Industrial Internship Report on

” Smart City Solutions”

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 “Smart City Solutions”. 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.

During the six weeks of the internship, my project, "Smart City Solutions" made substantial progress in leveraging cloud computing to make the city smart by providing some smart works. This summary provides a concise overview of the key achievements and milestones reached during this period.

Week 1: Introduction to Cloud Computing

- **Project Introduction**: About the architecture and the model buildings. Structure designs.
- **Team Formation**: The project team was formed, comprising interns with diverse skills cloud computing.

Week 2-3: Benefits and Account creation

- **Benefits**: Architecture benefits their essentials.
- **Account creation**: AWS account creation, library installation and data uploading to the cloud. Creating things and polices and attaching them.

Week 4-5: Model Development and Training

- **Model Selection**: We evaluated the model and uploaded the data for training the model.
- **Training and Fine**- Took the data and implemented model training algorithm.

Week 6: Web Application Development and Deployment

- **User Interface Design**: A user-friendly web application was designed with multiple pages, including sector-specific and community-focused sections.
- **Integration with ML Cloud**: ML cloud services were employed for data storage and real-time analysis to ensure that the web application provided up-to-date predictions.
- **Deployment and Testing**: The web application was deployed, and rigorous testing was conducted to ensure functionality and reliability.

About need of relevant Internship in career development.

Internships are a crucial component of career development for several compelling reasons. These experiences provide individuals, particularly students and recent graduates, with an opportunity to bridge the gap between academic knowledge and practical application in a real-world setting. Here are some of the key reasons why relevant internships are essential for career development:

1. **Skill Enhancement**: Internships offer a platform to apply theoretical knowledge gained in classrooms to actual workplace scenarios. This practical experience helps individuals develop and

enhance critical skills, such as problem-solving, communication, teamwork, and technical proficiency, which are often highly valued by employers.

2. **Industry Exposure**: Internships provide a firsthand look into specific industries and sectors. This exposure helps interns understand the intricacies of various professions, the company culture, and the expectations and demands of different roles. It also allows them to explore diverse career paths and make informed decisions about their future careers.

3. **Networking Opportunities**: Internships facilitate networking with professionals in the field. Building connections with experienced individuals can lead to mentorship opportunities, job referrals, and valuable insights into industry trends. These connections can be instrumental in securing future employment.

4. **Resume Building**: A well-rounded resume is critical for career advancement. Relevant internships not only provide practical experience but also add credibility to one's resume, making candidates more attractive to potential employers. Employers often consider internship experience as evidence of an applicant's commitment and readiness for the workforce.

5. **Confidence and Self-Esteem**: Successfully completing an internship can boost an individual's confidence and self-esteem. It validates their capabilities and empowers them to take on more significant challenges in their careers.

6. **Exploration and Clarification**: Internships allow individuals to test their career interests. Sometimes, people discover that a particular field or role isn't what they expected, which can save them from pursuing a career path that doesn't align with their goals and values. On the other hand, it can also confirm their passion and commitment to a chosen profession.

7. **Competitive Advantage**: In today's competitive job market, having relevant internship experience can set candidates apart from others with similar academic qualifications. Employers often prefer candidates who can immediately contribute to their organization's success without extensive on-the-job training.

8. **Adaptability**: Internships often expose individuals to real workplace challenges, including tight deadlines, high-pressure situations, and interpersonal dynamics. This experience enhances adaptability and equips them with valuable coping strategies, which are essential in any career.

9. **Professional Etiquette**: Internships teach interns about workplace etiquette, professional conduct, and workplace norms. Learning these aspects early in one's career is crucial for long-term success.

10. **Career Path Clarity**: Internships can clarify an individual's career goals and aspirations. By working in a particular field or role, interns can gain a clear understanding of their preferences and strengths, helping them make more informed career choices.

Brief about my project/problem statement.

The primary objectives of this project were:

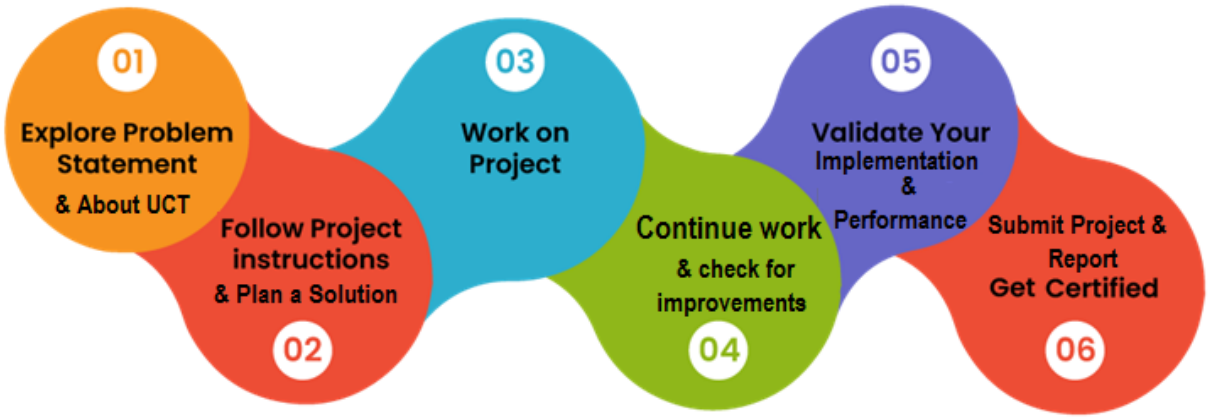
1. To develop solutions for the smart city .
2. To implement some algorithm using which the managementof the city can be in smart ways.
3. To enhance the overall decision-making process in cities.

