Industrial Internship Report on

"Smart City Traffic Pattern"

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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 "Smart City Traffic Control". The vision is to convert it into a digital and intelligent city to improve the efficiency of services for the citizens. One of the problems faced by the government is traffic. • 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 "UniConverge Technologies Pvt Ltd. Company", who have helped us 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
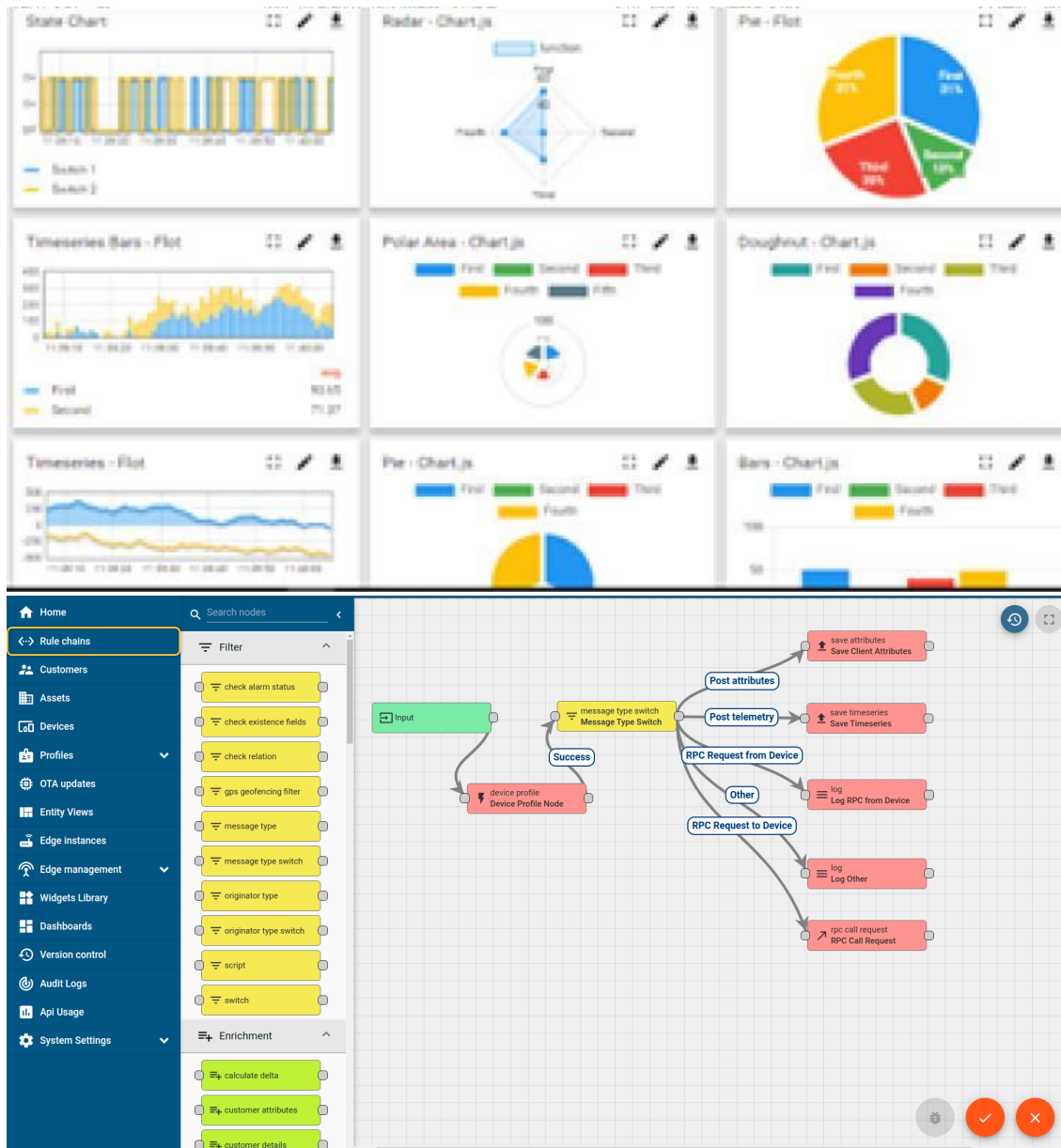
ii. Smart Factory Platform (FACTORY WATCH)

