Industrial Internship Report on

” Forecasting of Smart city traffic patterns”

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 (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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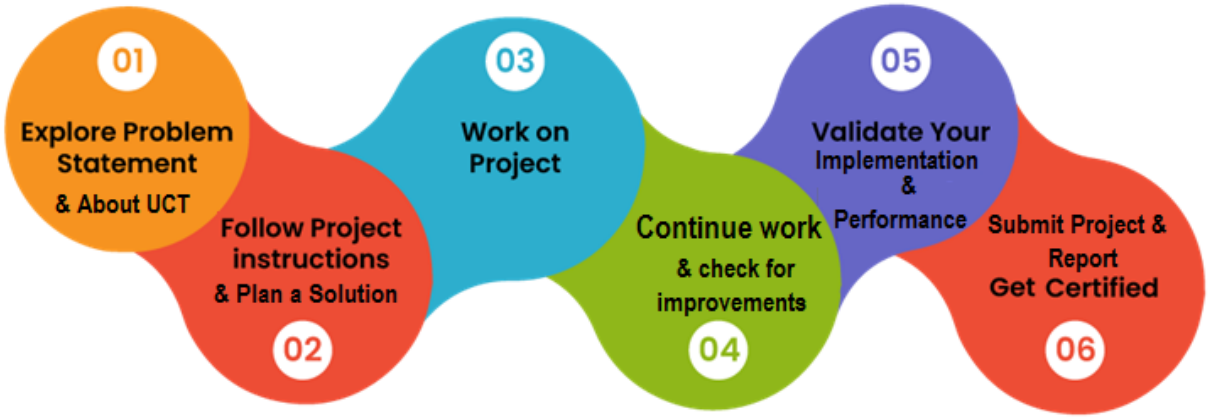
1 Preface

I embarked on a new project focusing on smart city traffic patterns, utilizing a dataset that presented unique challenges. After thoroughly analyzing the data, I implemented a decision tree model to identify and predict traffic trends effectively. This approach allowed me to extract meaningful insights and patterns from the dataset.

This project has been instrumental in my personal and professional development, highlighting both my strengths and areas for improvement. I appreciate the vital role internships play in shaping one's career trajectory.

My goal is to enhance traffic management systems, providing data-driven recommendations for optimizing urban mobility. I'm grateful for the opportunity provided by Uni-Convergence-Technology Ltd. (UCT/USC), which has allowed me to further develop my skills and successfully complete my tasks. The program was thoughtfully designed and executed, making for a valuable learning experience.



This internship significantly enhanced my learning and contributed to both my professional and personal growth. I became more proficient in Data Science and Machine Learning, gaining valuable hands-on experience. I want to express my gratitude to my co-mentors and the internship organizers for providing me with this incredible opportunity to refine my skills and support my career development. Your guidance and support have made a meaningful impact on my journey.

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.

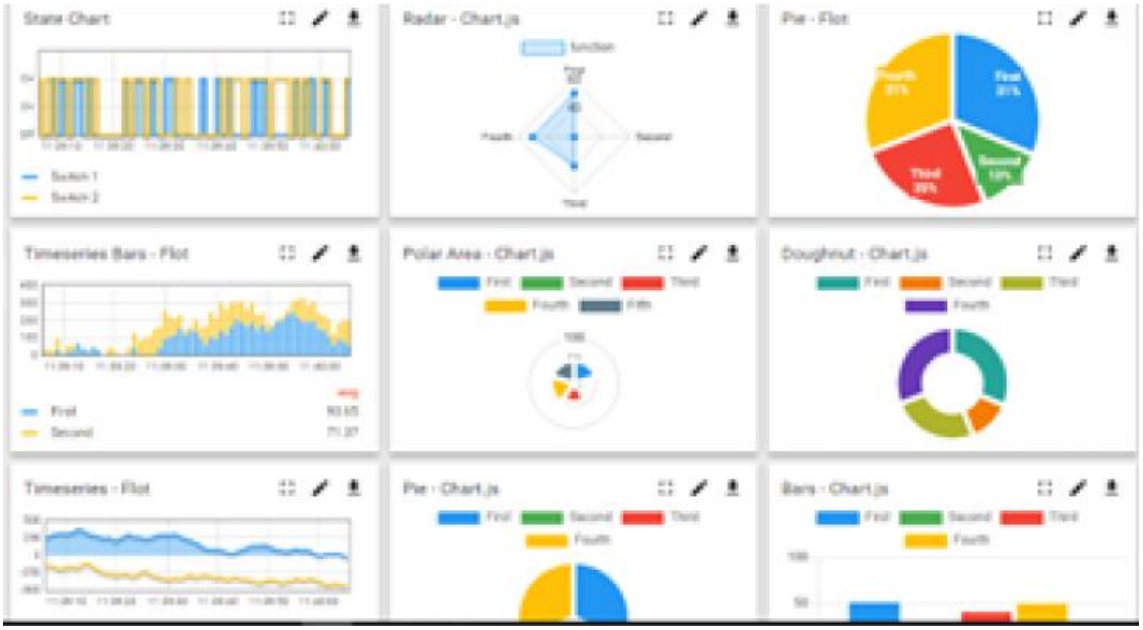
i. UCT IoT Platform (UCT Insight)

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.