Opportunity given by USC/UCT.

UCT offers a wide gamut of services and solutions across the world in IOT, Wireless Communication, Industry 4.0 & Predictive Maintenance. For developing its products and solutions it is leveraging various Cutting Edge Technologies e.g. Internet of Things (IoT), Cloud computing (AWS, Azure), Machine Learning, Communication Technologies (4G/5G/LoRaWAN), Java Full Stack, Python, Front end etc.

UCT provides industrial projects based on these technologies to the intern.

How Program was planned



My Learnings and overall experience.

During our internship at UniConverge Technologies Pvt Ltd, which lasted for [5th Aug – 15th sep], I had the opportunity to learn a variety of new skills. This experience was a significant step in my professional journey, and it provided me with numerous valuable insights and skills that I'd like to share.

Key Learnings:

1. **Technical Skills**: Throughout my internship, I acquired and honed several technical skills essential for the [Industry/Field], including [List Specific Technical Skills]. These skills not only expanded my knowledge but also gave me the confidence to tackle complex tasks and projects.

2. **Hands-On Experience**: The hands-on experience I gained during the internship was invaluable. I had the chance to work on [Describe Projects or Tasks], which allowed me to apply theoretical knowledge from my academic studies to real-world situations.

3. **Team Collaboration**: Collaboration was a significant aspect of my internship. Working closely with my colleagues taught me the importance of effective teamwork, communication, and adaptability. I learned how to navigate interpersonal dynamics and contribute meaningfully to group projects.

4. **Problem-Solving**: I encountered various challenges during my internship, such as [Provide Examples]. These experiences sharpened my problem-solving skills as I had to find creative solutions, often under tight deadlines.

5. **Networking**: Building relationships with professionals in the field was an unexpected but incredibly rewarding aspect of my internship. I had the privilege of meeting [Mention Notable Contacts], who generously shared their insights and experiences, opening up new perspectives for my career.

Highlights of Our Experience:

1. Project on Smart City Solutions: One of the most memorable aspects of my internship was working on this Project. This project pushed me out of my comfort zone and allowed me to demonstrate my abilities in Cloud Computing. It was incredibly fulfilling to see the project succeed, and it affirmed my passion for Cloud Computing.

2. Mentorship: My supervisor, played a pivotal role in my professional growth. Their guidance, mentorship, and constructive feedback helped me navigate challenges and make the most of my internship experience.

First I would like to thank “UniConverge Technologies Pvt Ltd”, for giving me the opportunity to do an internship with organization. I would like to thank the entire team at USC/ Company for their support and guidance during my internship. In particular, I would like to thank UCT my supervisor, for their mentorship and the opportunity to intern at the company.

Message to my juniors and peers.

Dear Juniors and Peers,

I want to take a moment to reflect on my recent internship experience and share some insights that i believe could be invaluable to all of you as you navigate your academic and professional journeys.

First and foremost, embrace every opportunity that comes your way. Internships are not just checkboxes; they are doors to real-world learning and personal growth. Seek out experiences that align with your interests and career aspirations.

Remember that learning is a continuous process. Use every opportunity, including internships, to acquire new skills, broaden your knowledge, and stay updated with industry trends.

Networking is more than just a buzzword. Building a professional network can open doors to mentorship, job opportunities, and collaborative projects. Connect with professionals in your field of interest whenever you can.

Be adaptable. The professional world can be unpredictable, and adaptability is a valuable skill. Be prepared to pivot, learn new things, and embrace challenges as opportunities for growth.

Effective time management is key. Balancing academic commitments, internships, and personal life can be challenging, but finding a system that works for you is crucial.

Collaboration is a vital skill. Working in teams during internships and in your future careers requires effective communication and teamwork. Practice these skills; they are essential for success.

Trust in your abilities. You are more capable than you might think. Don't be afraid to take on new challenges and responsibilities.

Set clear career goals. Take time to reflect on your experiences and set goals for your future. Understand where you want to go and what steps you need to take to get there.

Share your knowledge. Don't keep your learnings to yourself. Share your experiences, insights, and advice with your peers. This collective knowledge-sharing benefits everyone.

