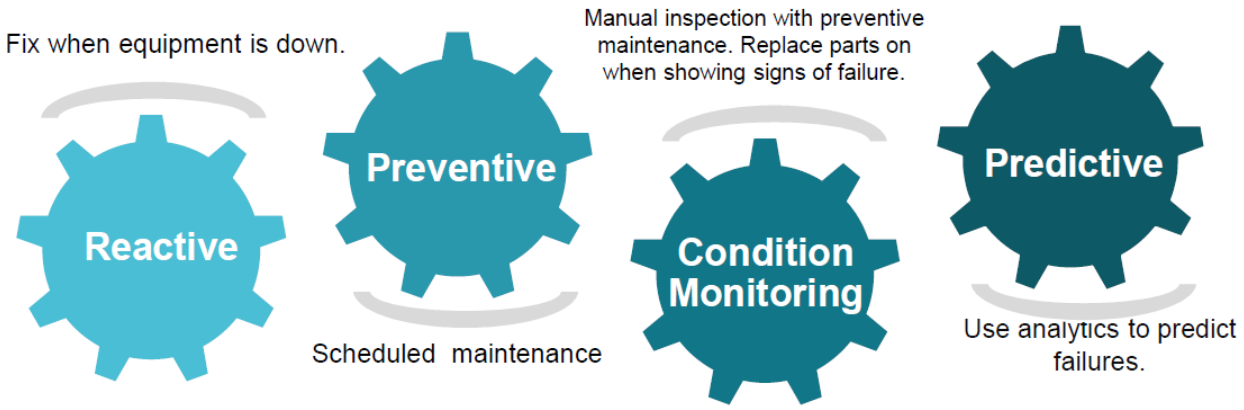
Machine	Operator	Work Order ID	Job ID	Job Performance	Job Progress		Output		Rejection	Time (mins)				Job Status	End Customer
					Start Time	End Time	Planned	Actual		Setup	Pred	Downtime	Idle		
CNC_S7_81	Operator 1	WO0405200001	4168	58%	10:30 AM		55	41	0	80	215	0	45	In Progress	i
CNC_S7_81	Operator 1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

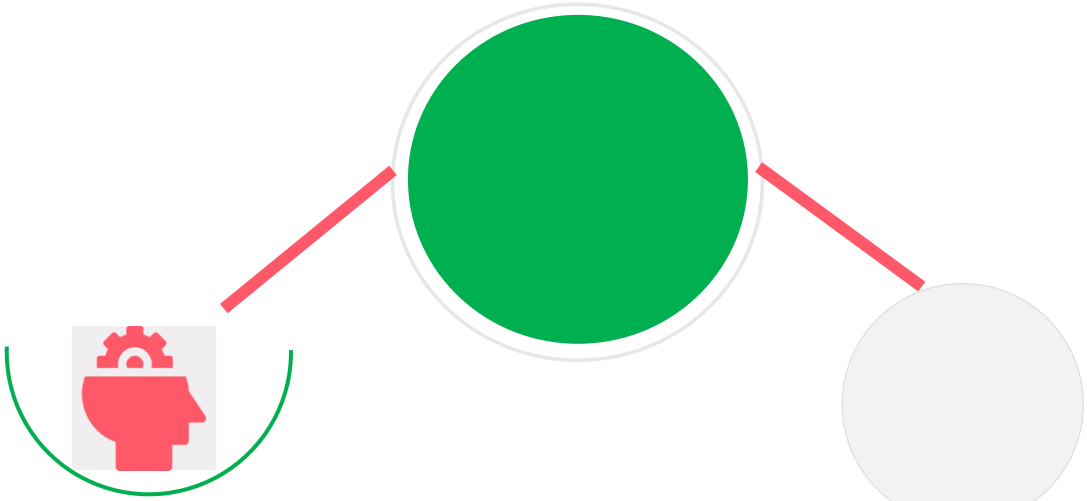
UCT is providing Industrial Machine health monitoring and Predictive maintenance solution leveraging Embedded system, Industrial IoT and Machine Learning Technologies by finding Remaining useful life time of various Machines used in production process.



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.

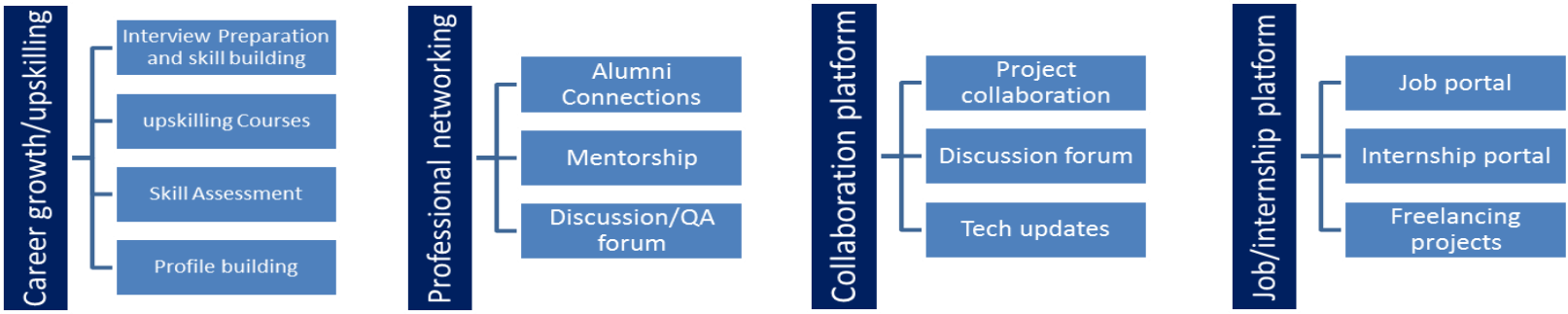
USC is a career development platform that delivers **personalized executive coaching** in a more affordable, scalable and measurable way.