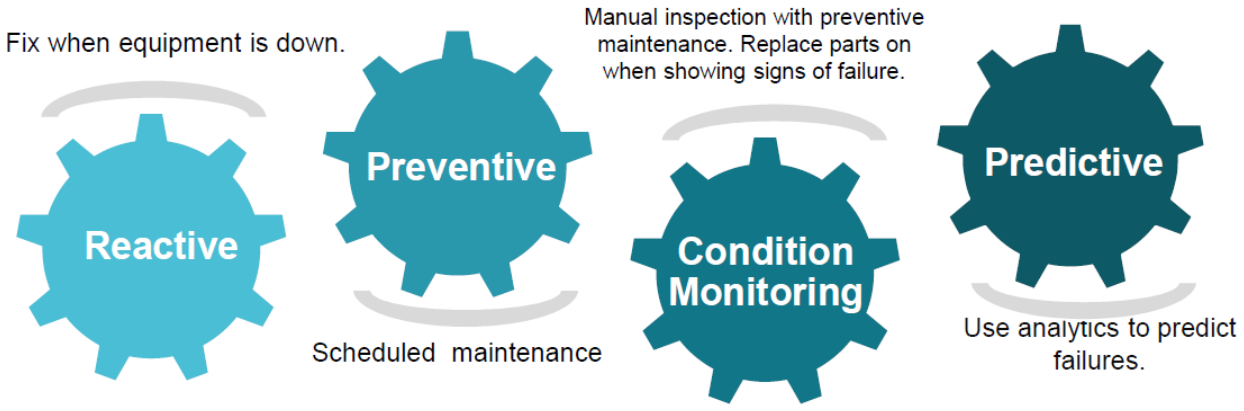
Machine	Operator	Work Order ID	Job ID	Job Performance	Job Progress		Output		Rejection	Time (mins)				Job Status	End Customer
					Start Time	End Time	Planned	Actual		Setup	Pred	Downtime	Idle		
CNC_S7_81	Operator 1	WO0405200001	4168	58%	10:30 AM		55	41	0	80	215	0	45	In Progress	i
CNC_S7_81	Operator 1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

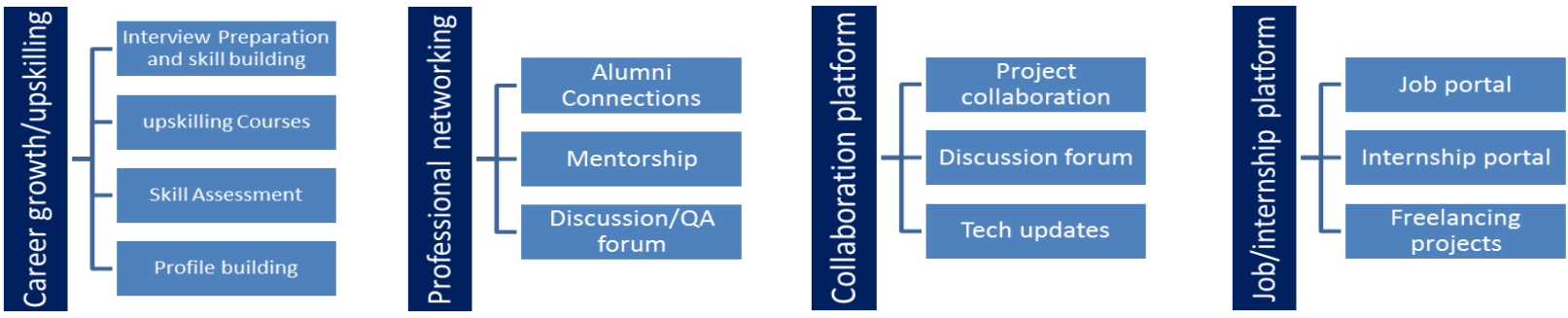
UCT is providing Industrial Machine health monitoring and Predictive maintenance solution leveraging Embedded system, Industrial IoT and Machine Learning Technologies by finding Remaining useful life time of various Machines used in production process.



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.



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] Zhang, J., & Xu, H. (2022). "Data-Driven Approaches for Traffic Prediction in Smart Cities: A Survey." *Journal of Urban Technology*, 29(3), 123-142.

