# Internship Report

## Internet of Things and It's Applications

## DLithe Consultancy Services Pvt. Ltd.

# Internship Report

**Trainee/Intern Name:** B R PRATIBHA, RAGHAV REDDY, ADARSH C R, MADHU SUDHAN D R

**Period:** 1MONTH

**Job Assignment:** SMART ENERGY METER USING IOT

**Organization:** DLithe Consultancy Services Pvt. Ltd.

**Supervisor's Name:** KARTHIK KUMAR S, ARCHANA S M

**Observations:** We the team of 4 members did the project of Smart Energy Meter using IoT. Smart energy meter using IoT is a system that can measure and monitor the energy consumption of various appliances and devices, and transmit the data wirelessly to a remote server or platform. This proposed smart meter is used to automatically measure energy consumption and automatically calculate the bill with the help of IoT and GSM techniques. This work deals with the energy consumption units measured from the user's location and calculates the bill consisting of hardware and software parts.

**Submitted to**

27 -11- 2023

Signature of Training Supervisor

Date:

Signature of Co-ordinator

Date:

# Letter of Transmittal

To,

Program Co-ordinator
DLithe Consultancy services
Bengaluru

Dear Sir,

I am writing to submit my report on IoT Internship that I recently completed on Internet of Things (IoT). The training program was an invaluable learning experience, and I am grateful for the opportunity to participate.

The training program covered various aspects of IoT including basic concepts, algorithms, programming languages, and practical applications. I gained a comprehensive understanding of the role of IoT in modern technology and industry, and also gained hands-on experience with IoT tools and platforms. The training highlighted the potential of IoT to revolutionize various fields, including healthcare, finance, and manufacturing.

The report includes a detailed overview of the training program, including the topics covered, the learning objectives, and the outcomes achieved. It also provides observations and insights into the potential benefits and challenges of implementing IoT in different fields.

I believe that the knowledge and skills that I acquired during the training program will be valuable to our organization. IoT are rapidly becoming more ubiquitous in various industries, and the ability to work with IoT tools and platforms will be increasingly important for our organization's success.

I hope that the report provides useful insights into the benefits of on-job training and the potential of IoT.

Sincerely,

Name: B R PRATIBHA, RAGHV REDDY, ADARSH C R, MADHU SUDHAN D R

Reg. no: 4GM21EC016, 4GM21EC054 ,4GM21EC001, 1AM22MC046.

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# Introduction

The Internet of Things (IoT) describes the network of physical objects things that are embedded with sensors, software, and other technologies for the purpose of connecting and exchanging data with other devices and systems over the internet. These devices range from ordinary household objects to sophisticated industrial tools.

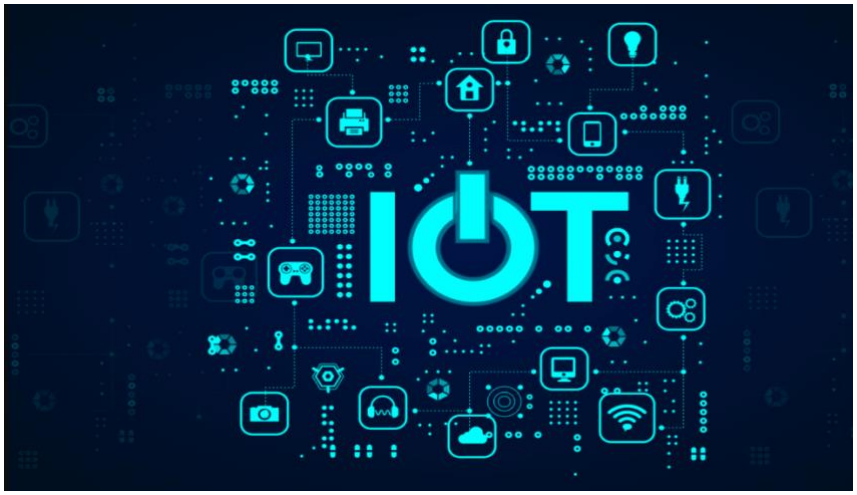
The Internet of Things (IoT) has emerged as a transformative technology, reshaping the way we interact with the world around us. At its core, IoT refers to the interconnected network of devices that communicate and exchange data through the internet. These devices, equipped with sensors and actuators, form a vast ecosystem capable of collecting, transmitting and analyzing information in real-time.

