Industrial Internship Report on Development of Practical Python Utility Tools

Project Name : Mini Python Projects

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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 UniConverge Technologies Pvt Ltd (UCT).

The internship focused on hands-on development of multiple mini-projects using Python, aiming to strengthen both fundamental and advanced programming skills.

My project involved developing four practical applications:

- A URL Shortener using GUI (Tkinter)
- A Password Manager with encryption and SQLite
- A File Organizer for categorizing files by type
- A Quiz Game using external JSON data

This internship helped me gain deep exposure to real-world problems and taught me how to design, code, and test solutions effectively. Overall, it was a valuable learning experience.

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1 Preface

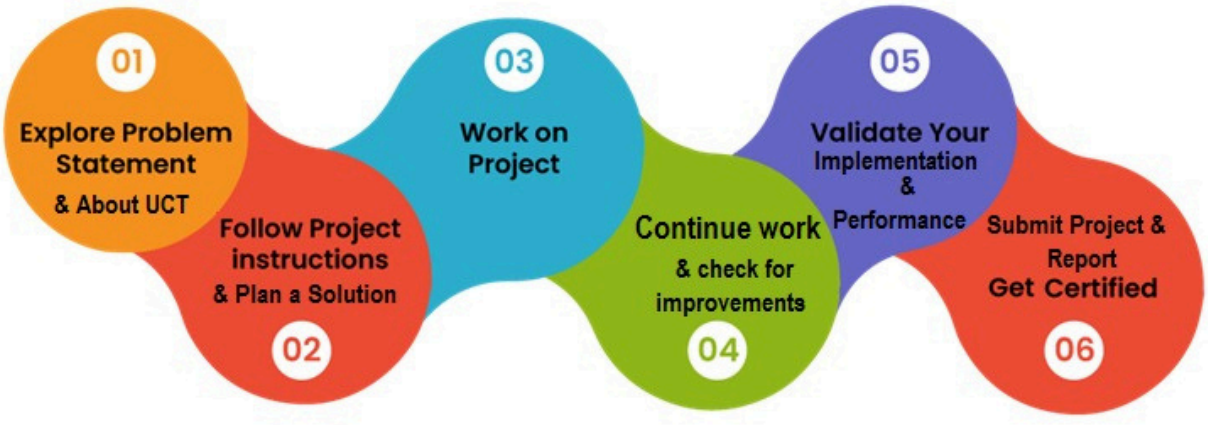
During this six-week internship organized by upskill Campus (USC) and The IoT Academy, in collaboration with UniConverge Technologies Pvt Ltd (UCT), I worked on four Python-based mini-projects focused on solving practical problems. These included a URL Shortener, Password Manager, File Organizer, and a Quiz Game—all designed to enhance my programming, automation, and data security skills.

Internships like this play a key role in career development by offering real-world exposure beyond classroom learning. The program was well-structured, starting with orientation, followed by project development, reviews, and final submission.

I am grateful to USC, The IoT Academy, and UCT for this opportunity, and to all mentors who guided me throughout.

Message to juniors:

Work on projects—big or small. They build your confidence and prepare you for real challenges.



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.