Stay resilient. The road to success is rarely a straight line. It's okay to face setbacks and obstacles; what matters is how you bounce back and persevere.

In conclusion, my internship was a transformative experience that has prepared me for the future. I encourage each one of you to actively seek out opportunities that contribute to your personal and professional growth. Embrace challenges, keep learning, and stay focused on your goals. I’m here to support and share my experiences with you all, and I look forward to seeing your remarkable achievements in the near future.

Best regards,

Krishna Prakash

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.

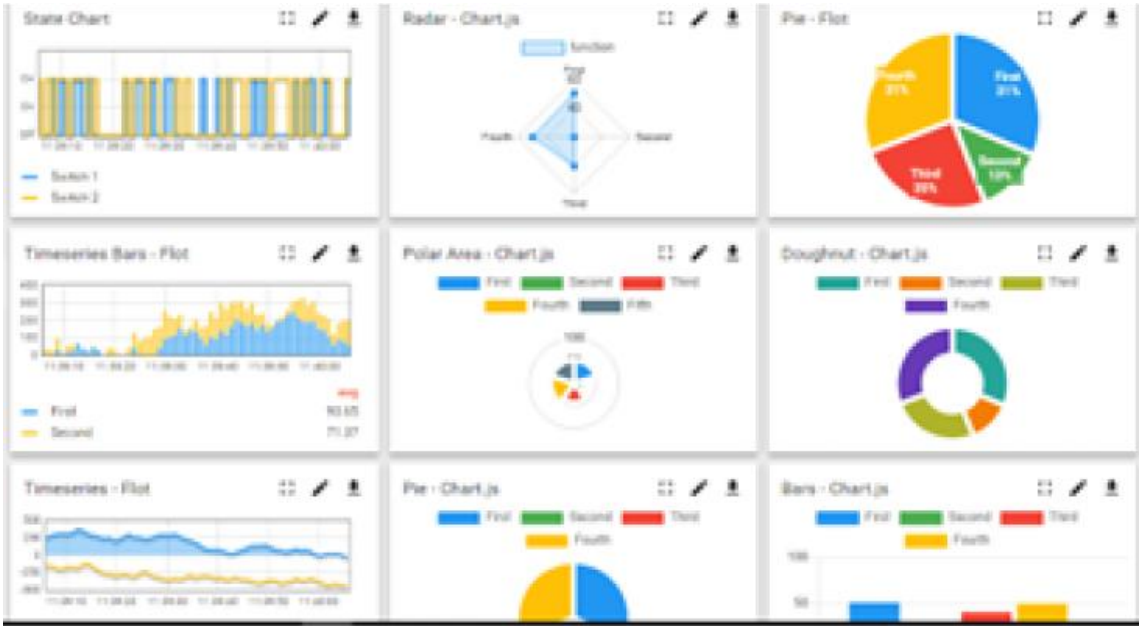
i. UCT IoT Platform (UCT Insight)

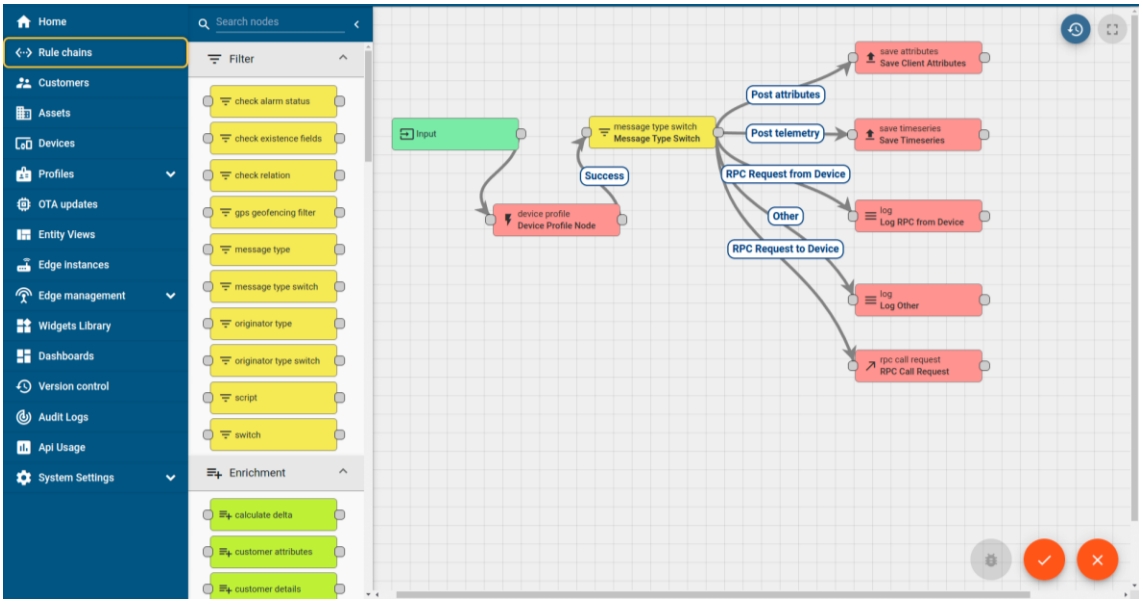
UCT Insight is an IOT platform designed for quick deployment of IOT applications on the same time providing valuable "insight" for your process/business. It has been built in Java for backend and ReactJS for Front end. It has support for MySQL and various NoSql Databases.

