

Industrial Internship Report on
"Smart City Traffic Pattern Analysis"

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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

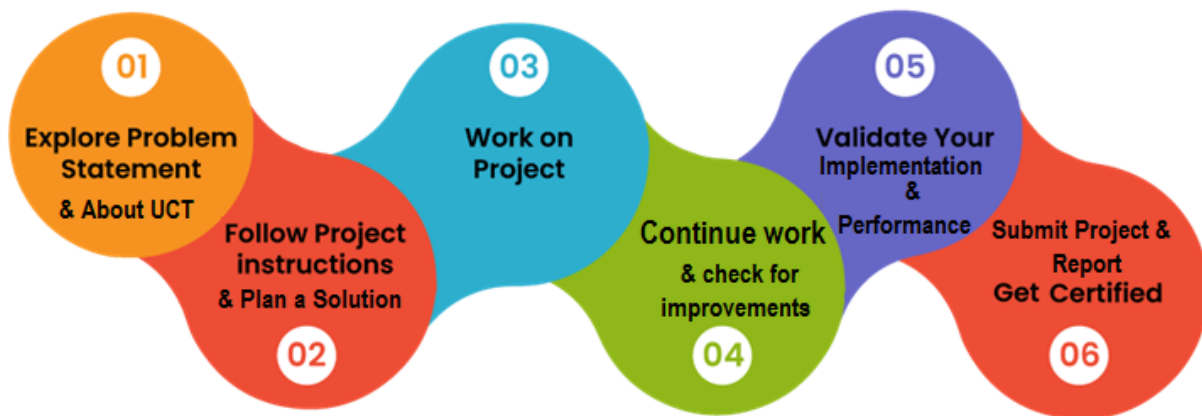
Summary of the whole 6 weeks' work.

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.



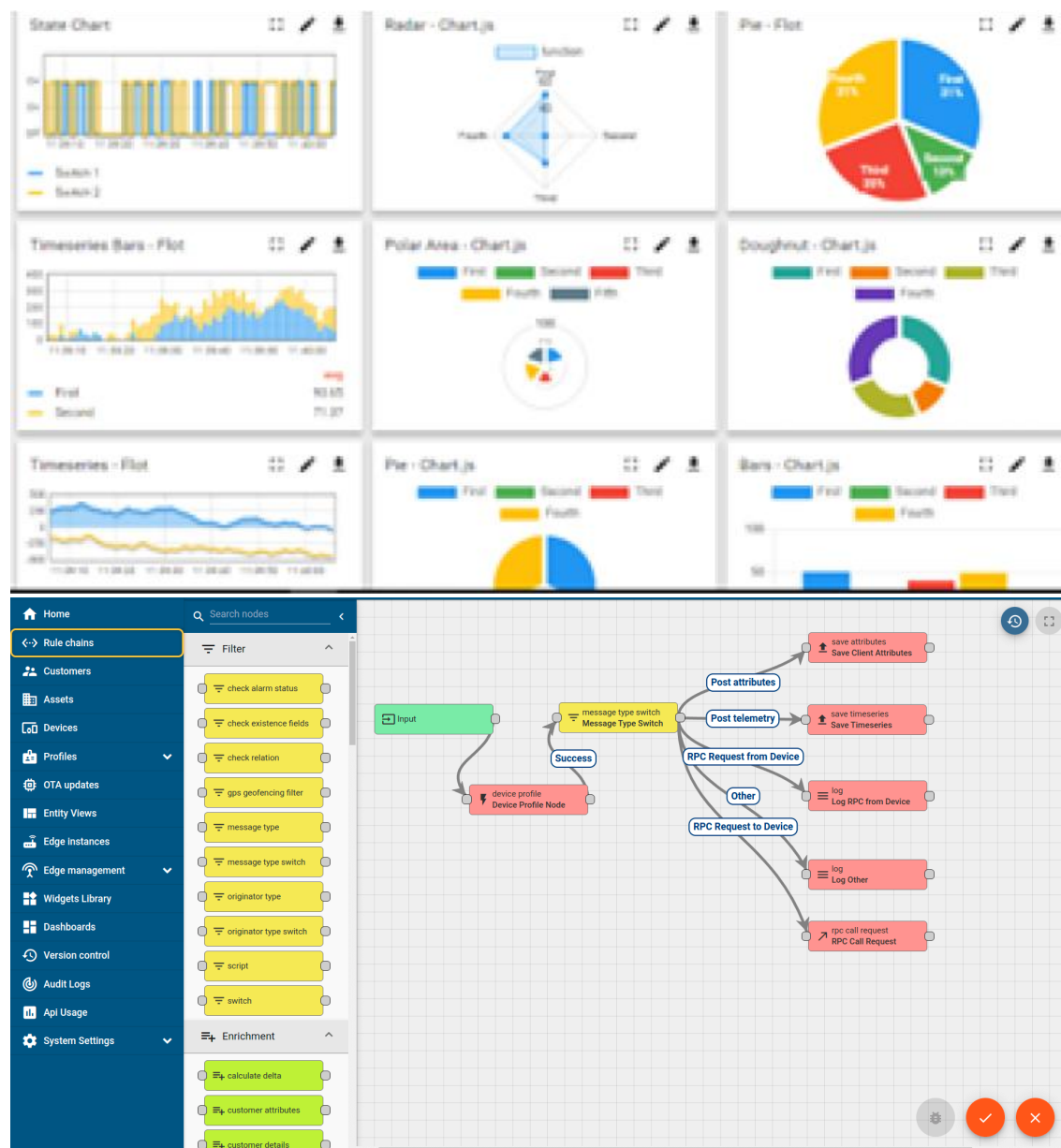
i. UCT IoT Platform ()