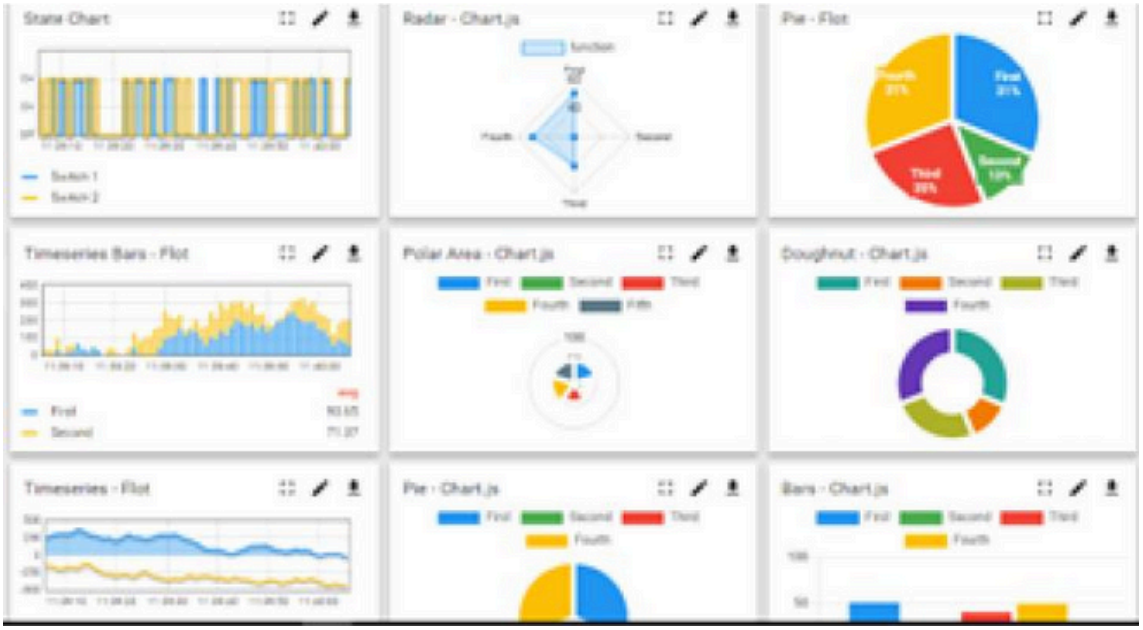
i. UCT IoT Platform (UCT Insight)

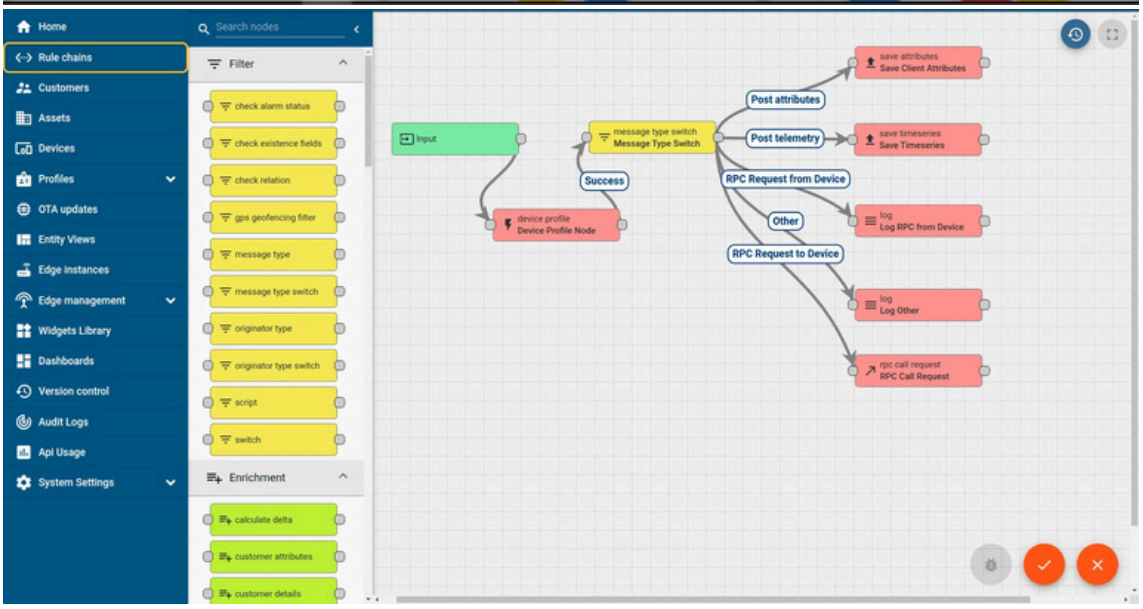
UCT Insight is an IOT platform designed for quick deployment of IOT applications on the same time providing valuable “insight” for your process/business. It has been built in Java for backend and ReactJS for Front end. It has support for MySQL and various NoSql Databases.

- 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.