As we delve into the intricacies of IoT, it becomes evident that its impact extends across various domains, influencing how we live, work, and engage with technology.

At a fundamental level, IoT represents the convergence of the physical and digital realms. Everyday objects, ranging from household appliances to industrial machinery, are embedded with sensors that gather data.

These sensors enable devices to perceive their environment, collecting information such as temperature, humidity, and motion. Through internet connectivity, this data is then shared with other devices and systems, forming a network that facilitates intelligent decision-making.

The success of IoT hinges on its key components. Sensors act as the sensory organs, detecting changes in the environment. Actuators, on the other hand, execute actions based on the information received.



# Overview

The Internship Training program on Iot and IoT that I participated in was conducted by a technology company. The program was designed to provide a comprehensive overview of the latest advancements in the field of IoT and to equip participants with the skills and knowledge required to build intelligent systems and applications.

The training program consisted of practical hands-on sessions. The lectures covered a wide range of topics, including the fundamentals of IoT various techniques and algorithms used in machine learning, and the latest developments in deep learning and neural networks. The practical sessions involved working on various projects and implementing machine learning algorithms on real-world datasets.

Embarking on a transformative journey into the realm of the Internet of Things (IoT) during our internship at DLithe we dove into a dynamic landscape where innovation meets practical application.

This overview provides a glimpse into the multifaceted experience that defined our time at DLithe shaping our Spanning a determined timeframe, our IoT internship at DLithe unfolded in a structured manner, balancing theoretical insights with hands-on experience.

Through a curated curriculum, we navigated through the intricacies of IoT, from fundamental concepts to advanced applications. Understanding of IoT and preparing us for the challenges and opportunities that lie ahead.

Throughout the internship, mentorship played a pivotal role. DLithe provided experienced mentors who not only guided us through the technical aspects but also shared valuable insights from their industry experience, bridging the gap between academia and the professional IoT landscape.

Encountering challenges is inherent in any learning process. Our internship at DLithe exposed us to real-world IoT challenges, prompting us to think critically, troubleshoot effectively, and collaborate on innovative solutions. The internship fostered a collaborative environment, encouraging interaction and knowledge-sharing among interns. Team projects and collaborative problem-solving sessions nurtured a sense of camaraderie and collective growth. In retrospect, our time at DLithe was not merely an internship it was a transformative experience that equipped us with the knowledge, skills, and confidence to navigate the future of IoT with a profound understanding of its intricacies and potential.

# Project / Use Case implementation

The objective of the project was the user can check their Power usage from anywhere and at any time interval. The IoT is used to Turn on/off the household appliances using relay and Arduino interfacing.

The objective of this system is to monitor the amount of electricity consumed.

This project aimed to enhance urban mobility through the implementation of Internet of Things (IoT) technologies, addressing traffic congestion and optimizing transportation systems.

Data Collection: The first step was to collect data from various sources such as credit card transactions, customer demographics, and customer feedback.

Data Preprocessing: The collected data was preprocessed to remove duplicates, missing values, and outliers.

Data cleaning techniques such as imputation, normalization, and scaling were applied to prepare the data for analysis.

Feature Selection: The relevant features were selected for analysis based on their importance and correlation with the target variable.

Clustering Algorithm Selection: Different clustering algorithms such as K-Means, Hierarchical Clustering, and DBSCAN were evaluated and compared to select the best algorithm for the data.

Model Training: The selected clustering algorithm was trained on the preprocessed data to generate clusters of credit card customers.

Cluster Analysis: The generated clusters were analyzed and interpreted to gain insights into the spending patterns and preferences of each cluster.

Results Visualization: The results of the analysis were visualized using charts and graphs to make it easy for stakeholders to understand and interpret the findings.

Dynamic Traffic Light Control: Based on the analysis, the system adjusted traffic light timings dynamically to optimize the flow of vehicles and reduce congestion.

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## Tools and Technologies Used:

During the project, I used various tools and technologies such as:

Arduino Software: The Arduino Software (IDE) makes it easy to write code and upload it to the board offline. We recommend it for users with poor or no internet connection.

ESP32: The ESP32 development board can communicate with the outside world using two main approaches: wired and wireless communication.

ESP32 can be used for monitoring and collecting data from environmental sensors such as temperature, humidity, air quality, barometric pressure and pollution sensors for applications such as smart agriculture, smart cities, and environmental monitoring systems.