- 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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0.00v
24.53%
24.53%
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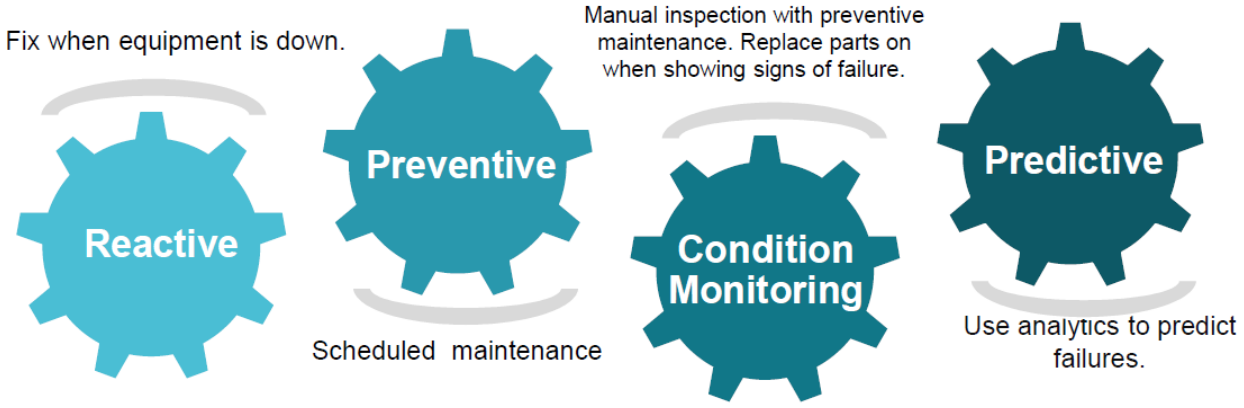
200.00v
62.35%
62.35%
Availability
Performance
Quality
OEE

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

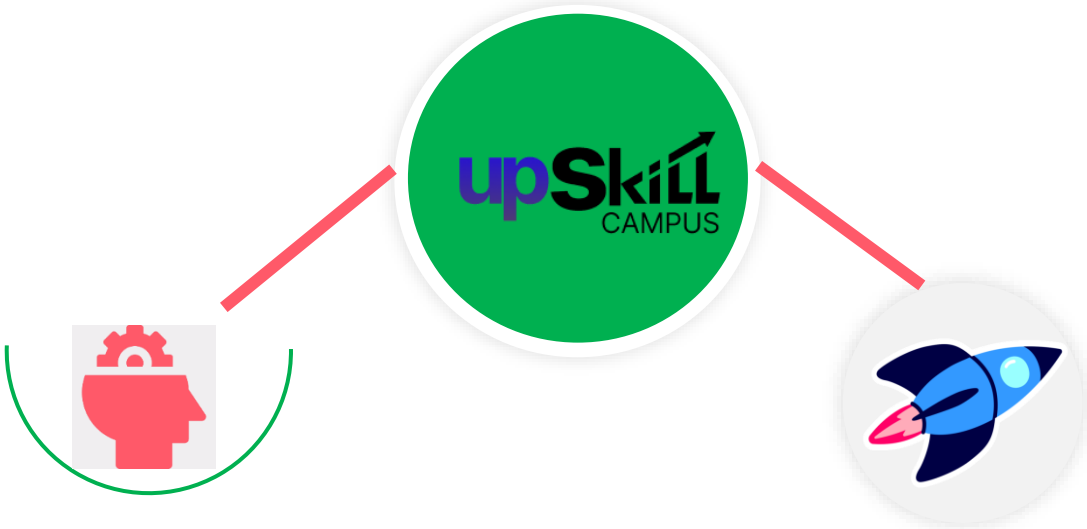
UCT is providing Industrial Machine health monitoring and Predictive maintenance solution leveraging Embedded system, Industrial IoT and Machine Learning Technologies by finding Remaining useful life time of various Machines used in production process.



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.