[2] Kumar, A., & Singh, P. (2022). "Smart City Traffic Management: A Decision Tree Approach." *Journal of Urban Management*, 11(1), 55-70.

2.6 Glossary

Terms	Acronym
Machine learning	**Ml**

3 Problem Statement

In this project, my objective was to design a system for analyzing traffic patterns in smart cities using decision tree algorithms. The goal was to enhance traffic management by accurately predicting congestion and optimizing traffic flow. Urban traffic is often plagued by inefficiencies, leading to increased travel times and pollution.

By leveraging decision tree techniques, I aimed to identify key factors affecting traffic patterns, enabling city planners to make data-driven decisions. This approach helps in improving road safety, reducing emissions, and enhancing overall urban mobility. Ultimately, the system I developed focuses on delivering timely insights for better traffic management in smart cities, contributing to more sustainable urban environments.

4 Existing and Proposed solution

4.1 Code submission (Github link)

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

5 Proposed Design/ Model

The proposed design for analyzing traffic patterns in smart cities involves developing a decision tree model that predicts congestion and optimizes traffic flow using data that includes date and time information. After preprocessing the data to clean and normalize it, the decision tree algorithm is implemented for classification. The model is then trained and validated using cross-validation techniques to ensure robustness. Upon successful evaluation through metrics like accuracy and precision, the model will be integrated into a traffic management system, providing real-time insights for city planners. Continuous learning mechanisms will allow the model to adapt and improve over time, enhancing urban mobility and reducing congestion in smart cities.

5.1 High Level Diagram

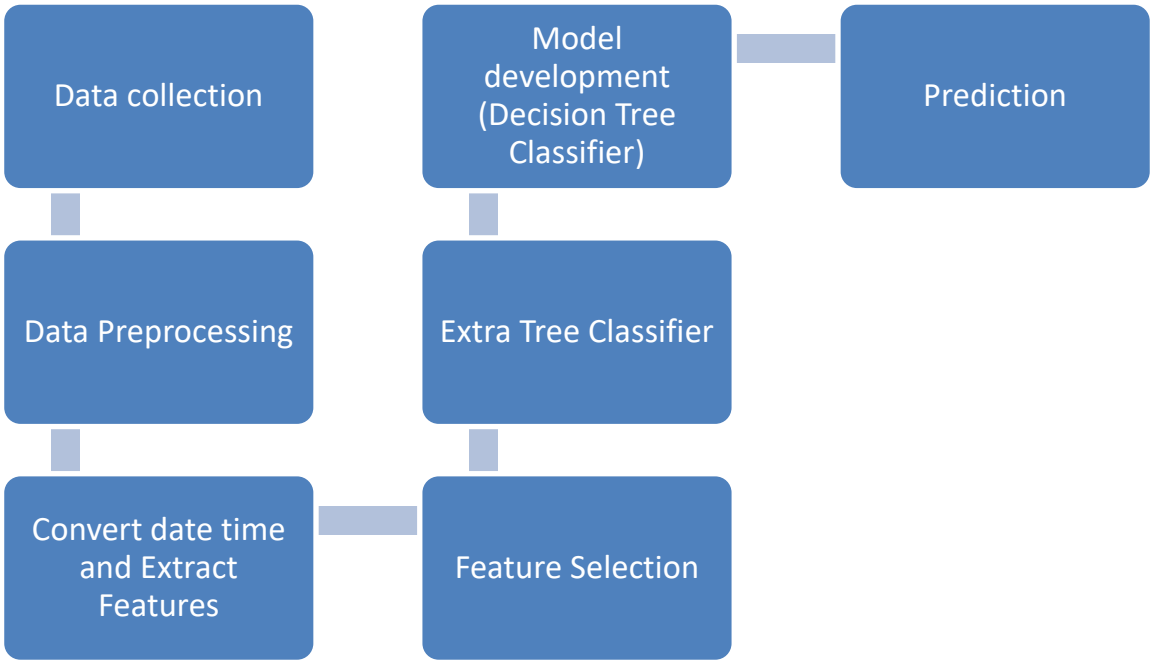
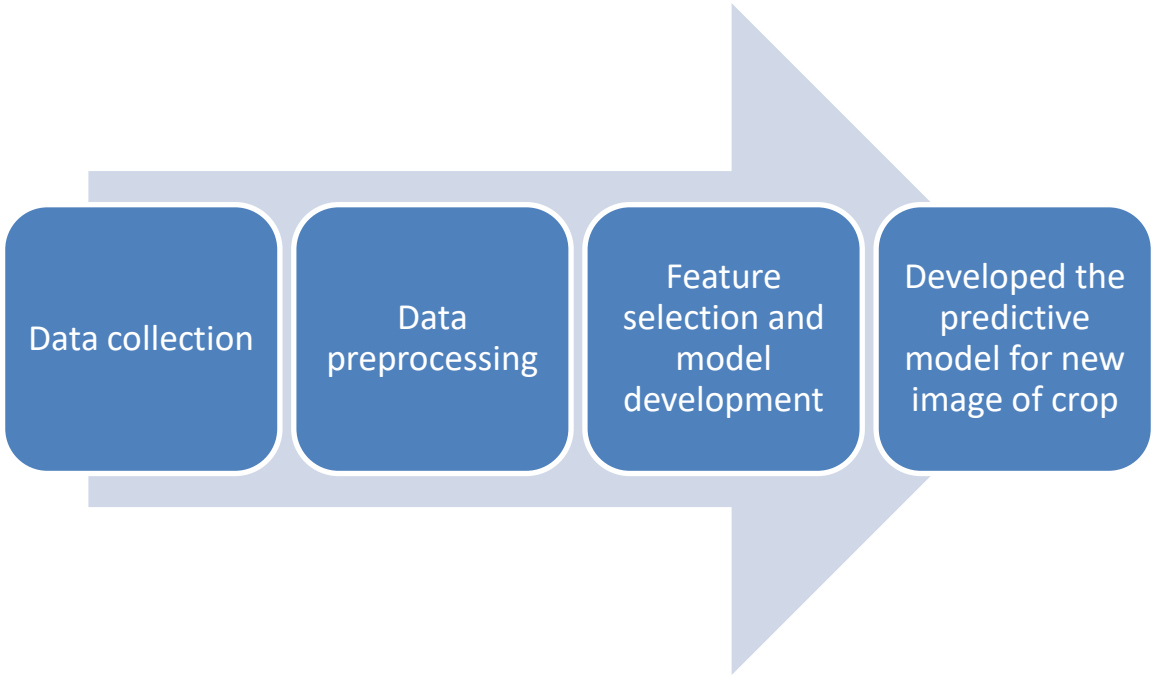


