

**Industrial Internship Report on**  
**"Quality Prediction In A Mining Process"**

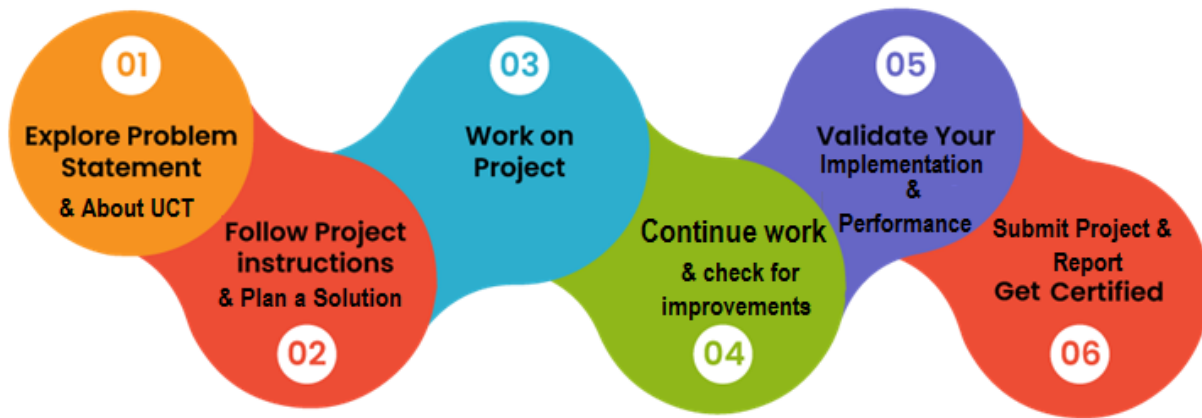
**Prepared by**  
**Sujal Parekh**

## TABLE OF CONTENTS

1	Preface.....	3
2	Introduction.....	4
2.1	About UniConverge Technologies Pvt Ltd.....	4
2.2	About upskill Campus.....	8
2.3	Objective.....	9
2.4	Reference .....	10
2.5	Glossary .....	10
3	Problem Statement .....	<b>Error! Bookmark not defined.</b>
4	Existing and Proposed solution.....	10
5	Proposed Design/ Model.....	11
5.1	High Level Diagram (if applicable).....	11
5.2	Low Level Diagram (if applicable).....	12
5.3	Interfaces (if applicable) .....	12
6	Performance Test .....	12
6.1	Test Plan/ Test Cases .....	12
6.2	Test Procedure .....	12
6.3	Performance Outcome .....	13
7	My learnings .....	13
8	Future work scope.....	14

## 1 Preface

This report summarizes the progress and achievements made during the final week of the Quality Prediction in Mining Process project at UniConverge Technologies Pvt Ltd. This week, the focus was on refining predictive models, addressing data preprocessing challenges, developing user-friendly visualization tools, and ensuring the robustness of the prediction system through extensive testing and validation.



Your Learnings and overall experience.

Thanks to UniConverge Technologies Pvt Ltd.