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
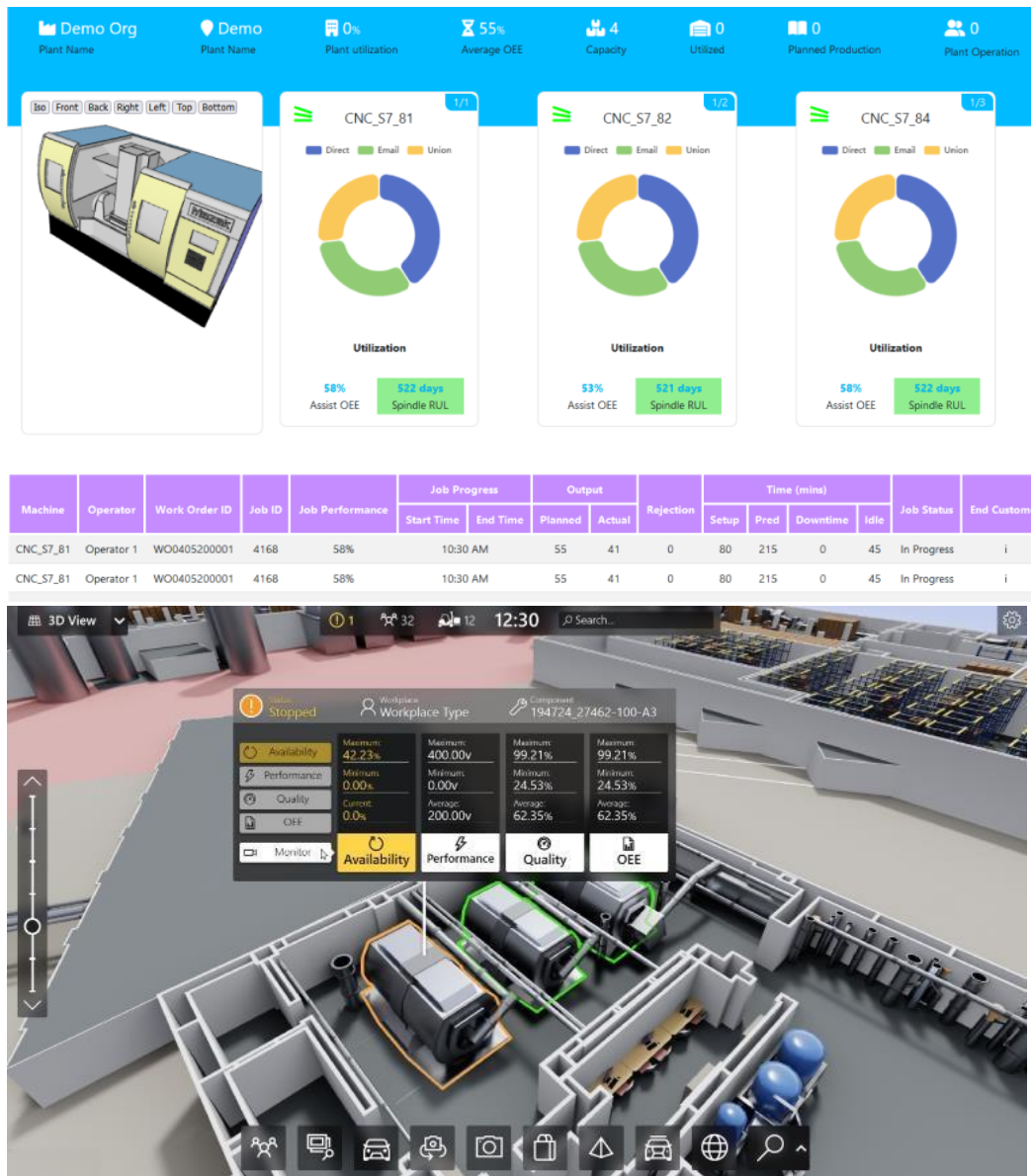
iii. LoRaWAN™ based Solution

