Industrial Internship Report on

" Prediction of Agriculture Crop Production in India**"**

Prepared by

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| *Executive Summary* |
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| 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 Prediction of Agriculture Crop Production in India. Crop yield prediction is an important aspect of agriculture that helps farmers make informed decisions about their crops. It involves estimating the number of crops that will be produced in a given area based on various factors such as soil type, weather conditions, and crop management practices. In recent years, machine learning (ML) has emerged as a powerful tool for predicting crop yields. Machine learning is a branch of artificial intelligence (AI) that allows computers to learn from data without being explicitly programmed. This makes it ideal for crop yield prediction because it can identify patterns and relationships in large amounts of data and make predictions based on these relationships.

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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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
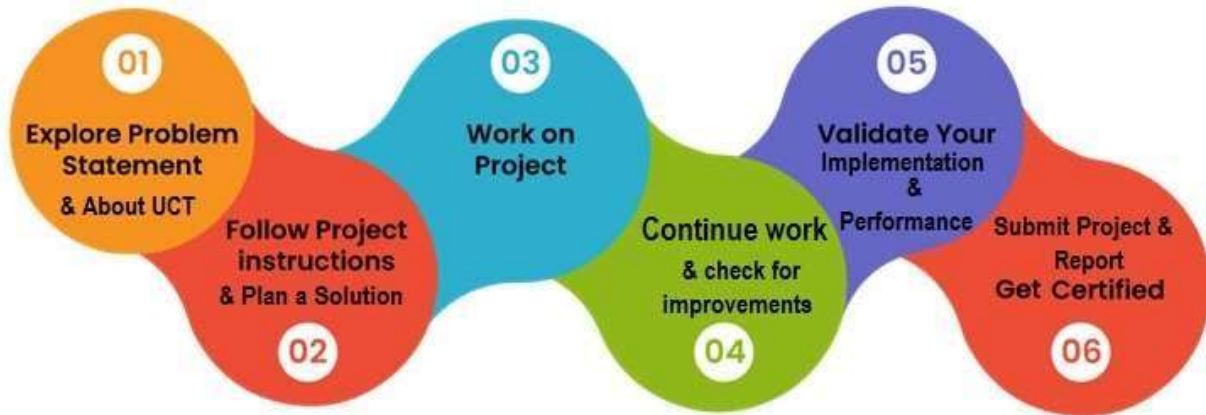
Your Learnings and overall experience.

Thank to all mentors and the dean, who have helped you directly or indirectly.

It was an awesome and insightful experience in the field of machine learning and Data Science at the prestigious UniConverge technologies.

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.

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i. UCT IoT Platform (uçt 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

)