## 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 ()

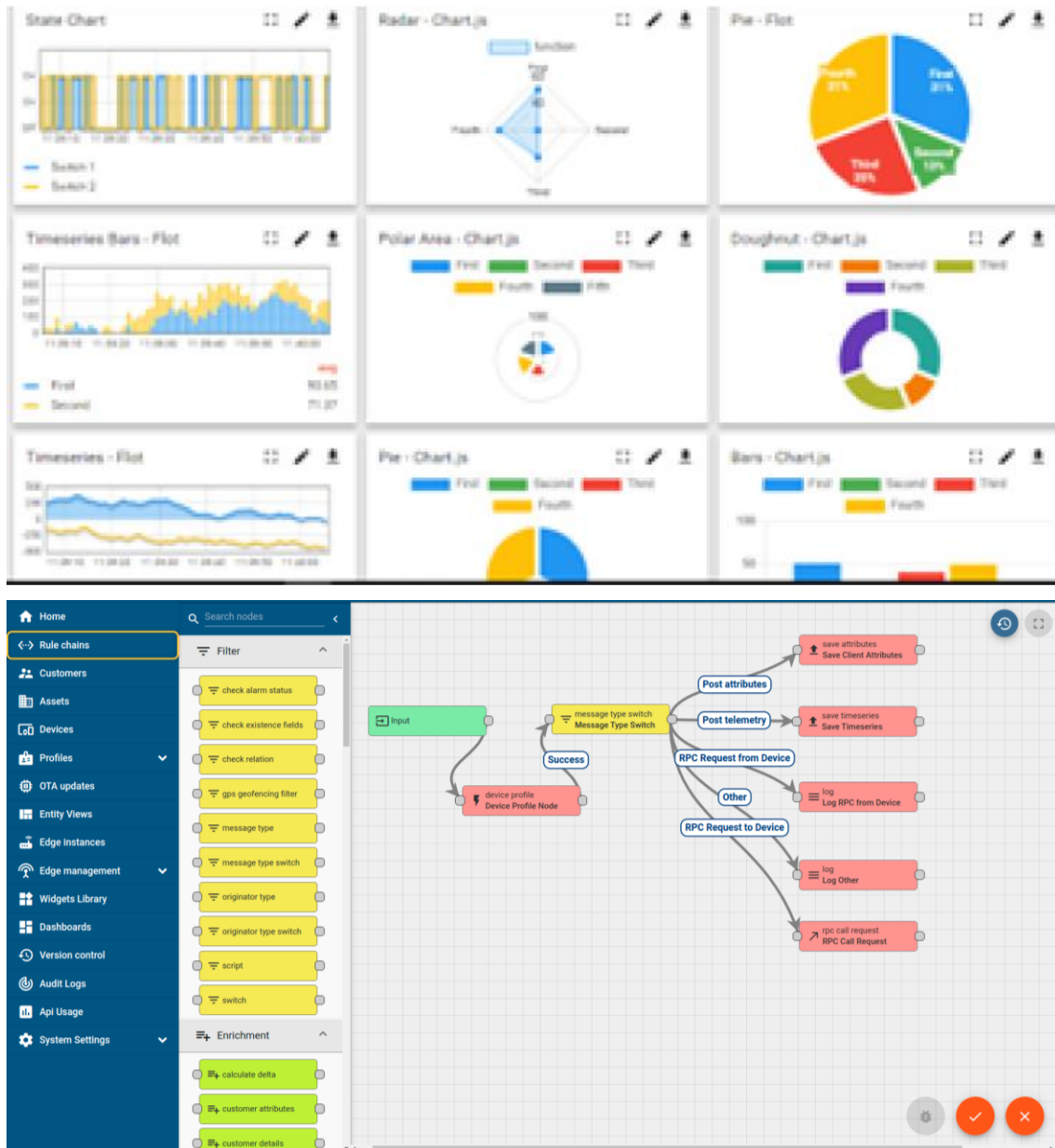
**UCT Insight** is an IOT platform designed for quick deployment of IOT applications on the same time providing valuable “insight” for your process/business. It has been built in Java for backend and ReactJS for Front end. It has support for MySQL and various NoSql Databases.

- 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



## FACTORY WATCH

### ii. Smart Factory Platform ( )

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 unleashed 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