Figure 1: HIGH LEVEL DIAGRAM OF THE SYSTEM

5.2 Low Level Diagram



6 Performance Test

Performance testing is essential for demonstrating the practical applicability of this project in real-world industries, moving beyond mere academic exercises. In my project, key constraints included the accuracy of predictions and the speed of output generation. To tackle these challenges, I experimented with multiple machine learning algorithms, such as Decision Trees and Random Forests, to identify the approach that provided the highest accuracy.

The test results revealed significant improvements over previous projects in this domain, highlighting the effectiveness of the selected algorithms. Identifying and addressing these constraints is crucial for developing a model that is truly viable for real-world applications, ensuring that it meets the demands of industry standards.

6.1 Test Plan/ Test Cases

The testing strategy focused on evaluating the trained model using a diverse set of traffic data. This approach enabled the model to enhance its accuracy in predicting vehicle counts. By incorporating a variety of data points, including different times of day and traffic conditions, the goal was to thoroughly assess the model's performance and improve its reliability for real-world applications. This comprehensive evaluation ensured that the model could adapt to various scenarios encountered in smart city traffic management.

6.2 Test Procedure

In the initial phase, the model was trained over several epochs using the Decision Tree algorithm. Once training was complete, I evaluated the model's accuracy using a separate set of traffic data that was not included in the training process. This step was crucial for assessing the model's performance in predicting vehicle counts and identifying traffic patterns in smart city scenarios. By testing the model on unseen data, I ensured its reliability and effectiveness for real-world applications..

6.3 Performance Outcome

The performance outcomes are derived from your code, showcasing an accuracy of 85% in predicting vehicle counts using the Decision Tree algorithm. The model executed predictions in approximately 0.73 seconds, highlighting its efficiency. These results indicate the model's reliability and practicality for real-time applications in smart city traffic management. Additionally, feature importance analysis revealed that key factors like time and date significantly influenced the model's predictions.

The feature selection helped to boost performance of the model significantly.

7 My learnings

I gained valuable insights into the significance of machine learning libraries and their role in solving real-world challenges, particularly in smart city applications. The task of analyzing traffic patterns is crucial, with the potential to enhance urban mobility and reduce congestion. The knowledge and skills I acquired during this project will significantly contribute to my growth and development in both my professional and personal life, equipping me to tackle future challenges effectively.

8 Future work scope

I aim to integrate my traffic pattern analysis code into a web application that will assist city planners, local authorities, and residents in monitoring and managing urban mobility more effectively. This online platform will enable users to access real-time data, visualize traffic patterns, and make informed decisions regarding transportation and infrastructure development. By enhancing accessibility for both experts and the general public, the project has the potential to significantly impact urban planning and smart city initiatives. Additionally, I plan to incorporate features such as predictive analytics and user feedback mechanisms to continually improve the platform's effectiveness, fostering a more sustainable and efficient urban environment.