Industrial Internship Report on

”Smart city traffic flow prediction using Data Science and Machine Learning”

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. 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

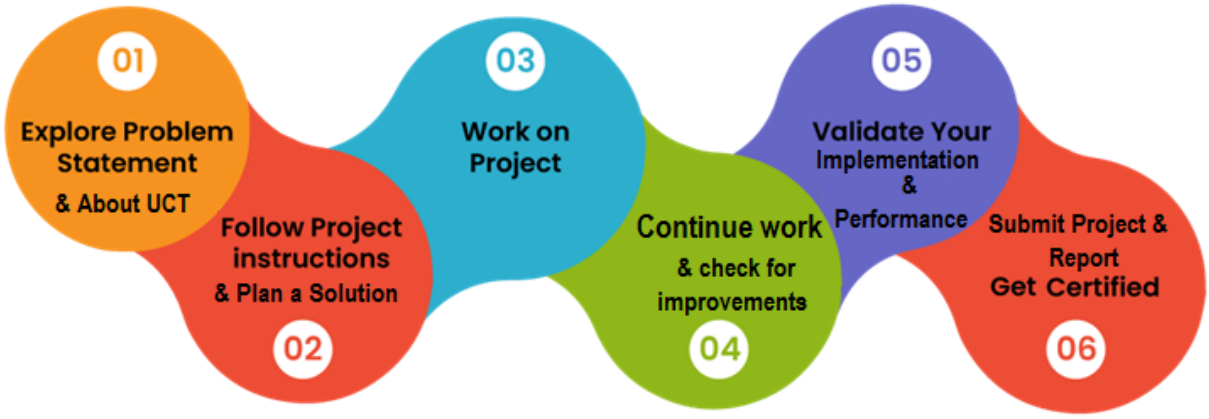
Summary of the whole 6 weeks' work.

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.

Thanks to all , who have helped you directly or indirectly.

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.

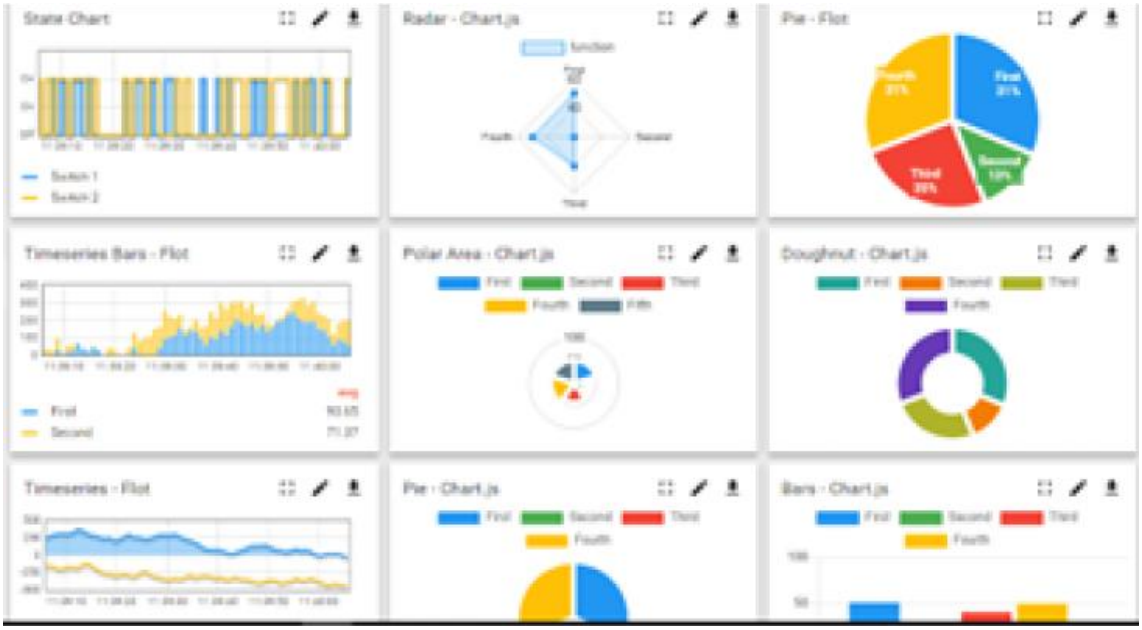
i. UCT IoT Platform (UCT Insight)