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.
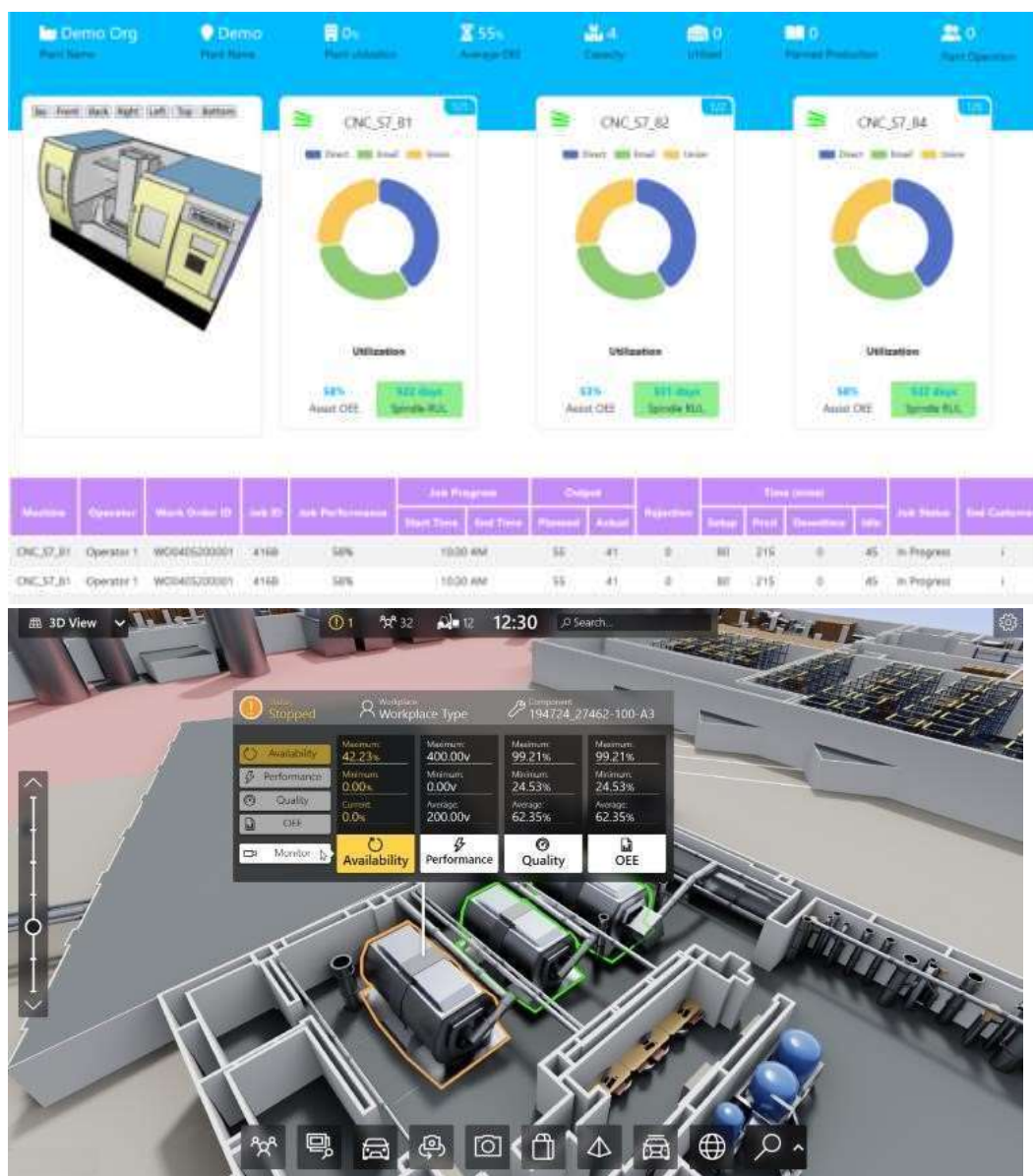
iii. LoRaWAN based Solution

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.
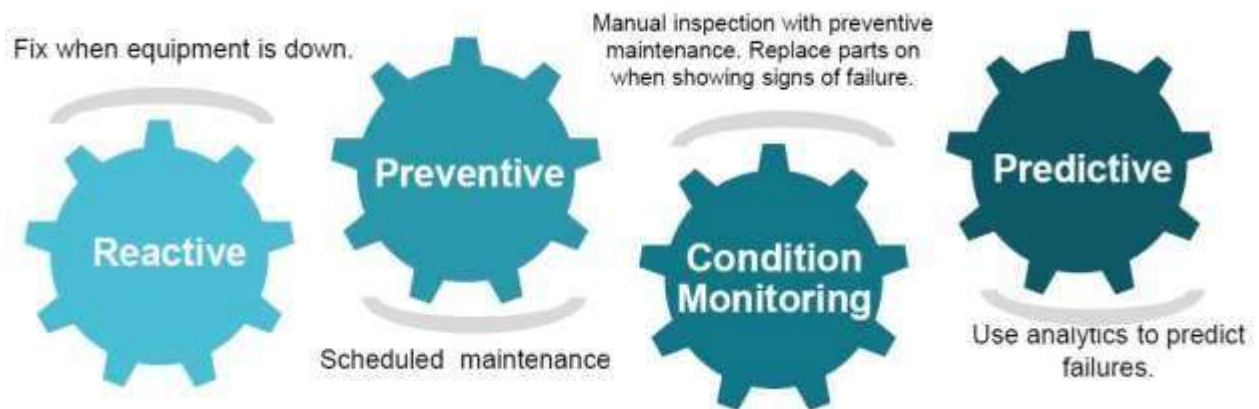
2.2 About upskill Campus (USC)

