

Industrial Internship Report on
"IoT based Air Quality Monitoring System"

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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 Air Quality Monitoring System.

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

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.

Thanks to Ankit from UpSkill campus for clarifying doubts, Tushar for helping me out while I was facing problem and Venkataramesh for guiding me through problem.

Use this opportunity to learn and implement real-time problems. This is really a great opportunity from UpSkill campus. Expecting more of these also in future.

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.



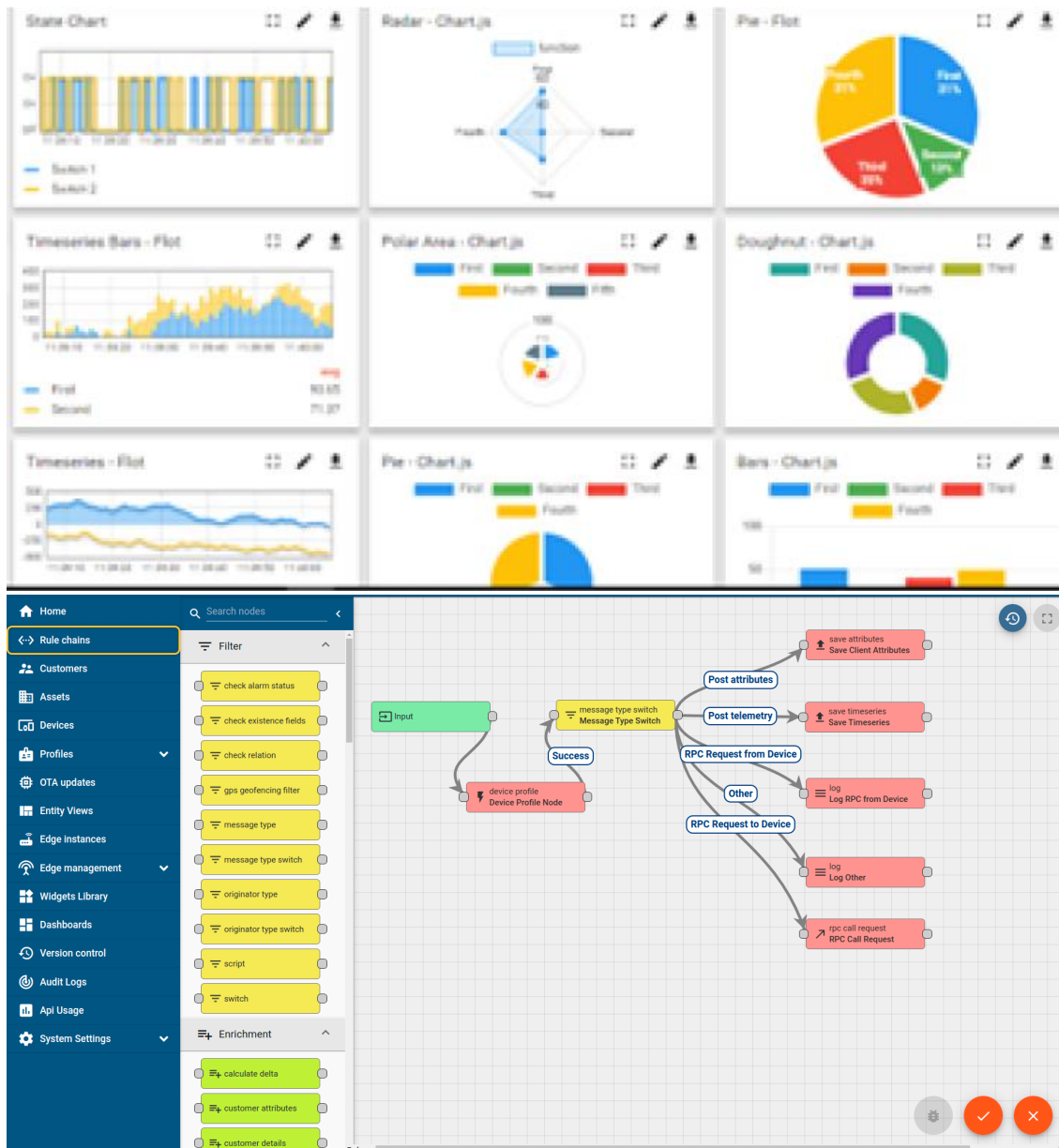
i. UCT IoT Platform ()