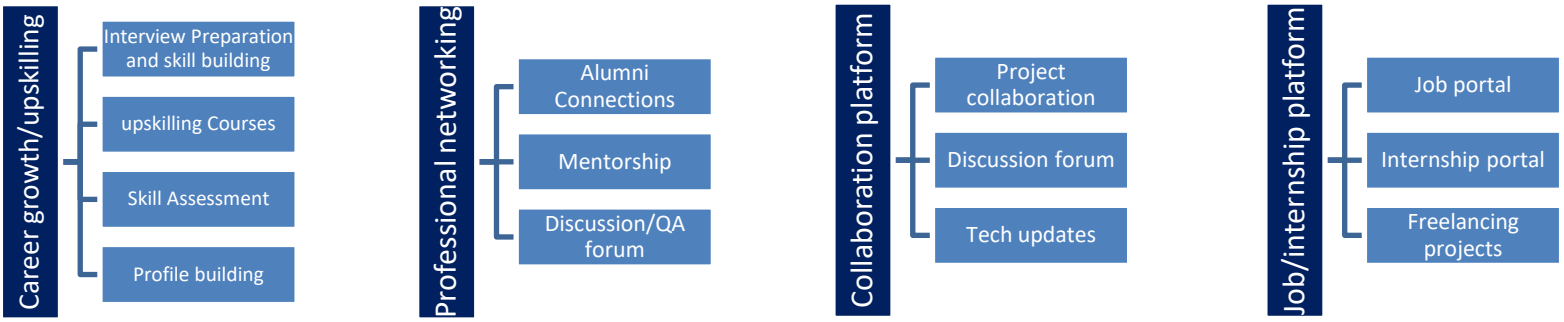
USC is a career development platform that delivers **personalized executive coaching** in a more affordable, scalable and measurable way.



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] Book: Cloud Computing: Concepts, Technology & Architecture by: Thomas Erl, Ricardo Puttini, Zaigham Mahmood

[2] Book: Architecting the Cloud: Design Decisions for Cloud Computing Service Models by: Michael J. Kavis

[3] Cloud Computing: Concepts, Technology & Architecture by: Thomas Erl, Ricardo Puttini, Zaigham Mahmood

2.6 Glossary

Terms	Acronym
CC	Cloud Computing
OS	Operating System
IoT	Internet of Things
RFID	Radio-Frequency Identification
LED	Light-emitting diode

3 Problem Statement

The main objective of this project is to design, to create a better road network system within the city for a smoother transition of traffic to increase the overall productivity of a city. This model should address the following challenges:

- **Smooth and Uninterrupted Traffic flow**: Traffic flow is the study of interactions between vehicles, drivers, and infrastructure, with the aim of understanding and developing an optimal road network with efficient movement of traffic and minimal traffic congestion problems.
- **Increase in transportation system efficiency**: The energy efficiency in transport is the useful traveled distance, of passengers, goods, or any type of load; divided by the total energy put into the transport propulsion means.
- **Enhance Road Safety**: Road safety barriers provide many benefits. Here are some of them. Increased Safety on the Roads. The road safety barriers are specially designed to increase safety levels on the roads by protecting the drivers and vehicles in cases of accidents.
- **Smart Mobility**: The main objective of this project is to create a better road network system within the city for a smoother transition of traffic to increase the overall productivity of a city.

4 Existing and Proposed solution

Existing Solutions

Current traffic control techniques involving magnetic loop detectors buried in the road, infra-red and radar sensors on the side provide limited traffic and require separate systems for traffic counting and traffic surveillance. The fact which encouraged us to conduct this research is that in many cities of the world, a signal allocation is still based on the timer.

Proposed Solution

Our proposed solution involves the following steps:

- A proposed system for the detection of these vehicles is based on Radio-Frequency Identification (RFID)**.**
- The use of this technology necessitates unnecessary extra hardware to be installed both at every junction and in every vehicle.
- There have also been studies to recognize these vehicles by analysis of the count of the vehicles through sensors and the android application control system.
- This technology is also easily influenced by vehicle count and requires additional hardware at every traffic signal.

4.1 Code submission (Github link):

https://github.com/krishnapr827/upskillcampus/blob/main/SmartCitySolutions.py

4.2 Report submission (Github link):

https://github.com/krishnapr827/upskillcampus/blob/main/SmartCitySolutions_KrishnaPrakash_USC_UCT.pdf

5 Proposed Design/ Model

The proposed design model consists of the following components:

- **Smooth and Uninterrupted Traffic flow**: Traffic flow is the study of interactions between vehicles, drivers, and infrastructure, with the aim of understanding and developing an optimal road network with efficient movement of traffic and minimal traffic congestion problems.
- **Increase in transportation system efficiency**: The energy efficiency in transport is the useful traveled distance, of passengers, goods, or any type of load; divided by the total energy put into the transport propulsion means.
- **Enhance Road Safety**: Road safety barriers provide many benefits. Here are some of them. Increased Safety on the Roads. The road safety barriers are specially designed to increase safety levels on the roads by protecting the drivers and vehicles in cases of accidents.
- **Smart Mobility**: The main objective of this project is to create a better road network system within the city for a smoother transition of traffic to increase the overall productivity of a city.
- **Reduce Journey time and inconvenience**: The fact which encouraged us to conduct this research is that in many cities of the world, a signal allocation is still based on a timer. The timer approach has a drawback that even when there is less traffic on a road, Advance traffic management system using google cloud 2019-2020 Department of CSE, RIT Hassan Page 4 green signal is still allocated to the road till its timer value falls to 0 while traffic on another road which is more, faces red signal at that time which causes congestion and time loss to commutators. Most of the present systems are not automated and are prone to human errors.

