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Industrial Internship Report on

” TRAFFIC SIGNAL CONTROL”

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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 (Tell about ur Project) 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

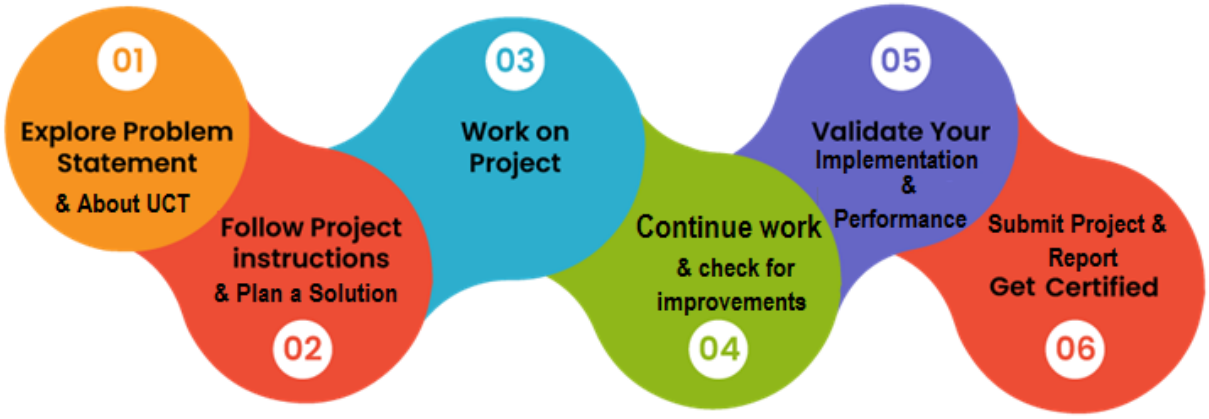
Summary of the whole 6 weeks' work.

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.

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.

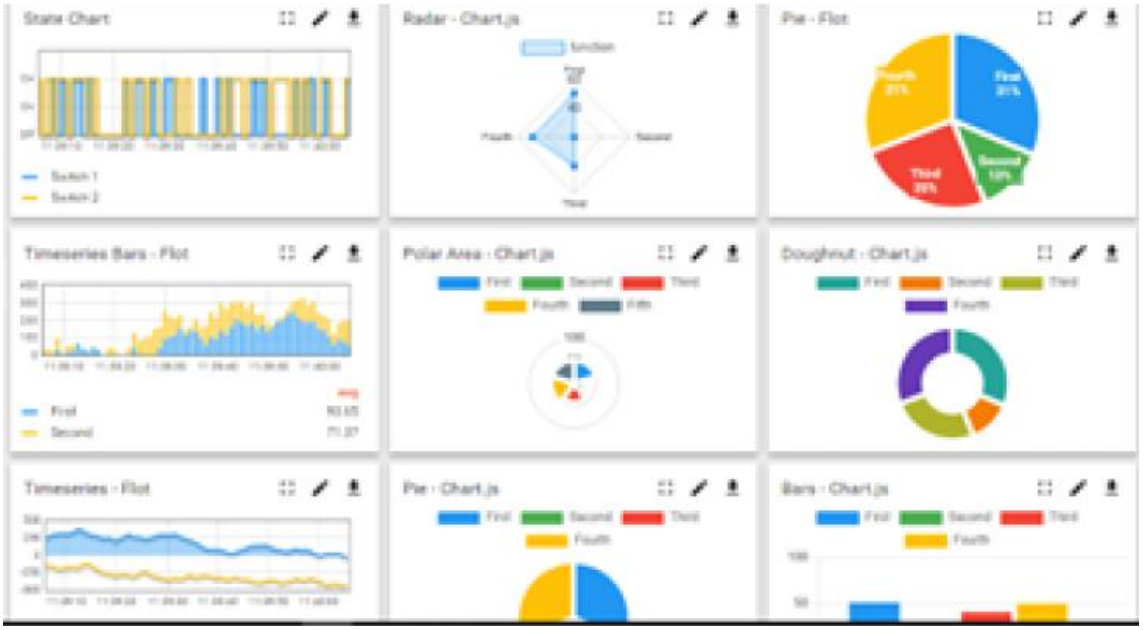
i. UCT IoT Platform (UCT Insight)