Current Sensor: The current sensor is a device that detects and converts current to get an output voltage, which is directly proportional to the current in the designed path. When current is passing through the circuit, a voltage drops across the path where the current is flowing.

Voltage Sensor: A voltage sensor is a device that measures voltage. Voltage sensors can measure the voltage in various ways, from measuring high voltages to detecting low current levels. These devices are essential for many applications, including industrial controls and power systems.

Bulb and Bulb holder: We used the bulb of 20 Watt. To understand how bright a light bulb will shine, a buyer should look at the lumens.

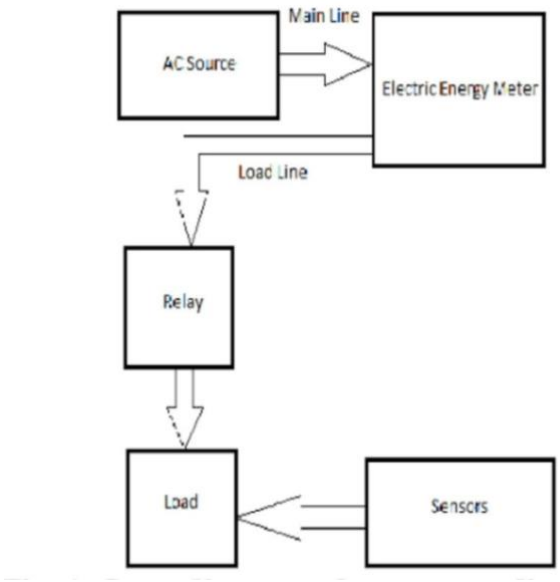
Lumens indicate the brightness, while watts indicate energy used to power the light bulb.

Connecting wires: Connecting wires are one of the most important components in an electrical circuit because these are the components through which electricity flows from one electrical component to another.

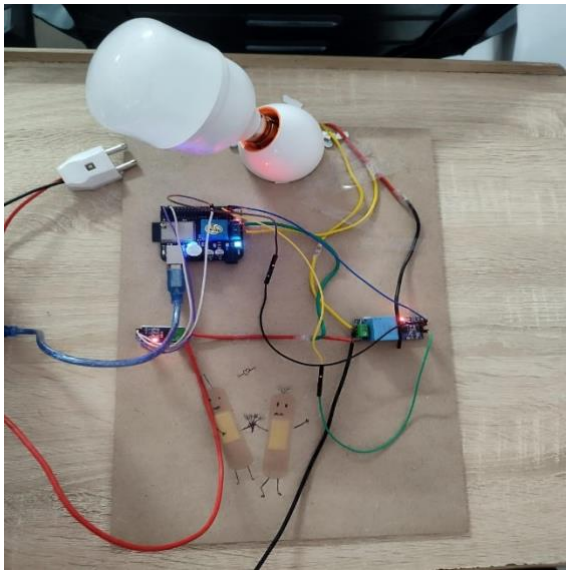
It is with the help of wire that electricity flows from cell to light bulb.

Jumpers (F to F): A jumper wire is an electric wire that connects remote electric circuits used for printed circuit boards. By attaching a jumper wire on the circuit, it can be short-circuited and short-cut (jump) to the electric circuit.