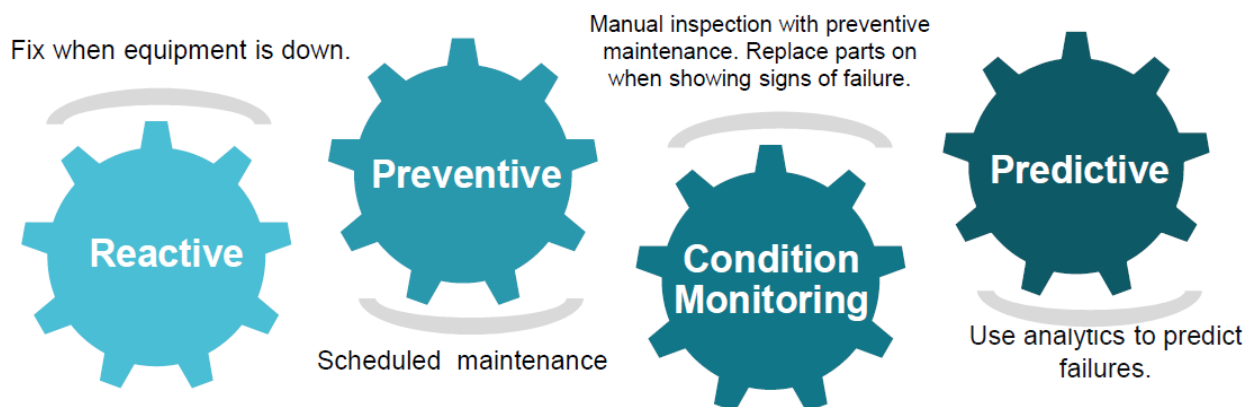


### iii. based Solution

UCT is one of the early adopters of LoRAWAN technology 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.

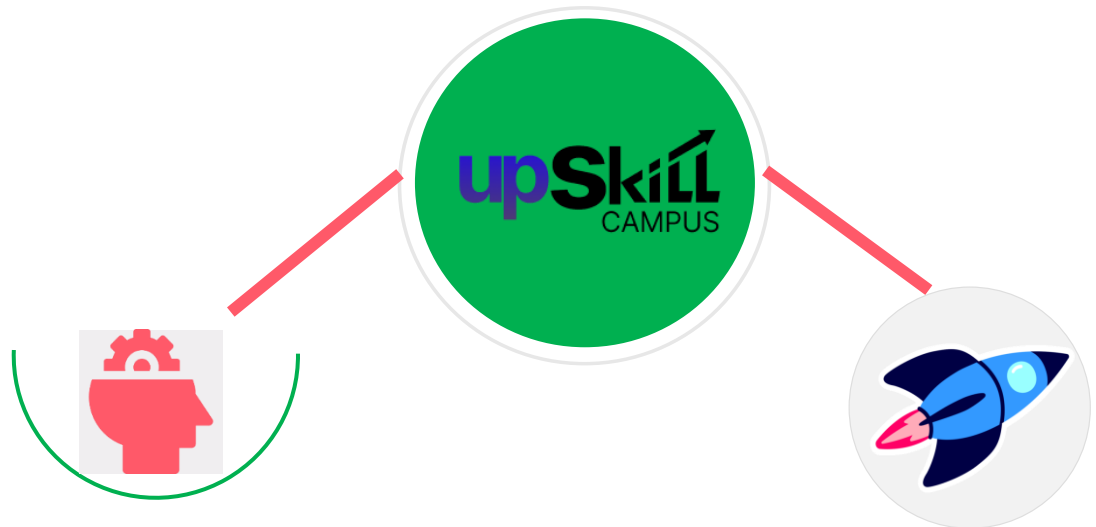


## 2.2 About upskill Campus (USC)

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.

