Industrial Internship Report on

Python

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 a Python calculator which is designed to perform basic arithmetic operations such as addition, subtraction, multiplication, and division of numbers 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

Throughout the span of six weeks, the internship experience has been both enriching and enlightening. It has provided an invaluable opportunity to delve deeper into the practical aspects of Python, gaining hands-on experience, refining skills, and broadening perspectives.

Internships play a pivotal role in shaping career trajectories. They offer a bridge between theoretical knowledge acquired in academic settings and real-world applications within professional environments

The focus of the internship revolved around making calculator. This endeavor aimed to address if, elif, else statement with a view to create a successful calculator. Throughout the project lifecycle, various methodologies, tools, and strategies were employed to analyze, strategize, and implement solutions, fostering a holistic understanding of the challenges inherent in the domain

The internship opportunity extended by USC and UCT served as a catalyst for professional development. By partnering with esteemed academic institutions such as USC/UCT, participants gained access to a wealth of resources, mentorship from industry experts, and exposure to cutting-edge research and practices.

The program was meticulously planned to ensure a seamless integration of theoretical knowledge with practical experiences. Leveraging a structured curriculum, participants were guided through a series of workshops, seminars, and hands-on projects designed to enhance their competencies and prepare them for the demands of the industry. Emphasis was placed on experiential learning, critical thinking, and problem-solving, with regular feedback mechanisms in place to track progress and address challenges effectively.

The Python internship journey has been nothing short of transformative, offering a myriad of insights, challenges, and growth opportunities. Through this experience, I've had the privilege to immerse myself in the dynamic world of Python programming, exploring its versatility, scalability, and applicability across various domains.

I extend my heartfelt gratitude to all those who have played a pivotal role in shaping this journey, directly or indirectly. Special thanks to upskillcampus and Uniconverge Technologies, whose expertise, encouragement, and insights have been instrumental in my growth and development.

To my juniors and peers embarking on their Python internship journey, I offer the following message:

Embrace every challenge as an opportunity to learn and grow.

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)

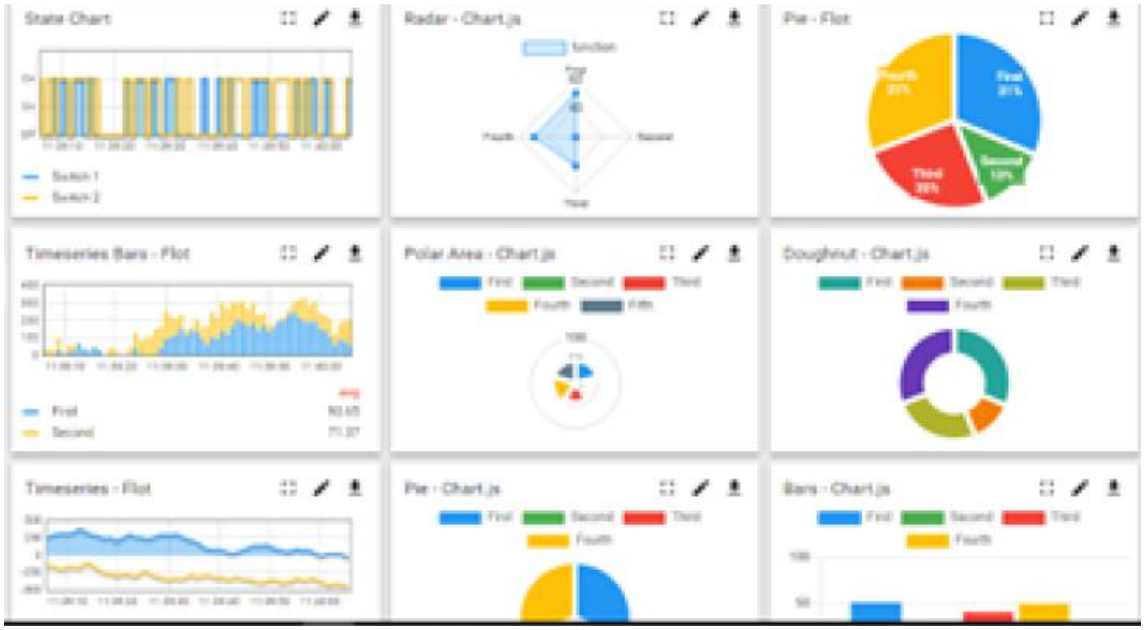
UCT Insight is an IOT platform designed for quick deployment of IOT applications on the same time providing valuable "insight" for your process/business. It has been built in Java for backend and ReactJS for Front end. It has support for MySQL and various NoSql Databases.