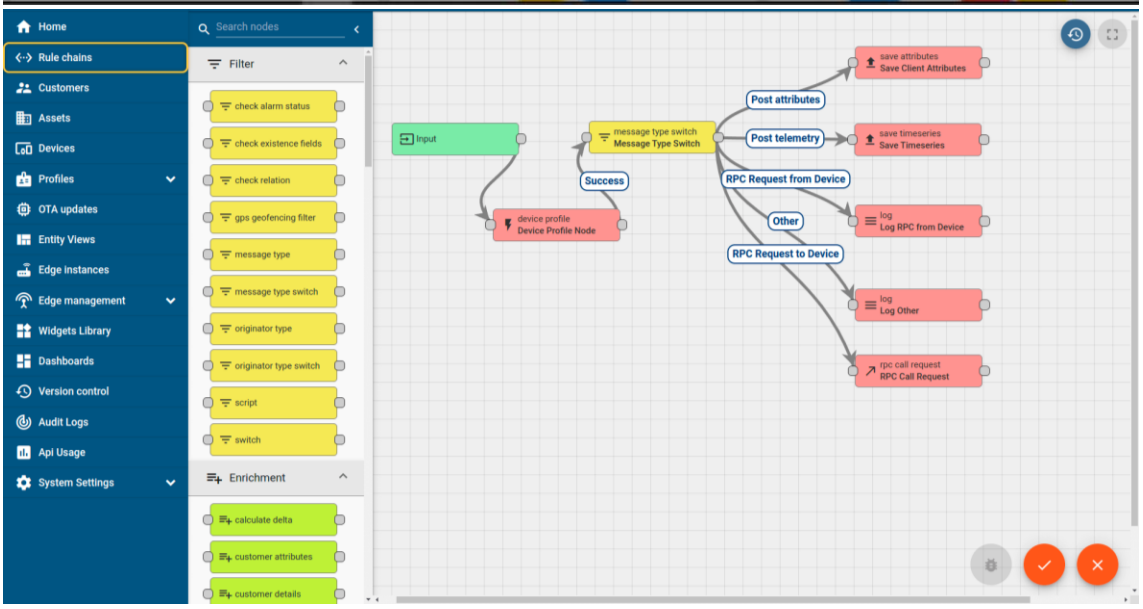
UCT Insight is an IOT platform designed for quick deployment of IOT applications on the same time providing valuable "insight" for your process/business. It has been built in Java for backend and ReactJS for Front end. It has support for MySQL and various NoSql Databases.

- 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





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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

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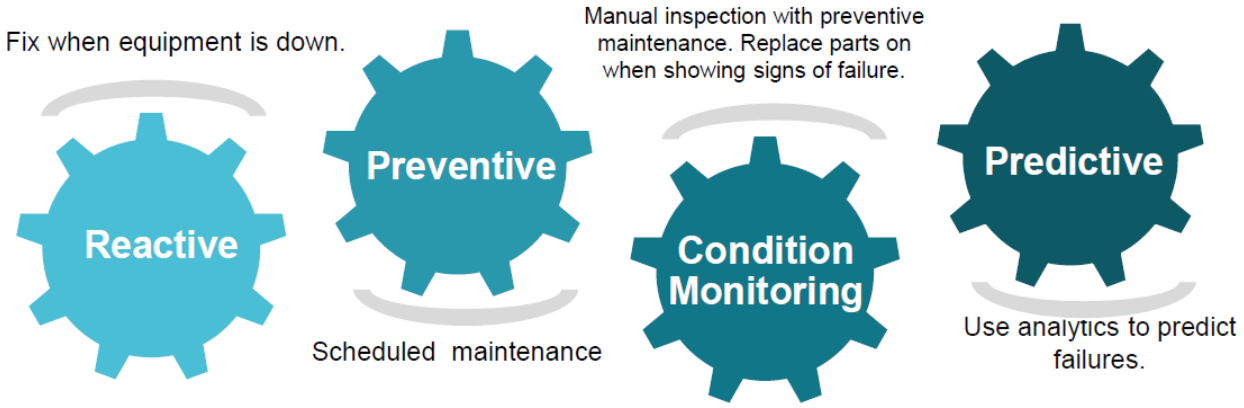
iii. LoRaWAN based Solution

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.