UCT Insight 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



FACTORY WATCH

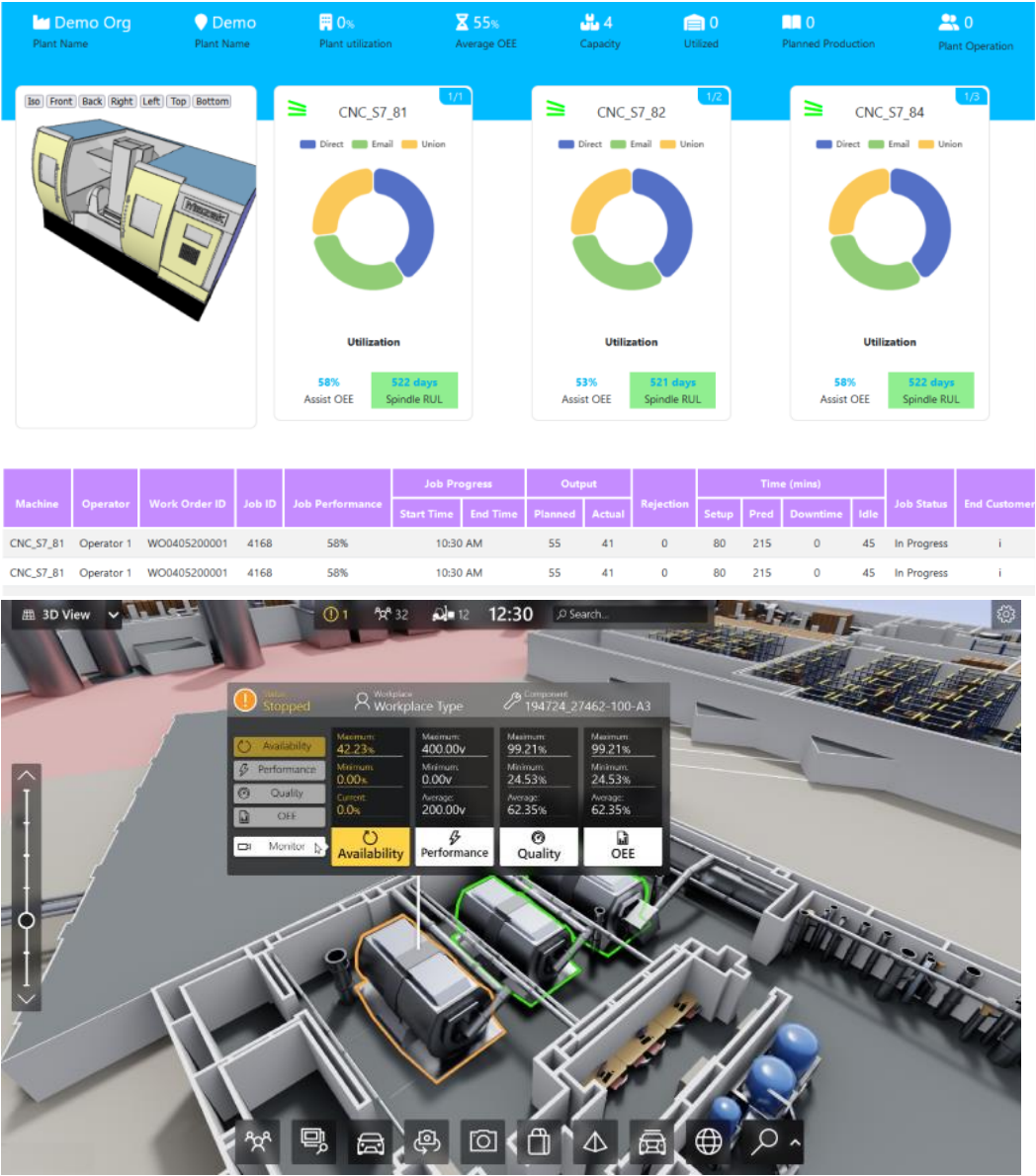
ii. Smart Factory Platform ()

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 unleash 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 want 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.





iii. based Solution

UCT is one of the early adopters of LoRAWAN technology and providing solution in Agritech, Smart cities, Industrial Monitoring, Smart Street Light, Smart Water/ Gas/ Electricity metering solutions etc.