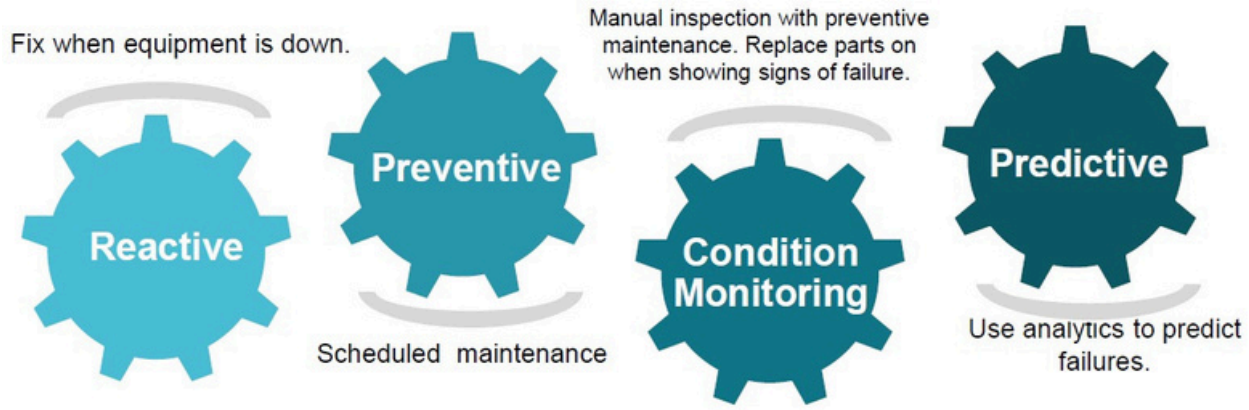
Machine	Operator	Work Order ID	Job ID	Job Performance	Job Progress		Output		Rejection	Time (mins)				Job Status	End Customer
					Start Time	End Time	Planned	Actual		Setup	Pred	Downtime	Idle		
CNC_S7_81	Operator 1	WO0405200001	4168	58%	10:30 AM		55	41	0	80	215	0	45	In Progress	i
CNC_S7_81	Operator 1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

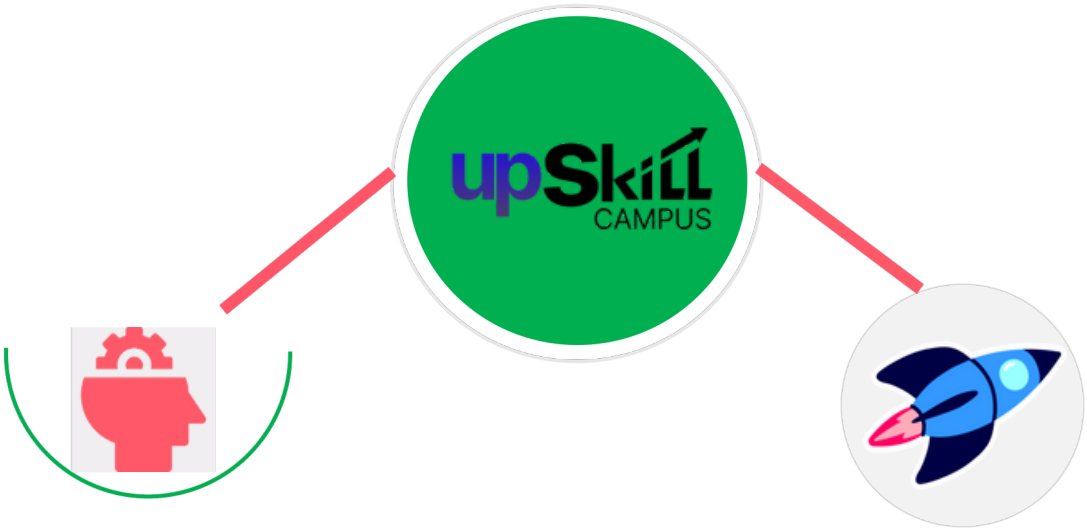
UCT is providing Industrial Machine health monitoring and Predictive maintenance solution leveraging Embedded system, Industrial IoT and Machine Learning Technologies by finding Remaining useful life time of various Machines used in production process.



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.