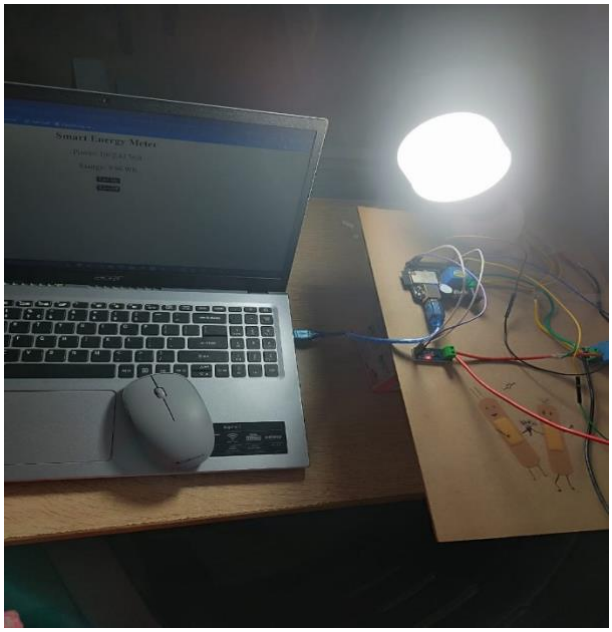
**Reference Images:**



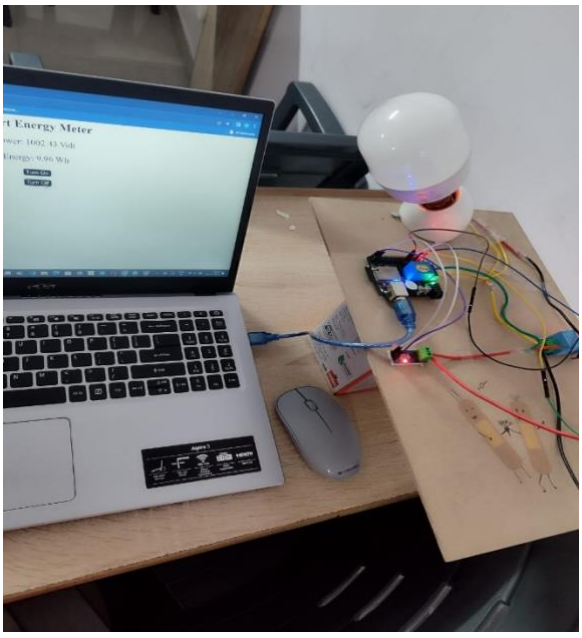

BLOCK DIAGRAM



CIRCUIT DIAGRAM



LED ON USING SMART ENERGY METER



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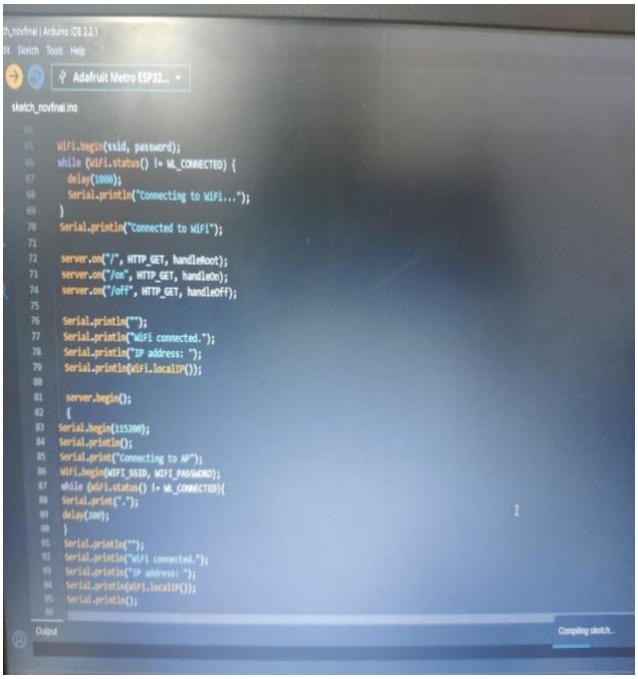


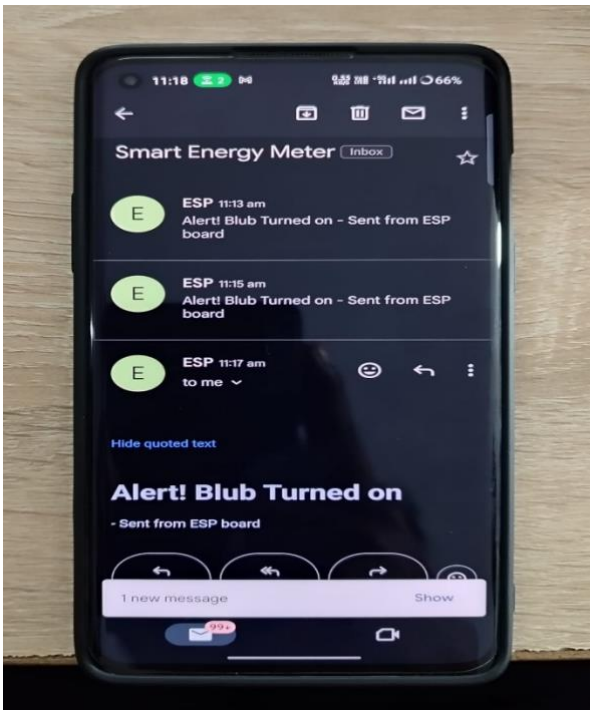


PROGRAM

ALERT MESSAGE IN BULB

GROUP PHOTO OF TEAM MEMBERS WITH KARTHIK SIR

## Training Experience

Hands-on Learning: My training program was designed to provide hands-on experience with IoT tools and technologies. I was given the opportunity to work on real-world projects and problems, which helped me develop practical skills and apply theoretical concepts.