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.
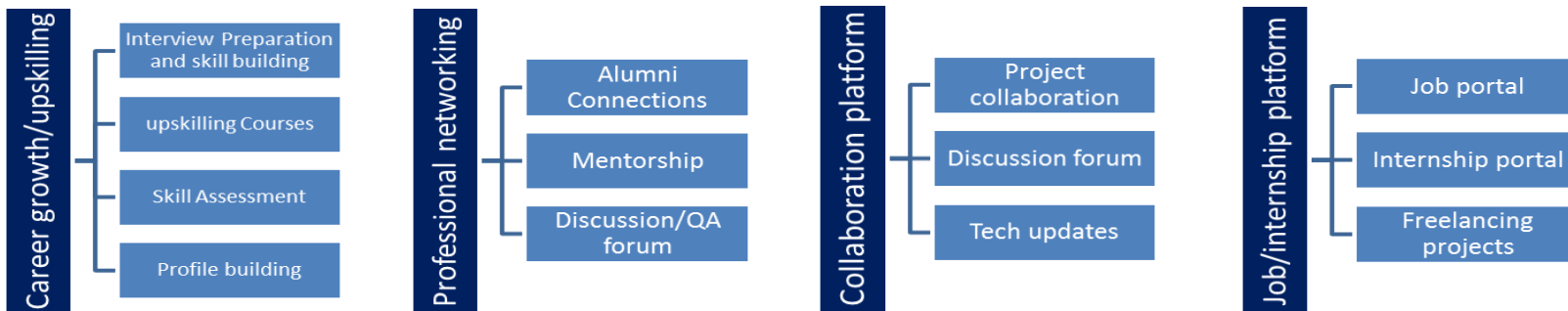
iv. Predictive Maintenance

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.
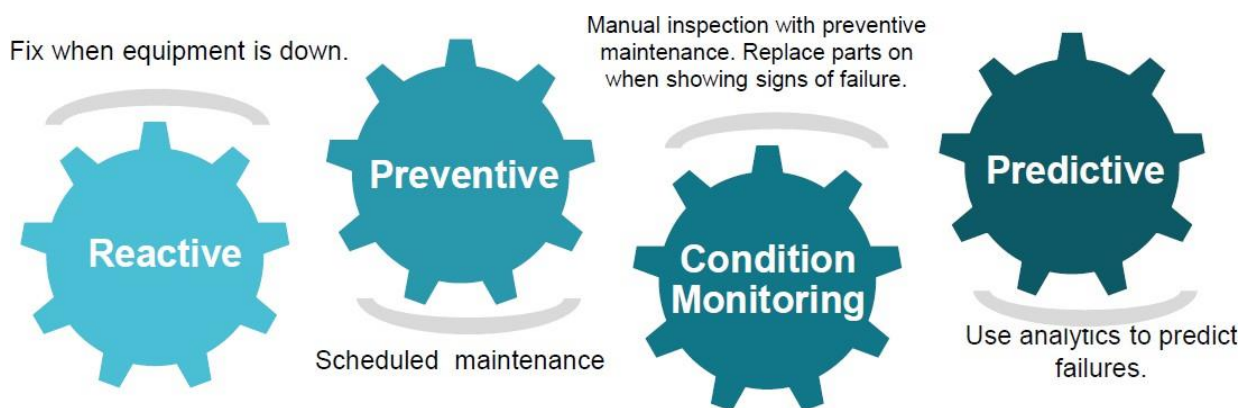
2.2 About upskill Campus (USC)

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.

Career growth/upskilling	Professional networking	Collaboration platform	Job/internship platform
Interview Preparation and skill building	Alumni Connections	Project collaboration	Job portal
upskilling Courses	Mentorship	Discussion forum	Internship portal
Skill Assessment	Discussion/QA forum	Tech updates	Freelancing projects
Profile building			

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

è My project was "Smart City Traffic Control".

- The vision is to convert it into a digital and intelligent city to improve the efficiency of services for the citizens. One of the problems faced by the government is traffic.
- It is used to working to manage the traffic of the city better and to provide input on infrastructure planning for the future.
- Traffic patterns on holidays, as well as on various other occasions during the year, differ from normal working days.