5.1 Diagrams

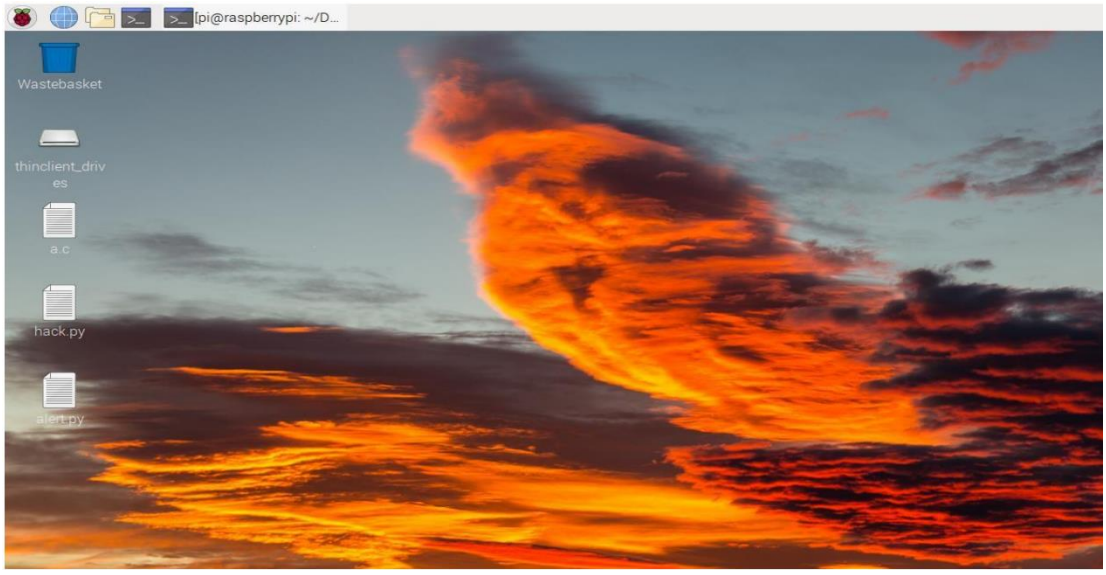


Figure 1: Desktop view of Raspberry pi Operating System

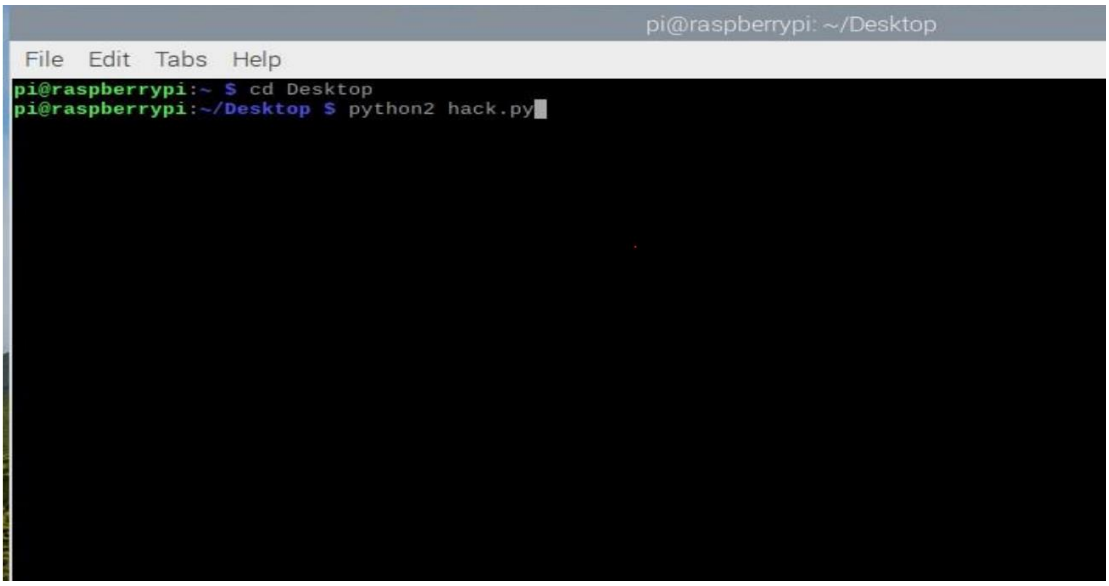


Figure 2: Run Python code using Terminal

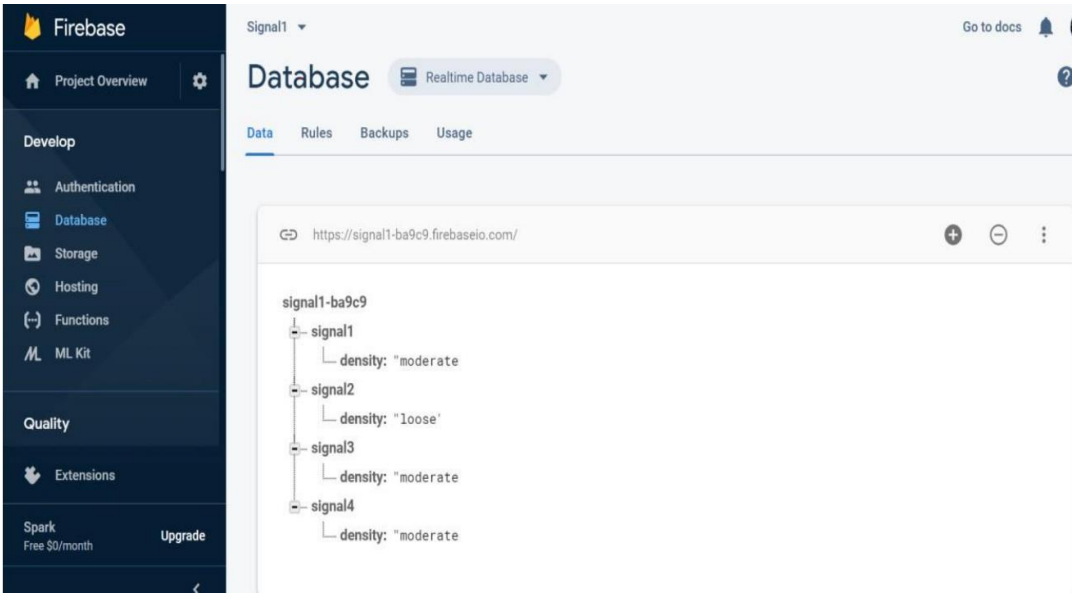


Figure 3: Dashboard of the Firebase Realtime Database

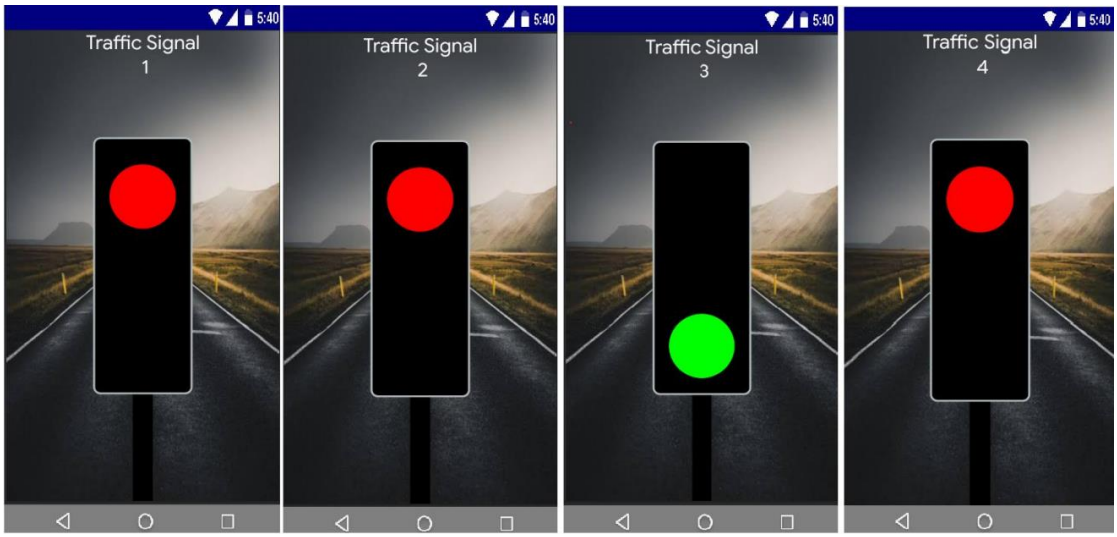


Figure 4: Android UI Provided for Signal Demonstration

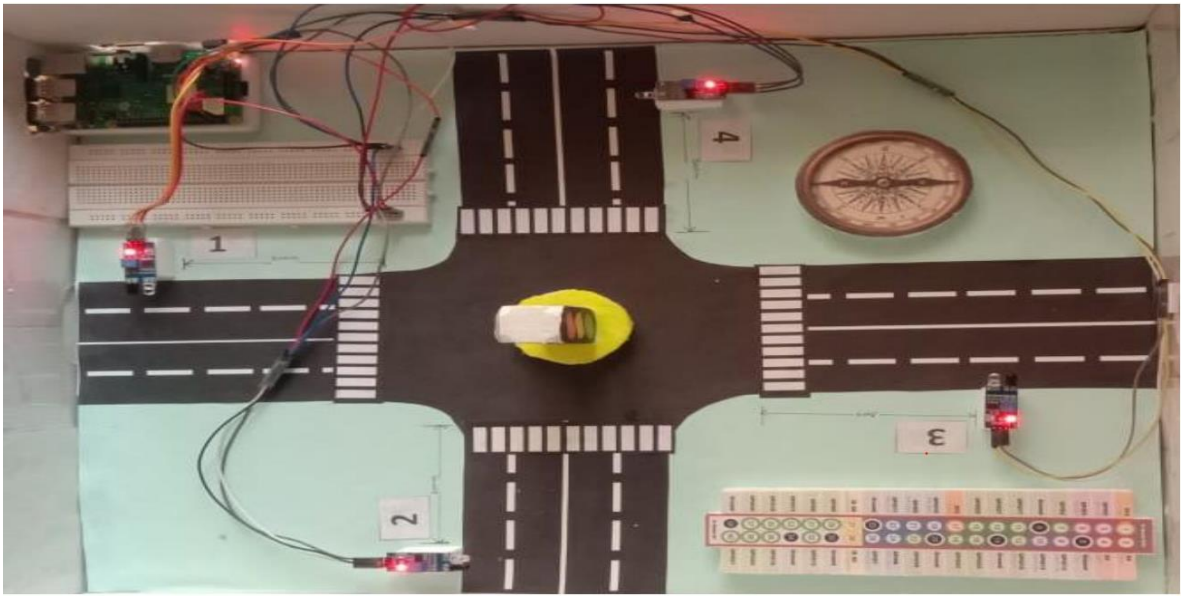


Figure 5: Advanced traffic management system using a google cloud model

5.2 Interfaces

Block Diagrams

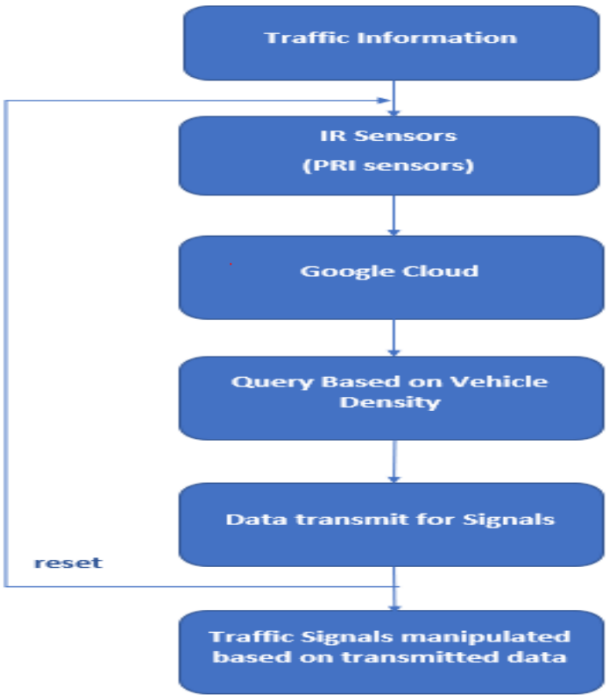


Figure 6: Block Diagram of an advanced traffic management system

6 Performance Test

6.1 Test Plan/ Test Cases

I will conduct performance testing to assess the accuracy and efficiency of the prediction model. The test plan includes the following:

- **Data Collecting**: Data collection over the cities traffic.
- **Model Training**: Train the model on the training data using various algorithms codes.