Mentorship: I was fortunate to have a mentor who was an experienced professional. My mentor provided guidance, feedback, and support throughout my training program, which was invaluable in my learning journey.

Collaboration: One of the most exciting aspects of my training program was the opportunity to work with a team of professionals from different backgrounds. We collaborated on projects and shared ideas, which helped me develop my communication and collaboration skills.

Exposure to Industry Trends: I was able to stay up-to-date with the latest industry trends and developments in IoT through various workshops, seminars, and conferences.

This helped me gain a broader perspective on the field and prepare for future challenges.

Use of Industry-standard Tools and Technologies: During my training, I had the opportunity to work with industry-standard tools and technologies such as Python, TensorFlow, Keras and Scikit-Learn. This allowed me to gain practical skills that are in demand in the industry.

Importance of Data Preparation: One of the most important lessons I learned during my training was the critical role of data preparation in the success of AI and ML projects.

I learned how to collect, clean, and preprocess data to make it suitable for training models.

Iterative Process: I also learned that developing an IoT model is an iterative process that requires a lot of experimentation and tweaking. It is essential to have a feedback loop that allows for continuous improvement of the model.

## Observations:

During my intership training on Internet of Things I was able to observe several important things. Here are my observations:

One prominent aspect of my observations was the diversity of IoT devices and their applications. From smart home devices like thermostats and security cameras to industrial sensors monitoring machinery, the breadth of IoT implementations showcased the versatility of this technology. Witnessing firsthand how these devices seamlessly communicated and exchanged data highlighted the interconnected nature of the IoT ecosystem.

Moreover, the internship underscored the critical role of connectivity protocols. I observed the significance of protocols such as MQTT and CoAP in enabling efficient communication between devices. Understanding how these protocols facilitated real-time data exchange not only enhanced my technical knowledge but also deepened my appreciation for the complexity of building a robust IoT infrastructure.

On the hardware front, I had the opportunity to work with various sensors, actuators, and microcontrollers. Exploring the intricacies of sensor technologies, such as RFID and environmental sensors, broadened my understanding of how IoT devices collect and transmit data. Additionally, hands-on experience with microcontrollers like Arduino and Raspberry Pi offered valuable insights into the hardware components that form the backbone of IoT solutions.

Data analytics emerged as a crucial aspect of my internship observations. Processing and analyzing the vast amounts of data generated by IoT devices proved to be a multifaceted challenge. I gained exposure to tools and techniques for managing, storing, and extracting meaningful insights from IoT-generated data. The importance of data security and privacy in the context of IoT became apparent as I delved into the intricacies of safeguarding sensitive information.

Challenges also surfaced during the internship, particularly in the realm of interoperability. Integrating diverse devices from different manufacturers underscored the need for standardized protocols and frameworks to ensure seamless communication.

Navigating through compatibility issues highlighted the importance of addressing interoperability challenges for the widespread adoption of IoT technologies.

## Key Learnings

During the training program, I learned a range of skills and concepts related to Internet of Things Some of the key skills that I acquired are:

Diverse Applications: One key learning from my IoT internship was the wide range of applications for IoT technology. From smart homes to industrial processes, the versatility of IoT in addressing various needs became evident.

Connectivity Protocols: Understanding the importance of connectivity protocols like MQTT and CoAP was crucial. These protocols facilitate efficient communication between IoT devices, forming the backbone of a seamless network.

Hardware Exploration: Hands-on experience with different sensors, actuators, and microcontrollers provided insights into the hardware components that make up IoT solutions. This exploration enhanced my understanding of how devices collect and transmit data.

Data Analytics: The internship highlighted the significance of data analytics in extracting meaningful insights from the vast amounts of data generated by IoT devices. Managing and analyzing this data proved to be a complex but essential aspect of IoT implementation.

Interoperability Challenges: Dealing with interoperability challenges emphasized the need for standardized protocols and frameworks. Ensuring compatibility between devices from different manufacturers is crucial for the successful integration of IoT solutions.