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.
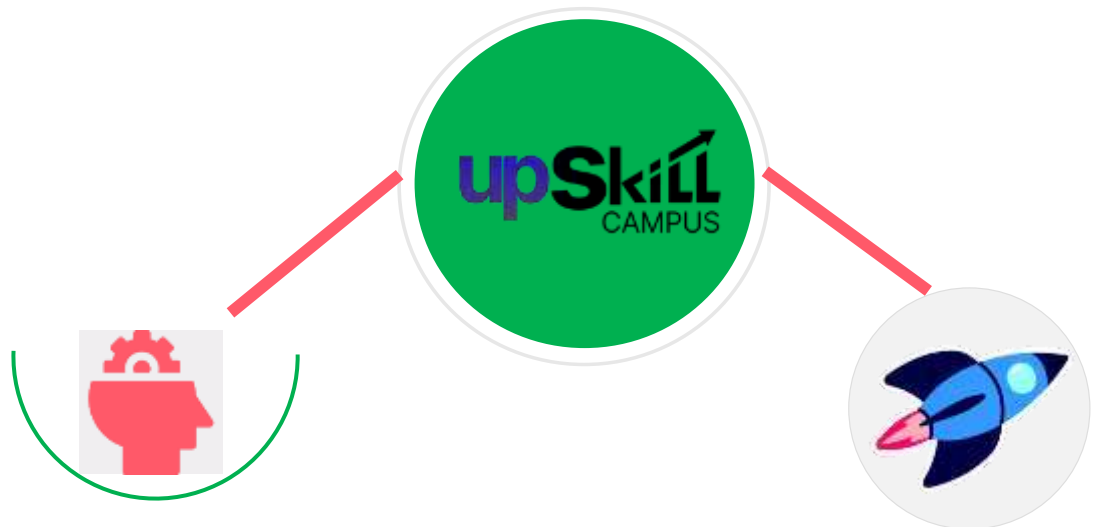
Seeing need of upskilling in self upSkill Campus aiming paced manner along-with to upskill 1 million additional support services e.g. learners in next 5 year Internship, projects, interaction with

Industry experts, Career growth Services

https://www.upskillcampus.com/

Career growth/upskilling
- Interview Preparation and skill building
- upskilling Courses
- Skill Assessment
- Profile building

Professional networking
- Alumni Connections
- Mentorship
- Discussion/QA forum

Collaboration platform
- Project collaboration
- Discussion forum
- Tech updates

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]   produce.csv

[2]   datafile.csv

[3]   https://learn.upskillcampus.com/s/mycourses?redirectToMicroFE=false

2.6 Glossary

Terms	Acronym
Agricultural Data	N/A
Data Preprocessing	N/A
Feature Engineering	N/A
Machine Learning Models	N/A

3 Problem Statement

In the assigned problem statement

Agriculture is one of the main sources of income in India. There is need to improve the sustainability of agriculture with the rate of increase in suicides of farmer due to crop failure and less yield and losses. Hence, it is a significant contribution towards the economic and agricultural welfare of the countries across the world. The Problem Statement revolves around prediction of yield of crops considering different climatic conditions of India including various attributes. Goal of this project is to help the farmers to choose the suitable crop to grow in order to get the required yield and the profit. Need for the crop yield prediction is very much essential at this point of time for selecting the right crop.

4 Existing and Proposed solution

Existing Solution

- In case of crop area determination, both subjective and objective methods are currently adopted to collect yield statistics in various countries.
- The subjective methods of estimating crop yield include farmers' assessments, expert opinions and crop cards, while the objective methods include whole-plot harvesting and crop-cutting experiments.
- The practice of sowing crops in mixture in a single parcel of land is prevalent in many countries, particularly where land holdings are small.
- The growing of crops in mixtures is a common practice because it protects farmers from adverse 10 weather conditions such as drought, flood, and pest and disease infestation.
- Further, it enables maximal utilization of the space, moisture and nutrients available in the field.
- Cultivators usually mix crops that cannot withstand a particular type of weather with another set of crops that thrive under those same conditions.