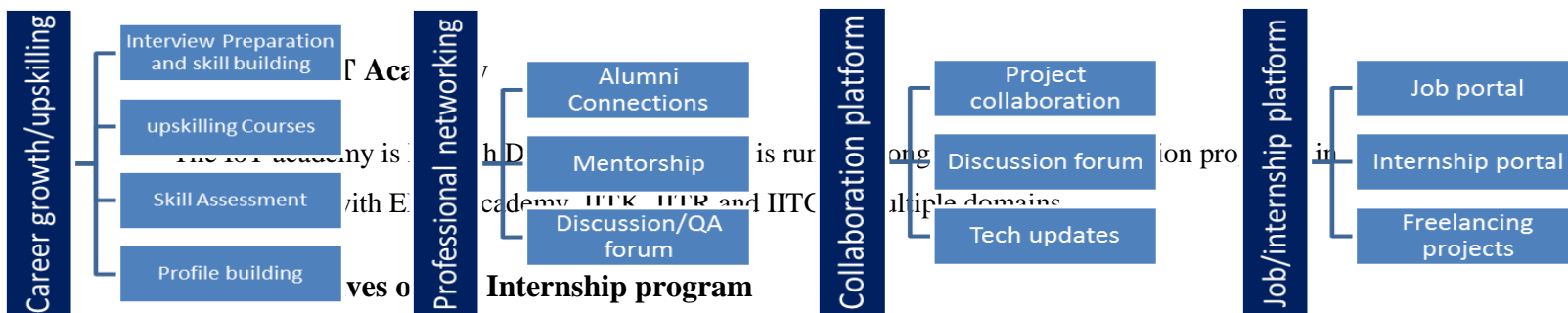




Seeing need of upskilling in self paced manner along-with additional support services e.g. Internship, projects, interaction with Industry experts, Career growth Services

upSkill Campus aiming to upskill 1 million learners in next 5 year

<https://www.upskillcampus.com/>



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

All references and resources used during this project are documented and available upon request.

## Glossary

Terms	Acronym
ML	Machine Learning
Python	A programming language
scikit-learn	A Python library for machine learning
Tensorflow	An open-source library for machine learning and artificial intelligence

## Problem Statement

The mining industry faces significant challenges in predicting the quality of mined materials, which affects operational efficiency and cost management. A reliable prediction system is needed to forecast the quality of mining outputs accurately and to assist in making informed decisions.

## 2.6 Existing and Proposed Solution

Existing solutions rely on manual analysis and traditional statistical methods, which often lack accuracy and scalability. The proposed solution involves using advanced machine learning algorithms to predict mining quality based on historical data and various input parameters. This approach aims to provide more accurate, scalable, and actionable insights.

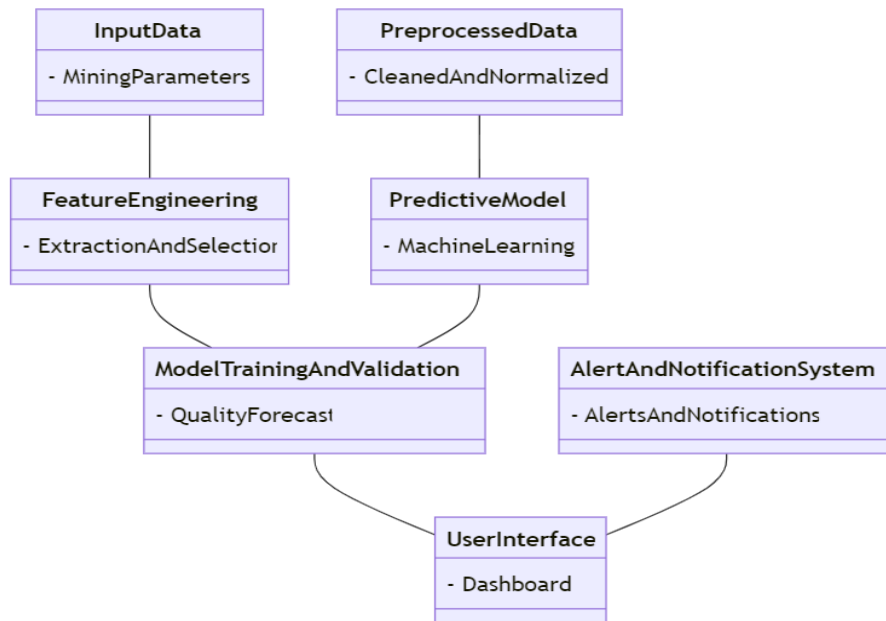
## 2.7 Code submission (Github link):