Data Security and Privacy: Protecting sensitive information emerged as a critical consideration. Learning about data security and privacy measures in the context of IoT underscored the importance of building robust security mechanisms into IoT architectures.

Real-world Problem Solving: The internship provided opportunities to address real-world challenges, from troubleshooting device connectivity issues to finding innovative solutions for data management and analytics.

Industry Impact: Recognizing the potential impact of IoT on industries and daily life was a significant takeaway. The internship instilled a sense of excitement about the transformative power of IoT in shaping the future.

Collaboration and Teamwork: Working on IoT projects often involved collaboration with multidisciplinary teams. Effective communication and teamwork were essential for tackling complex challenges and ensuring the success of projects.

Continuous Learning: The fast-paced nature of IoT technology highlighted the need for continuous learning. Staying updated on emerging trends and advancements in the field is crucial for staying at the forefront of IoT development.

## Applications of IoT

- Industry: IoT enables predictive maintenance by monitoring equipment health, reducing downtime and costs. Logistics and supply chain management benefit from IoT's real-time tracking of goods, improving efficiency.
- Environmental monitoring: Relies on IoT sensors to track pollution, climate conditions, and wildlife conservation efforts. Retail embraces IoT for inventory management and personalized customer experiences, utilizing beacons and smart shelves.
- Agriculture: For indoor planting, IoT makes monitoring and management of micro-climate conditions a reality, which in turn increases production. For outside planting, devices using IoT technology can sense soil moisture and nutrients, in conjunction with weather data, better control smart irrigation and fertilizer systems. If the sprinkler systems dispense water only when needed, for example, this prevents wasting a precious resource.
- HealthCare: First and foremost, wearable IoT devices let hospitals monitor their patients' health at home, thereby reducing hospital stays while still providing up to the minute real-time information that could save lives.
  In hospitals, smart beds keep the staff informed as to the availability, thereby cutting wait time for free space. Putting IoT sensors on critical equipment means fewer breakdowns and increased reliability, which can mean the difference between life and death.
- Transportation: By this time, most people have heard about the progress being made with self-driving cars. But that's just one bit of the vast potential in the field of transportation.
  The GPS, which, if you think of it, is another example of IoT, is being utilized to help transportation companies plot faster and more efficient routes for trucks hauling freight, thereby speeding up delivery times.
- Smart Grid and Energy: From intelligent energy meters to the installation of sensors at strategic places from the production plants to the distribution points,

IoT technology is behind better monitoring and effective control of the electrical network.

- A smart grid is a holistic solution employing Information Technology to reduce electricity waste and cost, improving electricity efficiency, economics, and reliability.

**Conclusion**

The smart energy meter using IoT project was a valuable learning experience that allowed me to apply my knowledge of data analytics and machine learning in a real-world setting. I gained hands-on experience with various data preprocessing techniques, clustering algorithms, and visualization tools.I also learned how to interpret and present the results of the analysis to stakeholders. Overall, the project helped me develop practical skills that are in demand in the data analytics industry.

Overall, my Internship Training experience on Artificial Intelligence and Machine Learning was extremely valuable. I gained a solid understanding of the fundamental concepts and techniques in the field, and developed strong programming and data analysis skills. The hands-on projects that I completed during the training gave me a real-world experience of implementing machine learning algorithms on real datasets. I am confident that the skills and knowledge that I acquired during the training will be invaluable in my future career as a data scientist or machine learning engineer.

As we conclude our IoT internship at DLithe we emerge not only with a comprehensive understanding of IoT but also with a portfolio of projects showcasing our practical skills. Armed with this knowledge, we are well-positioned to navigate the evolving landscape of IoT, whether pursuing further studies or venturing into the professional realm.

In retrospect, our time at DLithe was not merely an internship; it was a transformative experience that equipped us with the knowledge, skills, and confidence to navigate the future of IoT with a profound understanding of its intricacies and potential.

In my one-month IoT internship was a comprehensive exploration of the multifaceted world of connected devices. The experience enriched my technical skills, providing a solid foundation in IoT architecture, connectivity, and data analytics. As I reflect on my observations, I am excited about the immense potential of IoT to reshape industries and enhance our daily lives, while also recognizing the importance of addressing challenges to ensure a more connected and efficient future.