iv. Predictive Maintenance

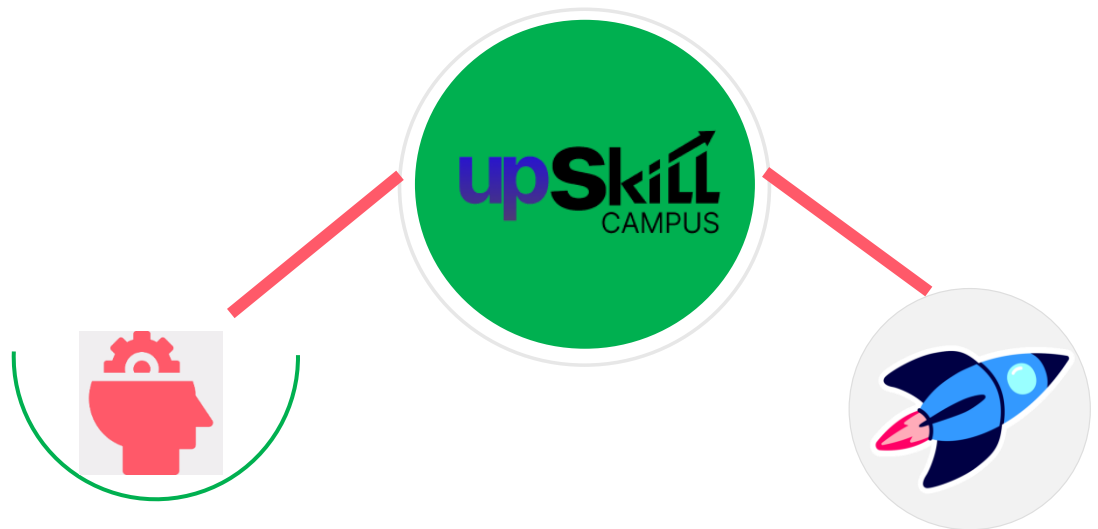
UCT is providing Industrial Machine health monitoring and Predictive maintenance solution leveraging Embedded system, Industrial IoT and Machine Learning Technologies by finding Remaining useful life time of various Machines used in production process.



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] Social media (LinkedIn)
- [2] Friends
- [3] Mail

2.6 Glossary

Terms	Acronym
AQI	Air Quality Index
PPM	Parts Per Million
UART	Universal Asynchronous Reciever/Transmitter
IDE	Integrated Development Environment
IoT	Internet of Things

3 Problem Statement

IoT based Air Quality Monitoring System

Foreign substances are introduced into the environment that has damaging effects on the livelihood in the environment is called air pollution. This pollution effects the quality of the environment and air. Detecting all the unwanted substances and the components in the air and passing the information to the host to manage the air pollution is called as air quality management.

Real time air pollution monitoring is very vital. It provides a lot of useful and accurate information to the public and the decision makers to improve the quality of their environment and implement measures to control the pollution. This real-time air monitoring plays a very vital role in densely populated areas which helps to access the values of micro level air pollution. Monitoring these pollutants with the help of IoT is very cost effective and it also provides real time analysis.

Factors effecting the quality of air

- Increase in automobile industries and the usage of automobiles which emit harmful gasses and aerosols in the environment.
- Medical waste is the main factor effecting the quality.
- Sulphur and nitrogen used for crop production pose a significant health hazards to the quality of environment as well as soil and crop production. Etc etc...

For continuous monitoring of Air quality levels, An IoT based Smart Air Quality monitoring system is developed and has been brought forward for the above purpose.

4 Existing and Proposed solution

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

All the existing solutions are based on the online monitoring system where the user will know only when they are on website and check about their location quality.

Limitations: High cost of maintenance and not every citizen can access to this website.

What is your proposed solution?

To use the stations located in crowded areas to read the air quality samples and send it to the cloud so that the resources and time are consumed less and the information is transmitted.

What value addition are you planning?

Stations, located in crowded areas of the city, periodically read a number of samples containing data from attached sensors. The data is transferred using a low-resource protocol.