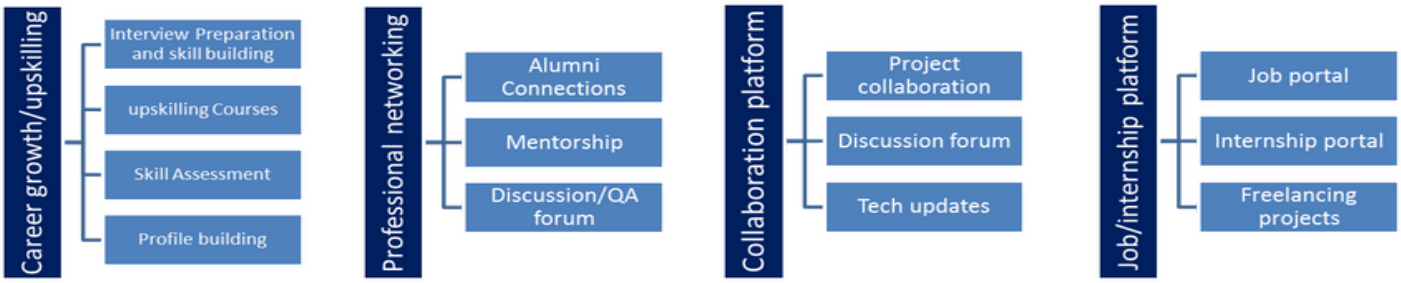
USC is a career development platform that delivers **personalized executive coaching** in a more affordable, scalable and measurable way.



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] Python Software Foundation, Python 3 Documentation : https://docs.python.org/3/
[2] GeeksforGeeks, Python Programming Tutorials : https://www.geeksforgeeks.org/python-programming-language-tutorial/
[3] Real Python, Python Tutorials for Developers : https://realpython.com/

2.6 Glossary

Terms	Acronym
Graphical User Interface	**GUI**
Uniform Resource Locator	**URL**
JavaScript Object Notation	**JSON**
Command Line Interface	**CLI**
Standard Python library used for creating GUI applications.	TKINTER

3 Problem Statement

1. URL Shortener:

Description: The URL shortener is a Python project that converts long URLs into shorter, more manageable links. It takes a long URL as input, generates a unique shortened URL, and redirects users to the original URL when the shortened link is accessed.

Scope: The scope of this project involves designing a user interface to input long URLs and display the shortened links, implementing a database to store the mapping between original and shortened URLs, and developing functions to generate unique shortened URLs and handle redirection.

2. File Organizer:

Description: The file organizer is a Python project that helps users organize their files in a directory. It scans a specified directory, categorizes files based on their type (e.g., images, documents, videos), and moves them into respective folders.

Scope: The scope of this project involves designing a user interface to specify the directory to organize, implementing functions to identify file types and create folders, and developing a file-moving algorithm to organize files into the appropriate folders.

3. Password Manager:

Description: The password manager is a Python project that securely stores and manages user passwords. It allows users to store their passwords for various accounts, generate strong passwords, and retrieve passwords when needed.

Scope: The scope of this project involves implementing encryption algorithms to secure password storage, designing a user interface to input and retrieve passwords, and developing functions to generate strong passwords and store/retrieve them from a database.

4. Quiz Game:

Description: The quiz game is a Python project that quizzes users on various topics. It reads questions and answers from a file or database, presents them to the user, and keeps track of their score.
Scope: The scope of this project involves designing a user interface to display questions and collect user answers, implementing a database or file system to store quiz data, and developing a scoring algorithm to track the user's progress and calculate their final score.

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4 Existing and Proposed solution

Existing and Proposed Solution

- Many URL shorteners exist but are often web-based. I built a desktop-based GUI shortener.
- Most password managers are paid or complex. My solution is offline and encrypted.
- File clutter is a common issue; my tool auto-sorts files by type using a modular script.
- Online quizzes exist, but mine can run locally with custom questions, useful for training and offline practice.

Value Addition: Each project is lightweight, fully offline, beginner-friendly, and ideal for personal or small-scale use.

4.1 Code submission (Github link) : click here

4.2 Report submission (Github link) : click here

5 Proposed Design/ Model

Each project developed during this internship followed a structured approach: understanding the problem, designing the flow, coding the logic, and testing the results. Below is a consolidated design overview:

5.3 High level Diagram (if applicable)

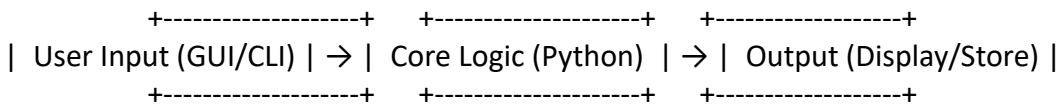
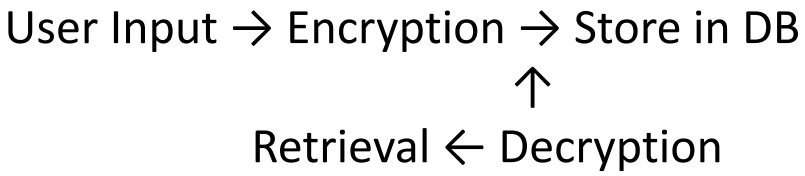