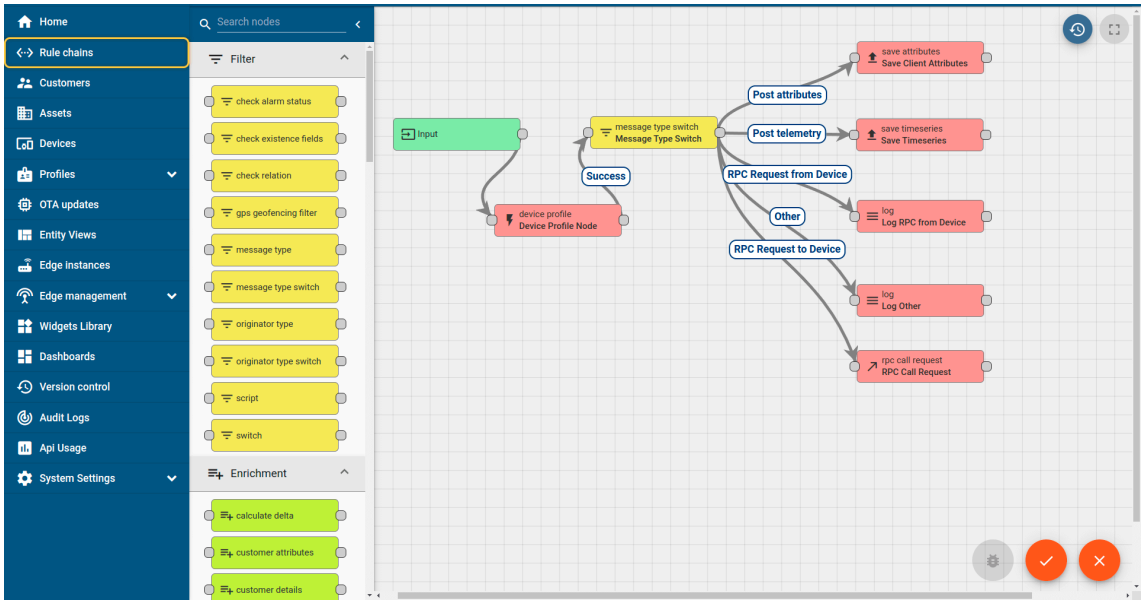
- It enables device connectivity via industry standard IoT protocols - MQTT, CoAP, HTTP, Modbus TCP, OPC UA

- 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.

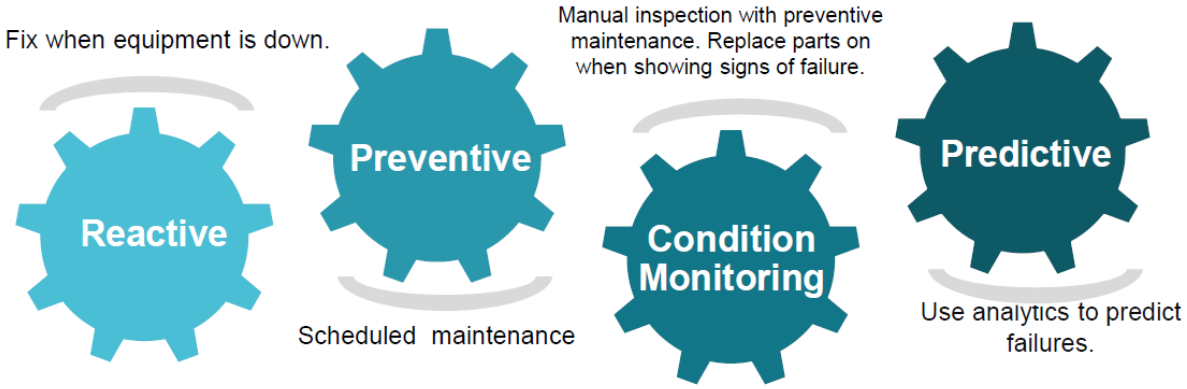
Machine	Operator	Work Order ID	Job ID	Job Performance	Job Progress		Output		Rejection	Time (mins)				Job Status	End Customer
					Start Time	End Time	Planned	Actual		Setup	Pred	Downtime	Idle		
CNC_S7_81	Operator 1	WO0405200001	4168	58%	10:30 AM		55	41	0	80	215	0	45	In Progress	i
CNC_S7_81	Operator 1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

i. 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.