UCT Insight 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

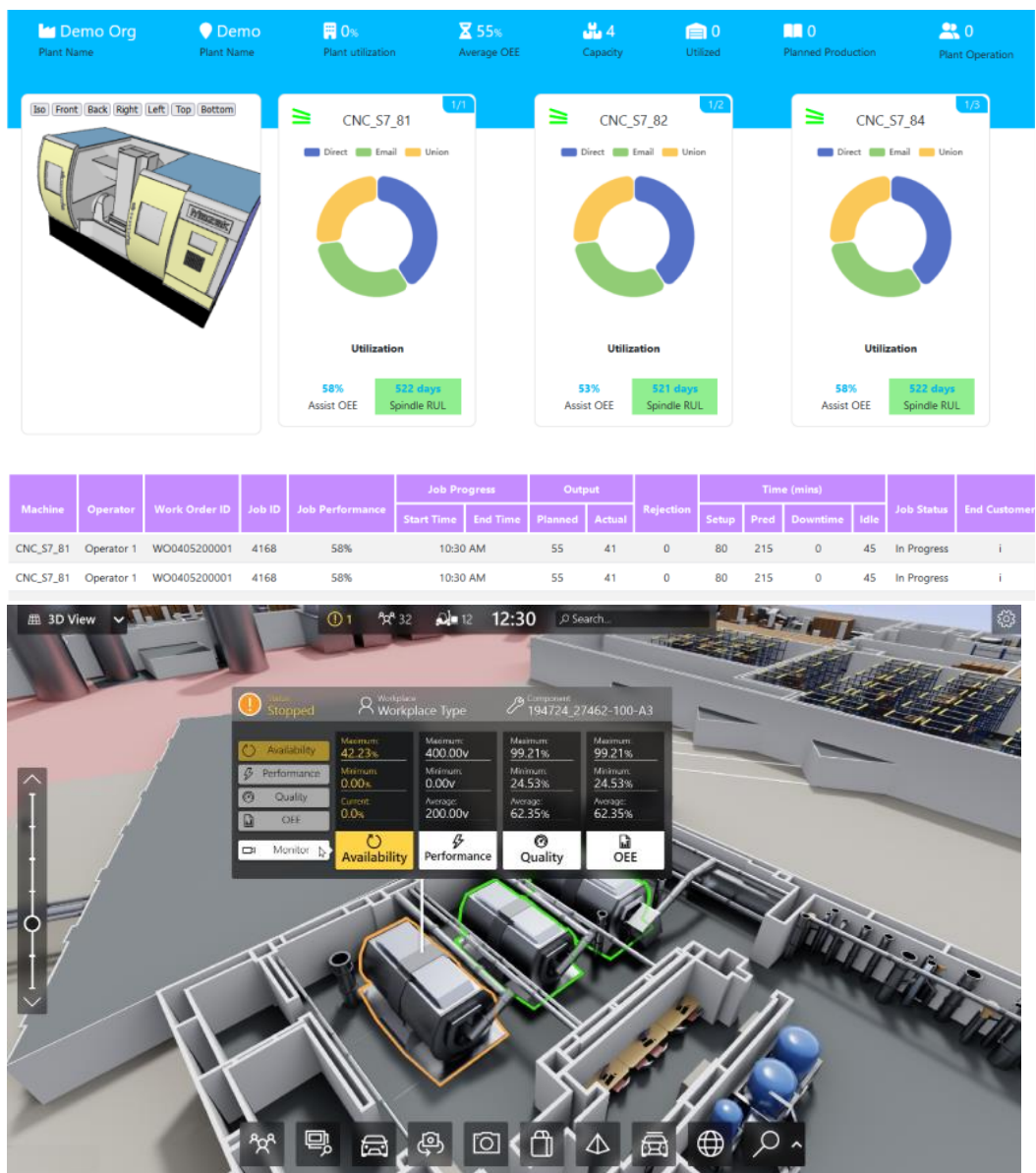
ii. Smart Factory Platform ()