Figure 1: HIGH LEVEL DIAGRAM OF THE SYSTEM

5.2 Low Level Diagram (if applicable)



5.3 Interfaces (if applicable)

Update with Block Diagrams, Data flow, protocols, FLOW Charts, State Machines, Memory Buffer Management.

6 Performance Test

These projects were designed to be lightweight, fast, and resource-efficient, suitable for local execution without requiring advanced hardware. Below is the breakdown of performance-related considerations:

- Constraints Identified:
  - Memory usage: Projects use minimal RAM as they run locally with lightweight libraries.
  - Speed (MIPS): All scripts execute within milliseconds to a few seconds, even with larger inputs.
  - Security (for Password Manager): Used symmetric encryption via Fernet to ensure data protection.
  - Accuracy (for Quiz Game): Accurate question matching and scoring through strict answer comparison.

6.1 Test Plan/ Test

Project	Test Case	Expected Result	Pass/Fail
URL Shortener	Input long URL	Shortened URL generated	✅ Pass
Password Manager	Add encrypted entry	Stored securely in DB	✅ Pass
Password Manager	Retrieve password	Decrypted correctly	✅ Pass
File Organizer	Run on unorganized folder	Files moved to correct folders	✅ Pass
Quiz Game	Load valid JSON quiz	Displayed and scored correctly	✅ Pass

6.2 Test Procedure

1. URL Shortener:
   - Enter a long URL in the input box and click "Shorten."
   - Observe the output field for the shortened URL.
2. Password Manager:
   - Run script, choose option to store credentials.
   - Enter site, username, and password.
   - Re-run and retrieve to verify correctness.
3. File Organizer:
   - Place mixed file types in a test folder.
   - Run the script and verify folder creation and file movement.
4. Quiz Game:
   - Run script with a valid quiz_data.json.
   - Attempt all questions and verify scoring.

6.3 Performance Outcome

- All tools performed efficiently under normal system conditions (Windows/Linux, 4 GB RAM, basic CPU).
- Execution time for all scripts was fast and consistent.
- Password Manager ensured confidentiality with encryption.
- No crashes or memory leaks observed in any tool.
- Tools are scalable for small to moderate usage scenario**s.**

7 My learnings

This internship gave me practical exposure to real-world software development using Python. I learned how to plan, design, and implement functional applications from scratch. Working on different types of projects—GUI (Tkinter), encryption and database handling (SQLite and cryptography), file system automation (os & shutil), and data parsing (JSON)—helped me understand various use cases of Python in industry.

I also gained hands-on experience with:

- Writing clean, modular, and testable code
- Securing sensitive data through encryption
- Organizing and structuring projects effectively
- Debugging and optimizing scripts for performance

Beyond technical skills, I improved my ability to manage time, work independently, and document my work professionally. This experience has boosted my confidence and prepared me better for future internships and career opportunities in software development.

8 Future work scope

- Integrate multiple URL shortening services (e.g., Bitly, Rebrandly) and add URL validation to improve reliability.
- Implement QR code generation and history management for shortened URLs.
- Develop web and mobile app versions for broader accessibility.
- Build a graphical user interface (GUI) for the password manager to enhance usability.
- Add multi-factor authentication and cloud synchronization for better security and cross-device access.
- Incorporate password strength analysis, expiration alerts, and secure import/export capabilities.
- Extend the file organizer to support recursive scanning of subdirectories.
- Create a GUI application for easier use by non-technical users.
- Allow customization of file categories and provide an undo feature to revert changes.
- Introduce scheduled automatic organization and integrate cloud storage services.
- Develop a GUI-based quiz application with interactive buttons and timed questions.
- Support multiple quiz categories, difficulty levels, and multimedia question types.
- Implement user profiles and score tracking for progress monitoring.
- Build web and mobile versions for wider accessibility.