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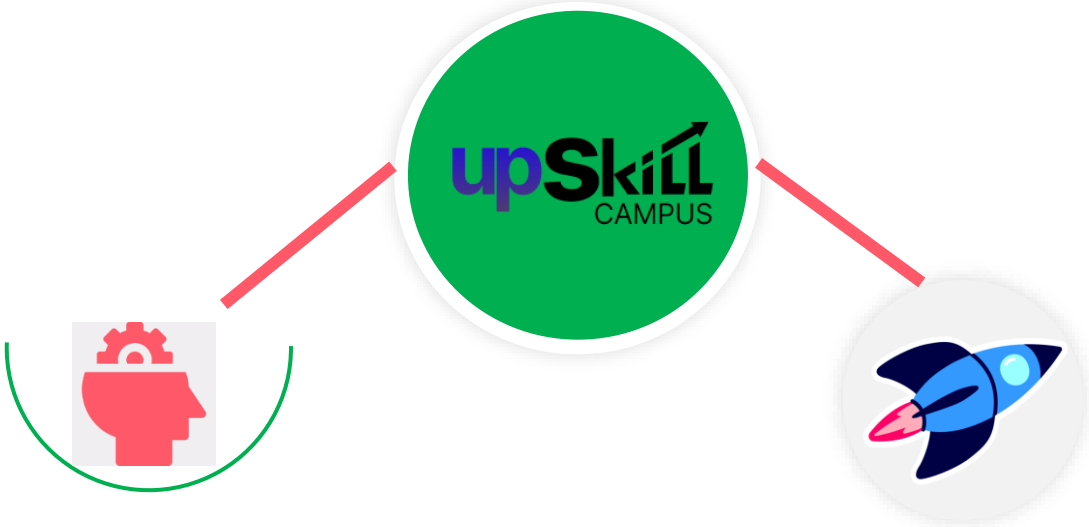
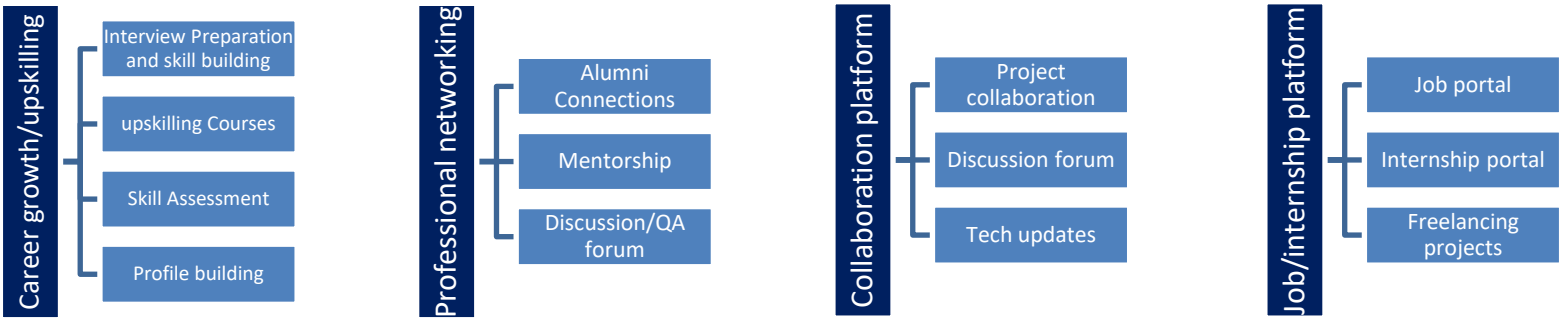


Seeing need of upskilling in self paced manner along-with additional support services e.g. Internship, projects, interaction with Industry experts, Career growth Services

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.

3 Problem Statement

Traffic signal control systems face challenges like poorly timed signals, faulty sensors, and uncoordinated signals, which can cause delays and congestion. Power failures and maintenance issues also disrupt operations. To improve effectiveness, implement adaptive signal control systems, upgrade to reliable sensors, enhance signal coordination, install backup power systems, and establish regular maintenance routines. This comprehensive approach helps optimize traffic flow and ensure road safety.

4 Existing and Proposed solution

Existing traffic signal solutions face several limitations:

Fixed-Time Signals: Operate on preset schedules, leading to inefficiencies and congestion during peak times.

Pre-Timed Plans: Use static schedules that don't adapt to varying traffic volumes, causing suboptimal flow.

Basic Sensor Systems: Employ simple sensors prone to inaccuracies and lack integration with broader systems.

Lack of Coordination: Fail to synchronize with adjacent signals, resulting in traffic bottlenecks and increased travel time.

The proposed solution is an adaptive traffic signal control system that:

Real-Time Adaptation: Adjusts signals based on live traffic data for improved efficiency.

Enhanced Coordination: Synchronizes signals across intersections to optimize flow.