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 unleashed 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.



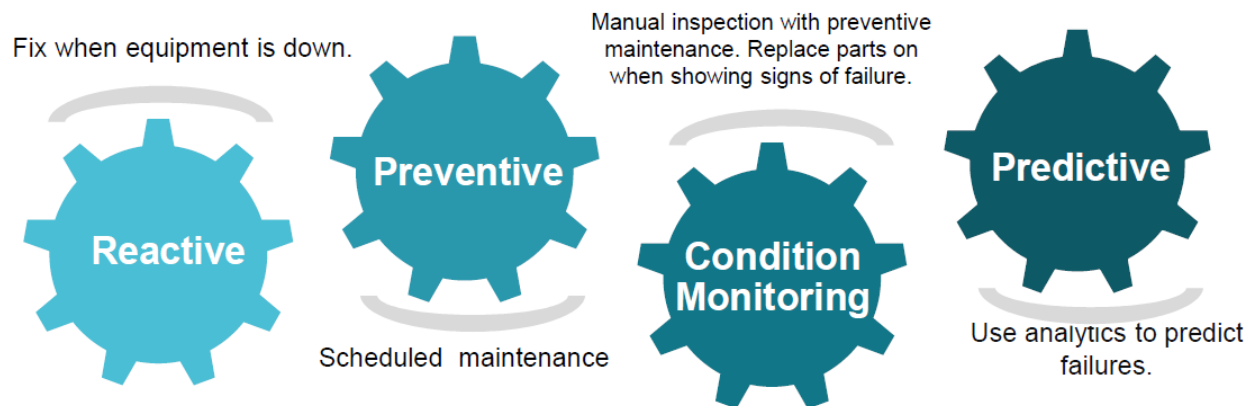


iii. LoRaWAN based Solution

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

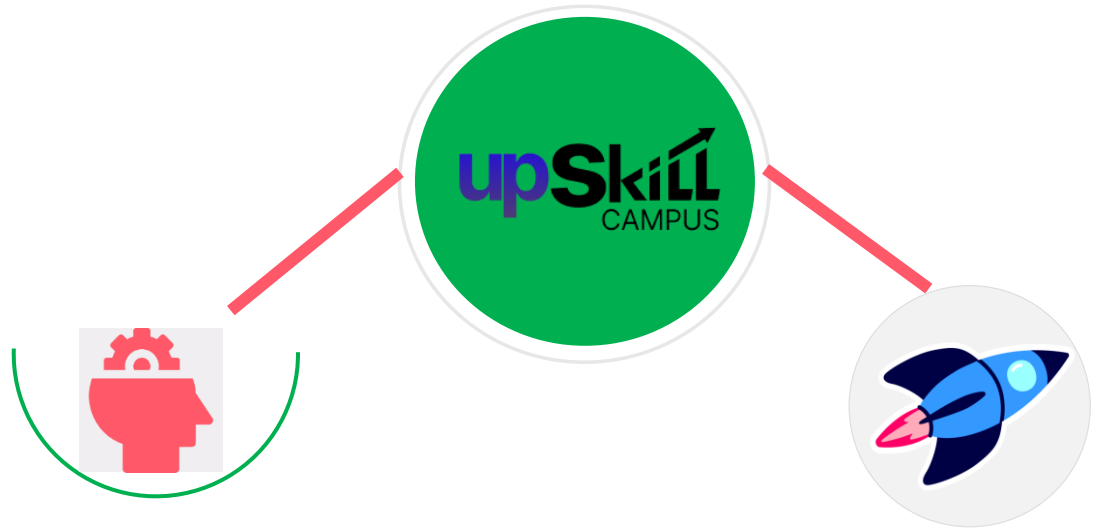
UCT is providing Industrial Machine health monitoring and Predictive maintenance solution leveraging Embedded system, Industrial IoT and Machine Learning Technologies by finding Remaining useful life time of various Machines used in production process.



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.

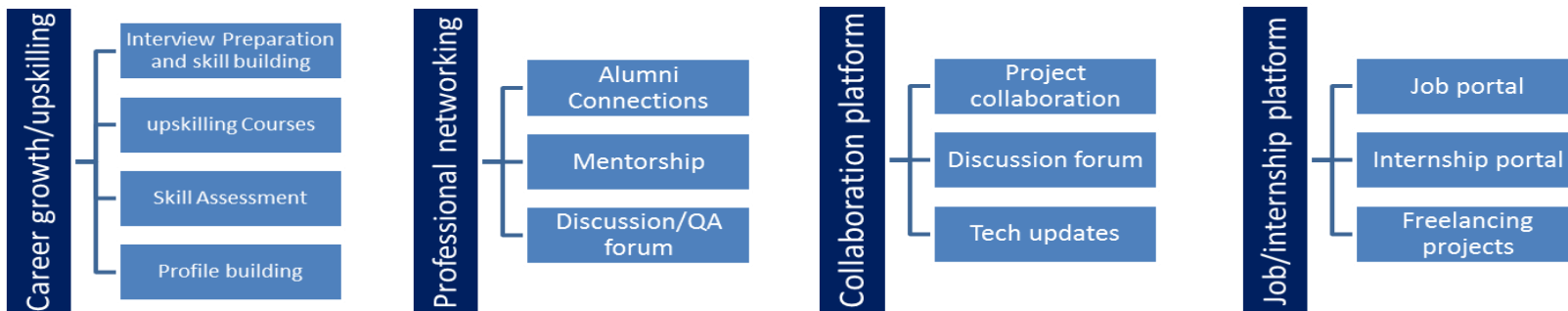
USC is a career development platform that delivers **personalized executive coaching** in a more affordable, scalable and measurable way.



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]

[2]

[3]

2.6 Glossary

Terms	Acronym

3 Problem Statement

In the assigned problem statement

- Analyze historical traffic data from the four major junctions of the city to identify patterns and trends in vehicle counts, peak hours, and the influence of holidays and special occasions.
- Develop predictive models to forecast future traffic volumes and patterns, taking into account factors such as time of day, day of the week, seasonal variations, and special events.
- Provide data-driven recommendations to the government for infrastructure planning, traffic signal optimization, and resource allocation to effectively handle traffic peaks and prepare for future growth.
- Integrate real-time data sources, such as traffic cameras, sensors, and crowdsourced information, to enable dynamic monitoring and responsive measures to alleviate congestion and improve traffic flow.
- Contribute to the overall vision of transforming the city into a smart and intelligent urban environment by leveraging data analytics, machine learning, and advanced technologies to optimize traffic management and enhance the efficiency of services for citizens.