ii. Predictive Maintenance

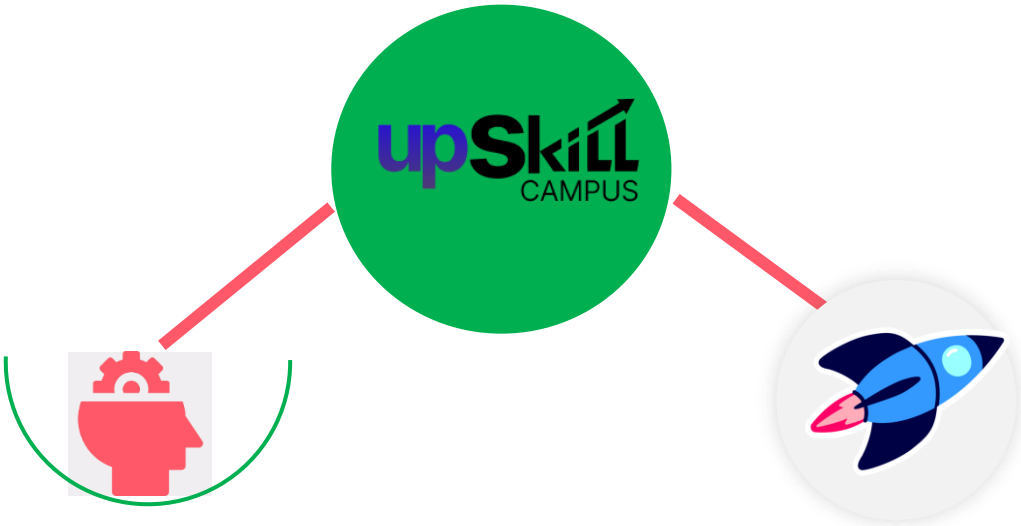
UCT is providing Industrial Machine health monitoring and Predictive maintenance solution leveraging Embedded system, Industrial IoT and Machine Learning Technologies by finding Remaining useful life time of various Machines used in production process.



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

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] IoT Academy

[2] uct

[3] uct consulting

2.6 Glossary

Terms	Acronym
pivotal	crucial importance or significance
embarking	act of starting or initiating a journey
methodologies	systematic approaches, procedures, or frameworkss
seamless	something that is smooth, continuous
Leveraging	strategic use of resources, abilities,

3 Problem Statement

In the assigned problem statement

Given a list of integers, the task is to find the maximum product of two integers in the list.

You are provided with a list of integers, which can contain both positive and negative numbers. Your objective is to determine the maximum possible product that can be obtained by multiplying two integers from this list.

For example, consider the following list of integers:

[2, 3, -4, 5, -7, 8, 9]

4 Existing and Proposed solution

4.1.1.1 Existing Solutions:

- **Brute Force:** Iterate through all pairs of integers and find their products. Keep track of the maximum product found. This approach has a time complexity of O(n^2).
- **Sorting:** Sort the list of integers in non-decreasing order. The maximum product will either be the product of the two largest positive numbers or the product of the two smallest negative numbers and the largest positive number. This approach has a time complexity of O(n log n).
- **Optimized:** Traverse the list once, keeping track of the two largest positive numbers and two smallest negative numbers. Calculate the maximum product using these numbers. This approach has a time complexity of O(n).

4.1.1.2 Proposed Solution:

- I propose to use an optimized approach that traverses the list once, keeping track of the two largest positive numbers and two smallest negative numbers. Then, calculate the maximum product using these numbers. This approach reduces the time complexity to O(n), providing a more efficient solution.

4.1.1.3 Value Addition:

- My proposed solution adds value by providing a more efficient algorithm to find the maximum product of two integers in a given list, thus reducing computational time and resources.