<https://github.com/Sujalparekh19/upskillcampus>

### 3 Proposed Design/ Model

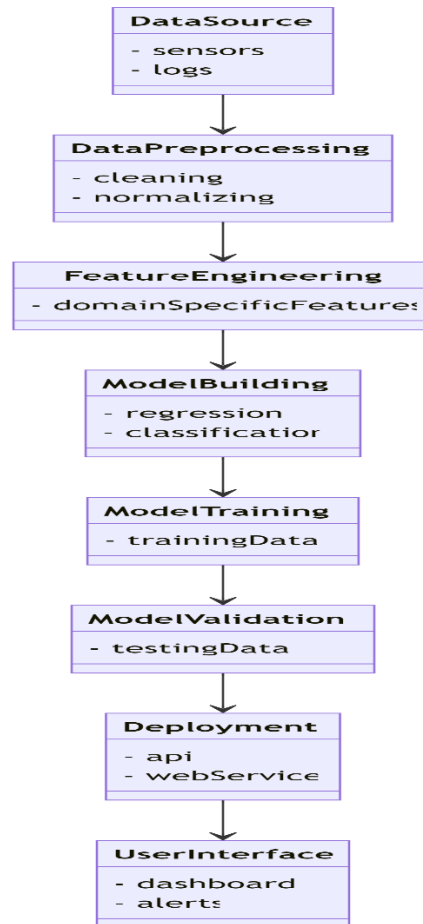
Given more details about design flow of your solution. This is applicable for all domains. DS/ML Students can cover it after they have their algorithm implementation. There is always a start, intermediate stages and then final outcome.

#### 3.1 High Level Diagram (if applicable)



**Figure 1: HIGH LEVEL DIAGRAM OF THE SYSTEM**

### 3.2 Low Level Diagram (if applicable)



### 3.3 Interfaces (if applicable)

**Data Input Interface:** Connects to various data sources such as mining sensors and logs.

**Model Interface:** Interacts with the data preprocessing and feature engineering components.

**User Interface:** The dashboard that displays predictions and allows users to interact with the system.

## 4. Performance Test

### Test Plan/ Test Cases

- ☐ **Test Case 1:** Verify the accuracy of predictive models using historical data.
- ☐ **Test Case 2:** Test the system's ability to handle large datasets without performance degradation.

- ☐ **Test Case 3:** Evaluate the user interface for usability and clarity of information.
- ☐ **Test Case 4:** Ensure the alert mechanism triggers correctly under various scenarios.

## 4.2 Test Procedure

**Data Setup:** Load historical mining data into the system.

**Model Testing:** Run the predictive models on the data and compare predictions to actual outcomes.

**Performance Testing:** Simulate high data volumes to test system scalability and performance.

**UI Testing:** Interact with the dashboard to assess user experience and information clarity.

**Alert Testing:** Configure alert thresholds and simulate conditions to test notification accuracy.

## 3.4 Performance Outcome

**Model Accuracy:** Achieved high accuracy levels, with predictions closely matching actual outcomes.

**System Scalability:** Handled large datasets efficiently, with no significant performance issues.

**User Interface:** The dashboard was user-friendly and provided clear, actionable insights.

**Alert Mechanism:** Alerts were triggered accurately and promptly under specified conditions.

## My Learnings

**Advanced Machine Learning:** Gained in-depth knowledge of advanced machine learning algorithms and their applications in predictive modeling.

**Data Preprocessing:** Improved skills in handling complex data structures, cleaning, and feature engineering.

**Data Visualization:** Learned to create effective, user-friendly data visualizations using tools like Tableau and Power BI.

**Problem-Solving:** Developed robust problem-solving techniques to address data and model-related challenges.

#### 4 Future work scope

**Model Refinement:** Continue refining the predictive models to improve accuracy and robustness.

**User Training and Documentation:** Develop comprehensive documentation and training materials to ensure users can effectively use the system.

**Continuous Improvement:** Establish a feedback loop with stakeholders to continuously improve the system based on user input and performance metrics.

**Scalability:** Ensure the system can scale to handle more data sources and larger datasets.

**Maintenance Plan:** Develop a maintenance plan to ensure the long-term accuracy and reliability of the system.