4 Existing and Proposed solution

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

What is your proposed solution?

What value addition are you planning?

4.1 Code submission (Github link)

<https://github.com/Mostaqul143/Upskill-Campas/blob/main/Traffic%20Prediction.ipynb>

4.2 Report submission (Github link) :

4.3

<https://github.com/Mostaqul143/Upskill-Campas>

5 Proposed Design/ Model

Given more details about design flow of your solution. This is applicable for all domains. DS/ML Students can cover it after they have their algorithm implementation. There is always a start, intermediate stages and then final outcome.

5.1 High Level Diagram (if applicable)

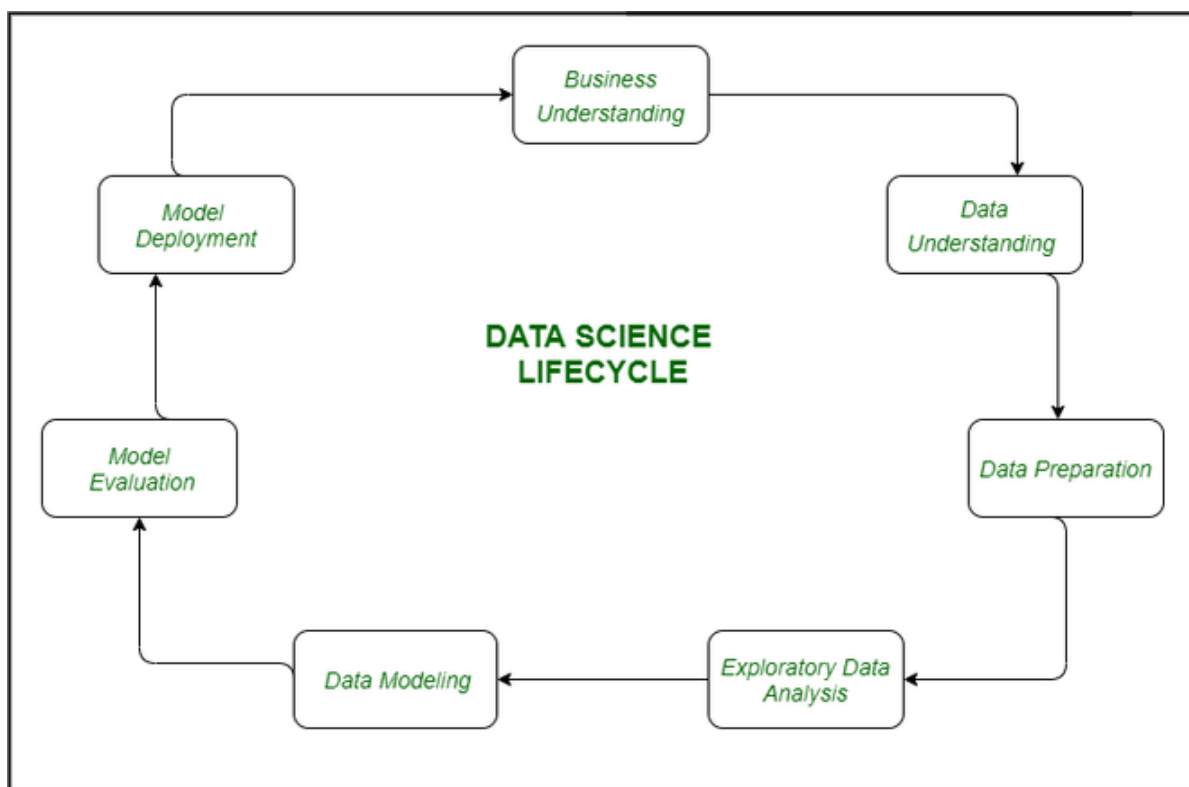


Figure 1: HIGH LEVEL DIAGRAM OF THE SYSTEM

6 Performance Test

This is very important part and defines why this work is meant of Real industries, instead of being just academic project.