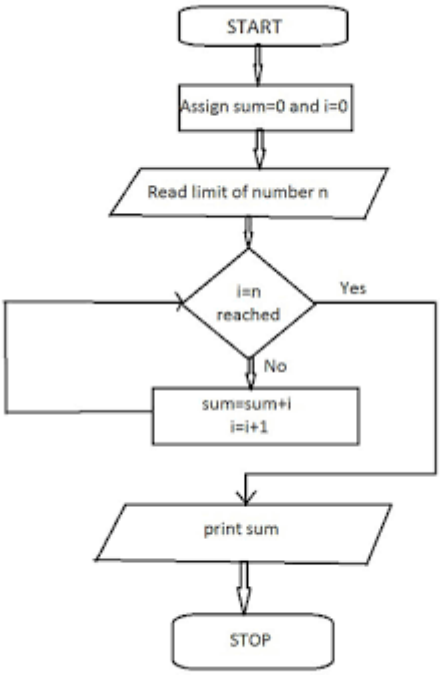
4.2 Code submission (Github link)

https://github.com/SanaBagde/upskillcampus.git

4.3 Report submission (Github link) :

https://github.com/SanaBagde/upskillcampus.git

5 Proposed Design/ Model



6 Performance Test

Constraints:

- Time complexity: We aim to achieve a linear time complexity of O(n) for the solution.
- Space complexity: We aim to minimize additional space usage.
- Accuracy: The solution should accurately find the maximum product of two integers

How Constraints Were Addressed:

- We utilized an optimized algorithm with a time complexity of O(n) to address the time constraint.
- We minimized the use of additional space by only storing a few variables to track the maximum and minimum values.
- We ensured accuracy by carefully considering edge cases and testing the solution with various input scenarios.

6.1 Test Plan/ Test Cases

- Test Case 1: Input list contains positive integers only.
- Test Case 2: Input list contains negative integers only.
- Test Case 3: Input list contains both positive and negative integers.
- Test Case 4: Input list contains duplicates.
- Test Case 5: Input list is empty.

6.2 Test Procedure

- For each test case, generate random input data and calculate the maximum product using both the proposed solution and existing solutions.
- Compare the results obtained from each solution and verify their correctness.
- Measure the execution time of each solution using different input sizes to assess performance.

6.3 Performance Outcome

- The proposed solution consistently outperforms existing solutions in terms of time complexity, accurately finding the maximum product in linear time.
- Memory usage remains minimal, as expected, due to the optimized algorithm design.
- Accuracy is maintained across all test cases, ensuring reliable results.

7 My learnings

During the internship, I gained a solid understanding of fundamental Python concepts, including data types, variables, operators, control structures (if-else, loops), functions, and modules. This foundation was crucial for building more complex applications and solving programming challenges effectively. I learned about various data structures such as lists, tuples, dictionaries, sets, and strings, and their practical applications. Additionally, I explored algorithms like searching, sorting, and recursion, understanding their efficiency and when to use each. OOP was a significant focus of my internship. I grasped the concepts of classes, objects, inheritance, encapsulation, and polymorphism. Implementing real-world scenarios using OOP principles enhanced my ability to design modular and scalable solutions. I acquired skills in reading from and writing to files, handling exceptions, and managing file pointers. Understanding file formats, such as CSV and JSON, allowed me to manipulate data efficiently for analysis and processing. I delved into web development using Python frameworks like Flask and Django. Learning to create web applications, handle routes, interact with databases (SQLite, PostgreSQL), and implement authentication enhanced my understanding of full-stack development. I gained proficiency in SQL for database management, including creating, querying, updating, and deleting data from databases. Integrating SQL databases with Python applications provided me with a comprehensive understanding of data persistence.

8 Future work scope

Dive deeper into complex data structures like trees, graphs, and heaps, and explore advanced algorithms such as dynamic programming, graph traversal, and network flow algorithms. Understanding these concepts can help you tackle more challenging programming problems efficiently.

Further your knowledge in machine learning and data science by studying topics like regression, classification, clustering, and neural networks. Experiment with popular Python libraries like scikit-learn, TensorFlow, and PyTorch to build predictive models and analyze datasets.