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
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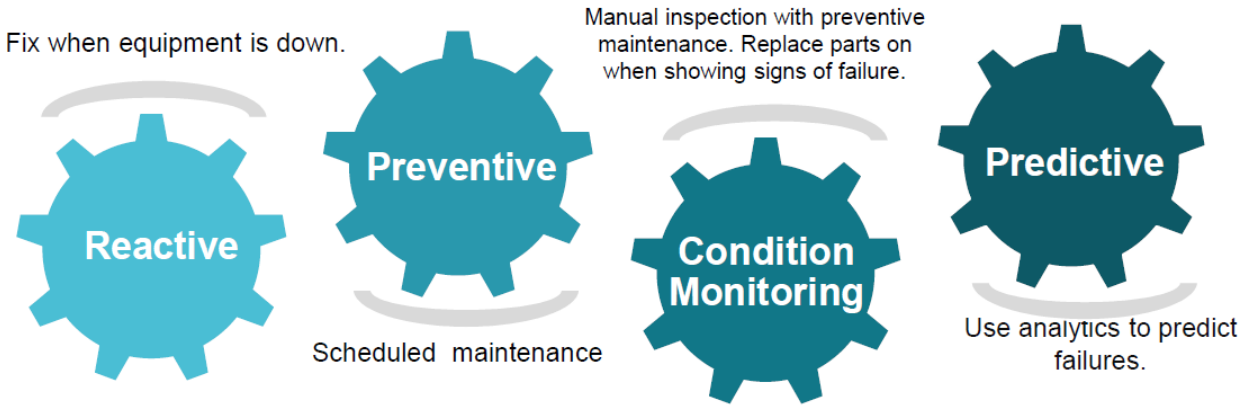
iii. LoRaWAN based Solution

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

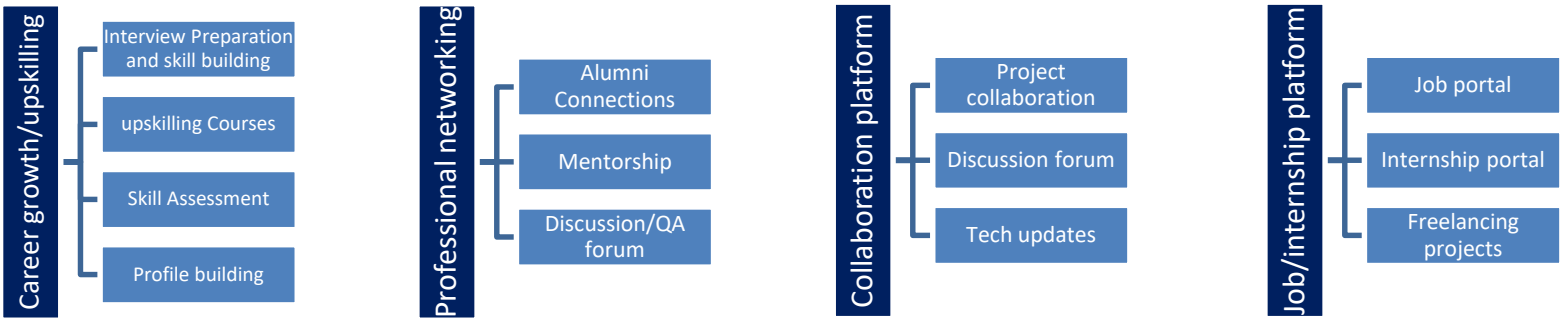
UCT is providing Industrial Machine health monitoring and Predictive maintenance solution leveraging Embedded system, Industrial IoT and Machine Learning Technologies by finding Remaining useful life time of various Machines used in production process.



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.



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

To solve the problem of increasing traffic and forecasting smart city traffic patterns by using Data Science and Machine Learning. Traffic prediction involves estimating the future behavior of traffic in a particular area. This information is useful for a variety of purposes, including reducing congestion, optimizing transportation systems, and improving road safety.

4. Project progress in detail

Smart city traffic forecasting using data science and machine learning involves using historical traffic data, advanced analytical techniques, and predictive modeling to anticipate future traffic patterns in urban areas. This approach can aid in efficient traffic management, urban planning, and resource allocation. Here's a general outline of the steps involved:

- Data Collection and Preparation: Gather relevant data sources, including historical traffic data, weather data, events, road network information, and any other relevant variables. Clean and preprocess the data, handling missing values, outliers, and inconsistencies. Feature Engineering:

- Create meaningful features from the collected data, such as time of day, day of week, holidays, road characteristics, traffic signals, and more. Compute aggregated statistics like average speed, traffic volume, and congestion levels. Exploratory Data Analysis (EDA):

- Visualize and analyze the data to identify trends, patterns, and correlations between different variables. Understand how external factors like weather or events impact traffic patterns. Model Selection:

- Choose suitable machine learning algorithms for time-series forecasting, such as: Autoregressive Integrated Moving Average (ARIMA) Seasonal Decomposition of Time Series (STL) Long Short-Term Memory (LSTM) networks Gradient Boosting Machines (GBM) Neural networks

- Data Splitting and Training: Divide the data into training and validation sets to train and evaluate the model's performance. Tune hyper parameters and train multiple models to find the best-performing one.

• Model Evaluation: Assess the model's accuracy using evaluation metrics like Mean Absolute Error (MAE), Root Mean Squared Error (RMSE), or Mean Absolute Percentage Error (MAPE). Evaluate the model on both training and validation datasets. • Forecasting: Use the trained model to make predictions for future traffic patterns. Incorporate uncertainty estimates to provide a range of potential outcomes.

• Visualization and Interpretation: Visualize the predicted traffic patterns alongside actual data for better understanding. Interpret the results to gain insights into how different factors affect traffic.

5. Github link:

https://github.com/SahanaPaneesh/project-ML.git