Here we need to first find the constraints.

How those constraints were taken care in your design?

What were test results around those constraints?

Constraints can be e.g. memory, MIPS (speed, operations per second), accuracy, durability, power consumption etc.

In case you could not test them, but still you should mention how identified constraints can impact your design, and what are recommendations to handle them.

6.1 Test Plan/ Test Cases

6.2 Test Procedure

6.3 Performance Outcome

7 My learnings

Technical Skills Enhancement: Through this project, I've honed my skills in data analysis, machine learning, and data visualization using Python libraries like Pandas, Matplotlib, and Seaborn. I've gained hands-on experience in preprocessing data, building predictive models, and creating insightful visualizations.

Problem-Solving Abilities: Dealing with the complexities of analyzing traffic patterns in a smart city setting has enhanced my problem-solving abilities. I've learned to approach challenges systematically, break them down into manageable tasks, and apply appropriate analytical techniques to derive meaningful insights.

Domain Knowledge: Working on a smart city traffic analysis project has deepened my understanding of urban transportation systems and the challenges associated with managing traffic in metropolitan areas. This domain knowledge will be valuable in future projects or roles related to smart city initiatives, urban planning, or transportation management.

Collaboration and Communication: Collaborating with stakeholders, including government officials and urban planners, has improved my communication and teamwork skills. I've learned to effectively communicate technical concepts and insights to non-technical audiences, which is crucial for success in any professional setting.

Career Growth Opportunities: The skills and knowledge gained from this project will open up career growth opportunities in various fields, including data science, urban planning, smart city initiatives, and transportation management. I can leverage my experience to pursue roles that involve analyzing complex datasets, developing data-driven solutions, and contributing to the advancement of smart city technologies.

Overall, this project has been instrumental in broadening my skill set, deepening my domain knowledge, and preparing me for future career opportunities in the rapidly evolving field of data science and smart city technologies.

8 Future work scope

Real-Time Traffic Monitoring: Implementing a real-time traffic monitoring system using live data streams from traffic cameras or sensors installed at various junctions. This system could provide up-to-date information on traffic conditions, allowing for more responsive traffic management strategies.

Predictive Maintenance for Infrastructure: Developing predictive maintenance models to anticipate the maintenance needs of roads, traffic signals, and other infrastructure components based on historical maintenance records and traffic patterns. This proactive approach could help prevent infrastructure failures and minimize disruptions to traffic flow.

Integration of External Data Sources: Integrating additional data sources such as weather forecasts, public transit schedules, and event calendars to enhance the analysis of traffic patterns. Incorporating these external factors could provide a more comprehensive understanding of the factors influencing traffic congestion.

Optimization of Public Transit Routes: Analyzing public transit data to optimize bus routes, schedules, and allocation of resources based on demand patterns. This could improve the efficiency and accessibility of public transportation options, thereby reducing reliance on private vehicles and alleviating traffic congestion.

Behavioral Analysis of Drivers: Conducting surveys or leveraging mobile app data to understand the behavior and preferences of drivers, such as preferred routes, travel times, and modes of transportation. This behavioral analysis could inform the development of targeted interventions to encourage more sustainable and efficient travel behavior.

Dynamic Pricing for Road Usage: Exploring the feasibility of implementing dynamic pricing mechanisms for road usage, where tolls or congestion charges vary based on traffic conditions. This could help manage traffic flow by incentivizing drivers to adjust their travel times or routes to less congested areas.

Collaboration with Urban Planners: Collaborating with urban planners and policymakers to integrate traffic analysis findings into broader urban planning initiatives. This could involve aligning transportation policies with land use planning, zoning regulations, and sustainable development goals to create more livable and resilient cities.