Backup Power Systems: Ensures operation during outages with backup power.

Regular Maintenance: Includes routine checks to maintain system reliability.

4.1 Code submission (Github link)

https://github.com/chandran5/Traffic-signal-code/tree/main

4.2 **Report submission (Github link) :** first make placeholder, copy the link.

https://github.com/chandran5/Traffic-control-Reports

5 Proposed Design/ Model

I started by studying the operation of sensors, Arduino, resistors, and LEDs for my traffic signal control project. I reviewed the pin diagrams of different sensors and examined how they might interfere with each other. This initial research and planning phase is essential for understanding the components and defining the system's requirements. The proposed solution for designing the traffic signal control system follows a structured approach, beginning with this foundational research. It continues through selecting and designing components, developing and testing prototypes, and optimizing the system's performance. The final steps involve assembling and deploying the system, integrating it with existing infrastructure, and performing ongoing monitoring and maintenance. The proposed solution adds value by improving traffic flow through real-time adjustments, enhancing accuracy with advanced sensors, and increasing system resilience with backup power and regular maintenance. By integrating these features, the system will provide more efficient and reliable traffic management, leading to reduced congestion and improved road safety.

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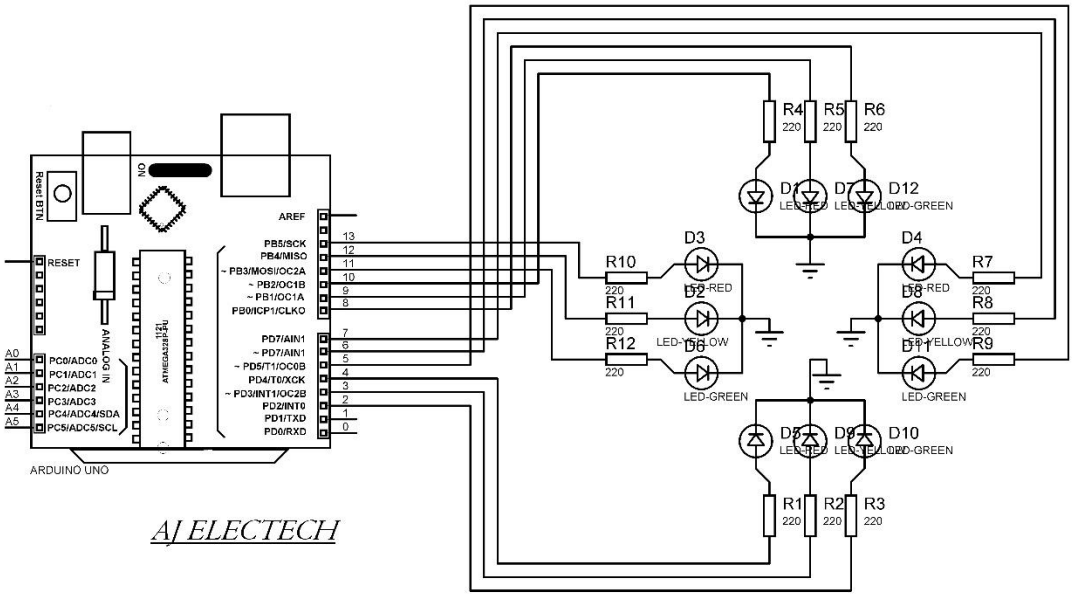
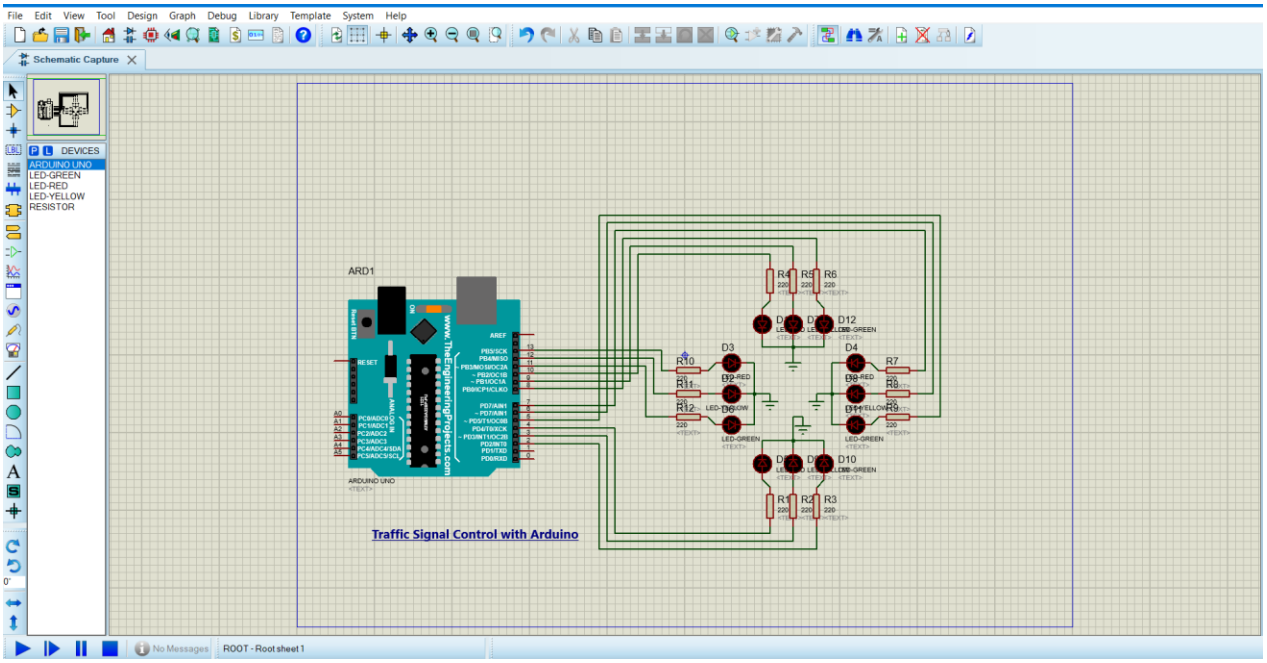
5.1 High Level Diagram (if applicable)