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/



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] ThingSpeak Documentation – https://thingspeak.com/docs

[2] DHT11 Sensor Datasheet – https://components101.com/sensors/dht11-temperature-sensor

[3] ESP32 Technical Reference Manual – https://docs.espressif.com/projects/esp-idf/en/latest/esp32/technical_reference/

2.6 Glossary

Terms	Acronym
Internet of Things	IoT – Network of physical devices connected to the internet to collect and exchange data
Hypertext Transfer Protocol	HTTP – Protocol used to send data to the web/cloud
Wi-Fi	Wireless Fidelity – Wireless communication technology used for data transmission
Thing Speak	An IoT cloud platform for data storage and visualization
D**HT11**	Digital Temperature and Humidity Sensor

3. Project title

IoT-Based Temperature & Humidity Monitoring

The aim of this project is to design and develop a real-time temperature and humidity monitoring system using the **DHT11 sensor**, **ESP32 Wi-Fi module**, and the **ThingSpeak cloud platform**. This project helps in understanding how environmental parameters can be measured and uploaded to the cloud for remote monitoring and analysis.

The system gathers data from the DHT11 sensor, processes it using the ESP32 microcontroller, and transmits it via HTTP protocol to the ThingSpeak platform using Wi-Fi. This project reflects a practical and scalable application of IoT technology in domains such as smart agriculture, weather stations, and industrial environment monitoring.

4. Existing and Proposed Solution

- **4.1 Existing Solutions**

Many traditional systems for temperature and humidity monitoring involve manual data logging or the use of expensive commercial-grade IoT systems. These setups are often costly, complex to maintain, or not suitable for small-scale use.

- **4.2 Proposed Solution**

The proposed solution is a **cost-effective**, **Wi-Fi-based** IoT system using **ESP32**, **DHT11**, and **ThingSpeak**. The system is designed for:

- Real-time monitoring.
- Easy wireless data transmission via HTTP.
- Online data visualization using the ThingSpeak dashboard.

This setup allows users to access environmental data from anywhere via the internet, ensuring remote monitoring and analysis.

- **4.3 Value Addition**
- Budget-friendly and beginner-friendly design.
- Easy integration with other sensors and cloud services.
- Scalable for future features like data alerting or control systems.

- **4.4 Code Submission**

GitHub link placeholder:
https://github.com/MANJEET-FRONTEND-DEVELOPER/upskillcampus/blob/main/IoT_TempHumidity_Monitoring_Manjeet.c

4.5 Report Submission

https://github.com/MANJEET-FRONTEND-DEVELOPER/upskillcampus/blob/main/IoT_TempHumidity_Monitoring_Manjeet_USC_UCT.pdf

5. Proposed Design/Model

- **5.1 High-Level Diagram**

High-Level Flow:

[DHT11 Sensor] → [ESP32 Microcontroller] → [Wi-Fi] → [ThingSpeak Cloud]

- The DHT11 reads temperature and humidity.
- ESP32 processes the data and formats an HTTP GET request.
- Data is uploaded to the ThingSpeak channel using an API key.
- Pin connections:
    - DHT11 DATA → GPIO 4 pin of ESP32
    - VCC → 3.3V
    - GND → GND
- Internal logic:
    - Read sensor → Format data → Connect Wi-Fi → Send to ThingSpeak
- **5.2 Interfaces**
- **Sensor Interface**: DHT11 via GPIO.
- **Wi-Fi Communication**: ESP32 connects to a local network.
- **HTTP Interface**: Uses GET method with API key to send data to ThingSpeak.
- **Cloud Visualization**: ThingSpeak dashboard graphs the values.

6. Performance Test

- **6.1 Test Plan / Test Cases**

Test Case	Expected Output	Result
Sensor Reads Correctly	Valid temperature & humidity	Pass
Wi-Fi Connection	ESP32 connects to Wi-Fi	Pass
HTTP Request	Data sent successfully	Pass
ThingSpeak Update	Data visible on dashboard	Pass

- **6.2 Test Procedure**
- Load code onto ESP32.
- Power up and connect to Wi-Fi.
- Observe serial monitor for HTTP status codes.
- Verify data on ThingSpeak every 15–30 seconds.
- **6.3 Performance Outcome**
- Data was successfully read every 30 seconds.
- No significant delays or failed transmissions observed.
- The system worked reliably in a controlled environment.
- Power consumption was low (~150–200mA during transmission).

7. My Learnings

- Understood how to interface DHT11 sensor with ESP32.
- Learned to structure HTTP GET requests for cloud platforms.
- Gained experience in using ThingSpeak for IoT data visualization.
- Improved debugging skills using the serial monitor and code tracing.
- Built confidence in designing and executing an end-to-end IoT project.

8. Future Work Scope

- Add multiple sensors (e.g., soil moisture, light sensors).
- Implement alerting features using email or Telegram bots.
- Extend the project to include local data logging on SD card.
- Use solar power for standalone operation.
- Explore integration with home automation systems.