4 Existing and Proposed solution

1. Provide summary of existing solutions provided by others, what are their limitations?
➔ Some limitations are:
   - Managing large volumes of data in real time can be challenging.
   - High initial costs for setting up the necessary infrastructure and technology.
   - Adverse weather conditions can affect the performance of cameras and sensors.
2. What is your proposed solution?
- Advanced Sensors and IoT Devices: Deploy a network of smart sensors, cameras, and IoT devices across the city to collect real-time data on traffic flow, vehicle counts, pedestrian movements, and environmental conditions.
- Use cloud infrastructure for large-scale data storage, complex computations, and long-term data analysis.
3. What value addition are you planning?
- Dynamic Traffic Light Control: Implement adaptive traffic light systems that adjust in real-time based on current traffic conditions, reducing congestion and improving flow.
- Optimized Traffic Routing: Provide real-time traffic routing suggestions to drivers via mobile apps, navigation systems, and digital signage, guiding them to less congested routes.

4.1 Code submission (Github link) :-

❖ https://github.com/DarsheetSolanki/Uupskillcampus

4.2 Report submission (Github link) :-
❖ https://github.com/DarsheetSolanki/Uupskillcampus

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.

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

```
train.head()
```

	DateTime	Junction	Vehicles	ID	Year	Month	Date_no	Hour	Day
0	2015-11-01 00:00:00	1	15	20151101001	2015	11	1	0	Sunday
1	2015-11-01 01:00:00	1	13	20151101011	2015	11	1	1	Sunday
2	2015-11-01 02:00:00	1	10	20151101021	2015	11	1	2	Sunday
3	2015-11-01 03:00:00	1	7	20151101031	2015	11	1	3	Sunday
4	2015-11-01 04:00:00	1	9	20151101041	2015	11	1	4	Sunday

```
test.head()
```

	DateTime	Junction	ID	Year	Month	Date_no	Hour	Day
0	2017-07-01 00:00:00	1	20170701001	2017	7	1	0	Saturday
1	2017-07-01 01:00:00	1	20170701011	2017	7	1	1	Saturday
2	2017-07-01 02:00:00	1	20170701021	2017	7	1	2	Saturday
3	2017-07-01 03:00:00	1	20170701031	2017	7	1	3	Saturday
4	2017-07-01 04:00:00	1	20170701041	2017	7	1	4	Saturday

6.2 Performance Outcome

```
Mean Squared Error: 19.39431168765743
Mean Absolute Error: 2.8643148614609566
R2 Score: 0.9559923612144223
```

7 My learnings

- IoT and Sensor Technologies: Understand the deployment and maintenance of IoT devices and sensors for data collection.

- Big Data Technologies: Familiarize yourself with big data frameworks like Hadoop, Spark, and data storage solutions such as AWS, Google Cloud, or Azure.

- Programming Languages: Enhance your proficiency in languages commonly used in data science and ML, such as Python, R, and Java.

- Frameworks and Libraries: Gain experience with ML frameworks like TensorFlow, PyTorch, and scikit-learn.

- Communication Skills: Develop effective communication skills to coordinate with team members, stakeholders, and external partners.

- Urban Planning: Learn about urban planning principles and how traffic management fits into broader city planning efforts.

- Adaptability: Learn to adapt to new challenges and changing project requirements effectively.

8   Future work scope

➔ **Future Ideas for Smart City Traffic Control:**

- Long-term Traffic Forecasting: Develop models that can predict traffic patterns weeks or months in advance, considering variables like weather forecasts, scheduled events, and historical data trends.

- Real-time Public Transport Coordination: Integrate real-time data from buses, trams, and subways to optimize traffic light timings, giving priority to public transportation and reducing delays.

- Vehicle-to-Vehicle: Facilitate direct communication between vehicles to improve traffic flow and prevent accidents by sharing information about speed, location, and road conditions.

- Air Quality Monitoring: Integrate air quality sensors into the traffic control system to monitor pollution levels and adjust traffic flow to minimize environmental impact.

- Bike and Scooter Integration: Integrate data from bike and scooter-sharing systems into the traffic control system to ensure safe and efficient travel for all modes of transportation.

- Advanced Encryption: Implement advanced encryption techniques to protect data transmission between sensors, vehicles, and control systems.