- **Model Evaluation**: Evaluate the models using sensors, codes
- **Cross-Validation**: Implement cross-validation techniques to assess model robustness.

6.2 Test Procedure

1. Collect and train the model using collected data.
2. Upload the data for training.
3. Train the models using different algorithms.
4. Evaluate model performance using appropriate algorithms.
5. Perform cross-validation to assess model robustness.
6. Compare the performance of different models.

6.3 Performance Outcome

The performance testing is expected to yield the following outcomes:

- Identification of the most accurate prediction model.
- Quantification of prediction errors.
- Assessment of model robustness through cross-validation.

7 Our learnings

The "Smart City Solutions" project aims to provide an advanced solution to a critical situation of the city like traffics. By leveraging cloud computing and IoT things a user-friendly application, I intend to empower the cities critical situation and manage the traffic in a smart way. Initial tests have shown promising results, with improvements in prediction accuracy and usability.

8 Future work scope

The project's future work scope includes:

- **Integration of Real-Time Data**: Incorporate real-time data sources to make predictions more dynamic and responsive to current conditions.
- **Enhanced Regional Models**: Develop specialized models for different regions in India to account for local variations.
- **Advanced Time-Series Analysis**: Explore advanced time-series forecasting methods to capture more intricate temporal patterns.
- **Stakeholder Engagement**: Collaborate with more cities and experts to ensure the model's practical utility.
- **Scalability**: Optimize the model for scalability to handle larger datasets and serve a broader user base.

In conclusion, the "Smart City Solutions" project aims to leverage cloud computing to provide accurate management of the situations, ultimately contributing to better management and handling situations.