5.2 Interfaces (if applicable)



6 Performance Test

1. Functionality Testing: Ensure all components work correctly and execute the intended control logic.

2. Real-Time Response: Measure the system's speed in processing data and adjusting signals.

3. Traffic Flow Efficiency: Assess how well the system manages traffic and minimizes congestion.

4. Adaptability: Test the system's ability to adjust to changing traffic conditions and incidents.

5. System Integration: Verify seamless integration with other traffic management systems.

6. Reliability: Check the system's stability and performance over time.

7. User Interface: Evaluate the usability and responsiveness of the control interface.

8. Error Handling: Ensure the system can handle errors and recover effectively.

9. Data Accuracy: Confirm the precision of sensor data and control decisions.

10. Compliance: Verify adherence to relevant regulations and standards.

6.1 Test Plan/ Test Cases

➢ Successfully completed interfacing Arduino with Proteus for simulation.

➢ Plan to create a full extension of the project by developing a comprehensive simulation video.

➢ The video will offer a detailed walkthrough of the project's functionality.

➢ It will showcase the practical implementation within a simulated environment.

6.2 Test Procedure

➢ Write and compile your Arduino code in the Arduino IDE. Ensure that "Verbose output during compilation" is enabled to track the location of the generated .hex file.

➢ Locate the .hex file in the output directory specified by the Arduino IDE after compilation.

➢ Open Proteus and design your circuit, including the appropriate Arduino board model and any additional components you plan to use.

➢ Double-click the Arduino board in Proteus, then browse to and load the .hex file into the "Program File" field.

➢ Run the simulation in Proteus to test the circuit and verify that the Arduino operates as intended with the connected components.

6.3 Performance Outcome

After completing the initial programming on the Arduino, I further developed the project by simulating the traffic signal control system in Proteus software. This allowed me to visualize the circuit and test the functionality in a virtual environment.

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7 My learnings

Through developing the traffic signal control system, I learned how to effectively integrate components like sensors and Arduino, and gained practical experience in real-time data processing and system adaptation. I honed skills in troubleshooting, prototyping, and testing, and understood the importance of signal coordination, system resilience, and regular maintenance. Additionally, I recognized the value of data analysis in optimizing performance and enhancing road safety.

8 Future work scope

Integrating advanced analytics and machine learning into traffic signal control systems involves collecting comprehensive traffic and environmental data to develop predictive models. These models analyze traffic patterns, forecast congestion, and enable dynamic signal timing adjustments in real-time. By continuously learning from traffic conditions and system performance, the system can optimize signal control and improve overall traffic flow. Enhanced user interfaces and real-time alerts provide actionable insights for traffic managers, while ongoing model updates ensure the system adapts to changing conditions, leading to more efficient and responsive traffic management.

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