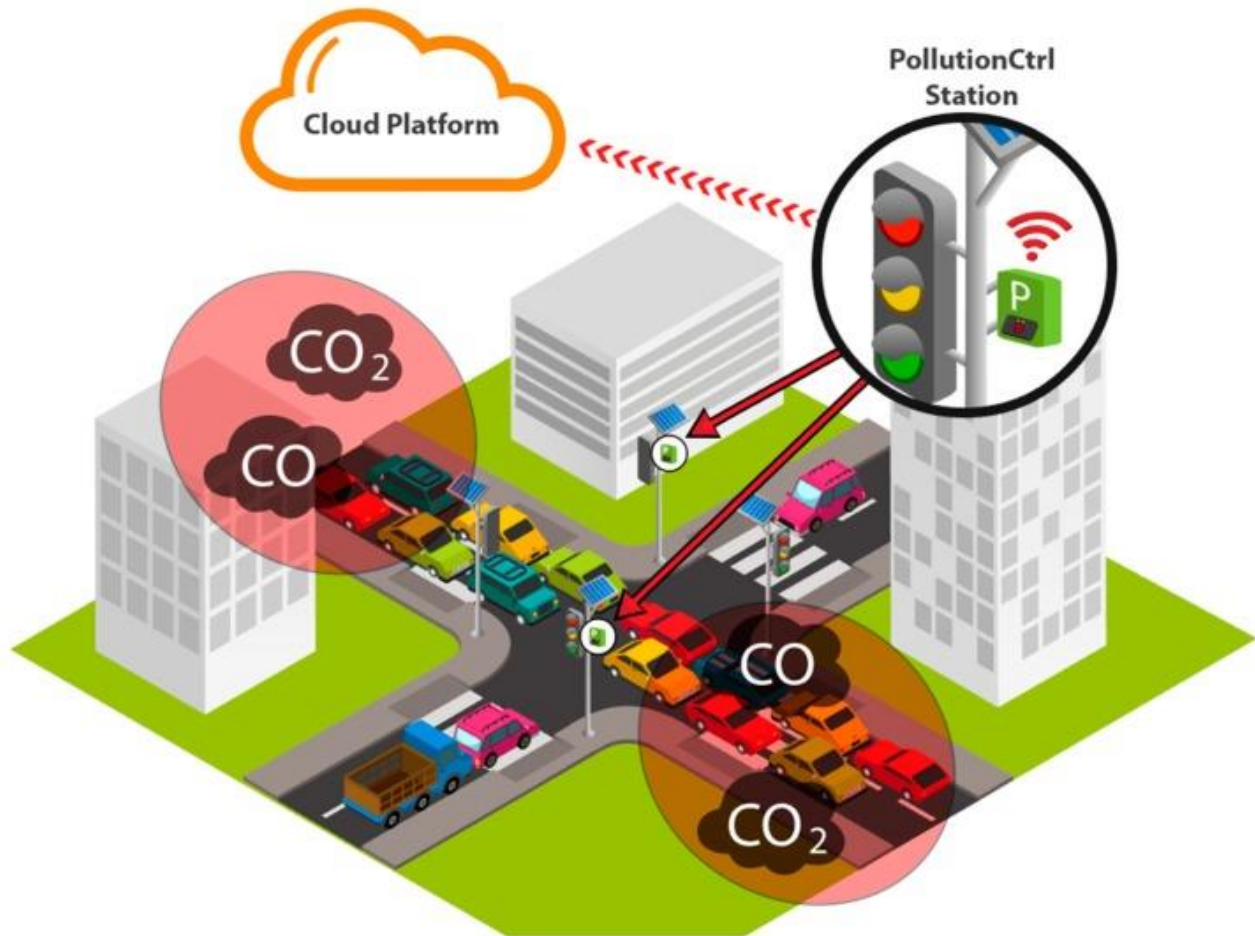
4.1 Code submission (Github link)

<https://github.com/SahithiKollipara/upskillcampus>

4.2 Report submission (Github link):

<https://github.com/SahithiKollipara/upskillcampus>

5 Proposed Design/ Model



5.1 Interfaces (if applicable)

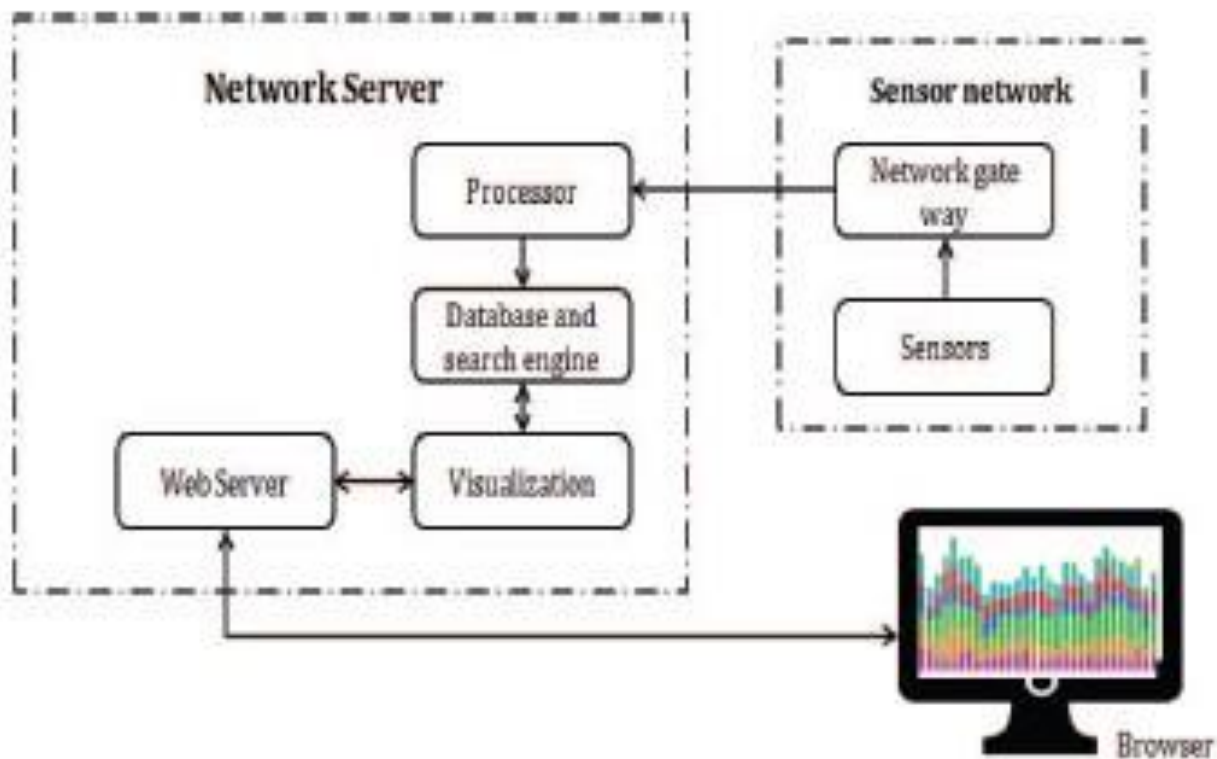


Fig. 1. Architecture Diagram

6 Performance Test

The constraint in my project is it might be little time taking. In terms of power consumption, it takes consumes comparatively less. But in terms of accuracy I have tried my level best to maintain it.

How those constraints were taken care in your design?

The delays in between the processing and calculation have been modified number of times and I have seen to that the readings are delivered properly with possible accuracy.

What were test results around those constraints?

I couldn't actually test my code but the constraints that I have mentioned may or may not be affecting my program. In any case of affect make sure to rearrange the values of delays and slope float values for required outcomes.

6.1 Test Plan/ Test Cases

PPM of Carbon Dioxide in Air = _____ ppm

PPM of ammonia in Air = _____ppm

PPM of Carbon monoxide in Air = _____ppm

PPM of Flammable gasses in Air = _____ppm

6.2 Test Procedure

Connect the circuit, sensors and also connect the circuit and the sensors to the same server to transmit the message produced.

All the code should be written in the Arduino that is used. Set the values of delays and float according to the requirement.

The sensor raw data is converted to the necessary Parts Per Million (PPM) data format to implement the concept of Edge Computing. Therefore, levels of hazardous gases such as Carbon Monoxide, Carbon Dioxide and Ammonia can be detected and if required, necessary actions can be initiated to reduce the pollution. After the data is collected from the sensors, the data interpretation process begins.

6.3 Performance Outcome

The IoT framework can be utilized for observing the Air Pollution of certain localities and help in rectifying the existing problems of Air Pollution in such areas.

7 My learnings

In this project IoT based on measurement and display of Air Quality Index (AQI), Humidity and Temperature of the atmosphere have been performed. From the information obtained from the project, it is possible to calculate Air Quality in PPM.

After performing several experiments, it can be easily concluded that the setup is able to measure the air quality in ppm, the temperature in Celsius and humidity in percentage with considerable accuracy.

Since it's an IOT-based project, it will require a stable internet connection for uploading the data to the ThinkSpeak cloud. Therefore, it is possible to conclude that the designed prototype can be utilized for air quality, humidity and temperature of the surrounding atmosphere successfully.

This was a very interesting topic to learn and explore. I have dedicated all of my heart in completing this project and it was really fun learning experience.

Thanks to all the people who have helped me through out and thanks to upskill platform that I have been able to grab the opportunity and give my best through out.

8 Future work scope

All the front end and the hardware testing to develop a major project is the major drawback that I have faced.

But I intend to develop a whole project based on this Air Quality Monitoring system.