Proposed Solution

- In this 21st century, it is very common to experiment in every sector by implementing new technological techniques. Making use of new techniques simplifies the process and provides the better results.
- The factors like wind, water supply, soil fertility, rainfall changes unexpectedly, when natural disasters occur.
- This leads to crop failure, reduction in crop production, scarcity of food products and other materials. A single crop failure can cause huge losses to farmers and countries economic growth.
- So, there is a desperate need for a new system which can predict the rate of production of crop yield accurately.
- In order to eradicate all such problems, we have proposed this new system, in which high yielding crop will be selected by considering most influencing parameters. This system helps the farmers to meet their crop yield production. The chances for failure of crops will be very less.
- In this proposed system, Machine Learning techniques like Random Forest Regressor and Decision Tree Regressor are made used to predict the rate of production of crop yield considering the input parameters like State Name, Season, Area, Crop.
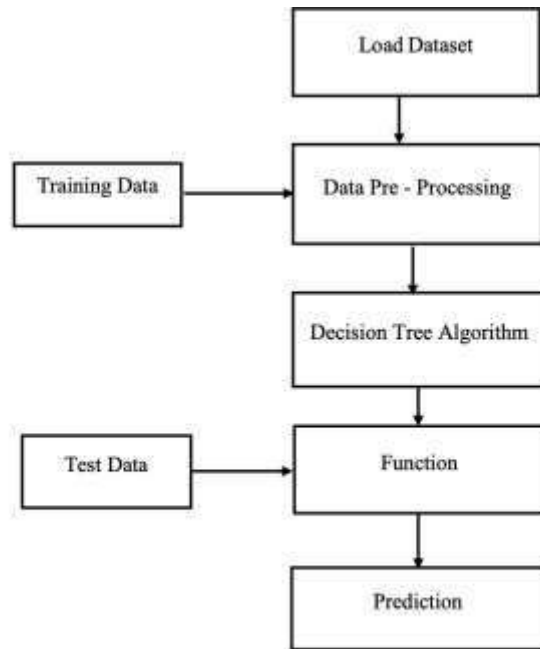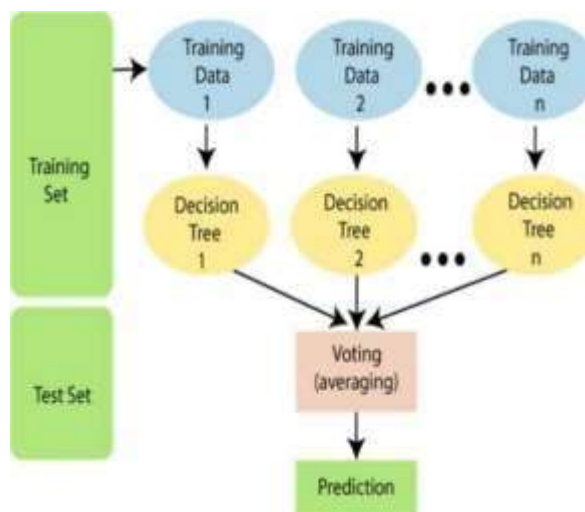
Fig.No.1: Proposed System

4.1 Code submission

https://github.com/Madhu1805/madhushree_crop-production-project

5 Proposed Design/ Model

Flowchart of Crop Yield Prediction

- In this project, the system makes use of the Machine Learning techniques to predict rate of crop yield.

- The programming language used is Python as it is widely accepted for new idea implementations in the field of Machine Learning.

- In this project, collected data set will be uploaded and prediction for crop yield will be generated by applying Machine Learning techniques like Random Forest Regressor and Decision Tree Regressor.

- The results depend on the information present in the collected data set. Accurate the information about the parameters in the collected datasets, better the results will be.
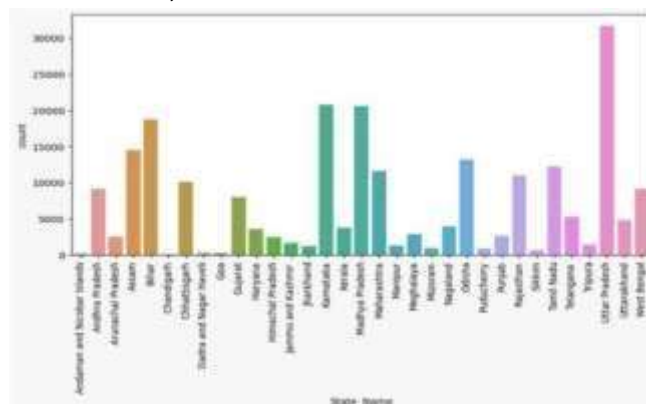
6   Performance Test

6.1 Test Plan/ Test Cases

The implementation of the project was divided into two i.e crop yield prediction and rainfall prediction (for fertilizers module).

Crop Yield Prediction: This module returns the predicted production of crops based on the user's input. If the user wants to know the production of a particular crop, the system takes the crop as the input as well. Else, it returns a list of crops along with their production as output.

Fertilizers Module: This module is used to suggest the farmer on usage of fertilizer based on the rainfall in next few days. To predict the rainfall for the next 15 days we are using an API service provided by Open Weather'. If it is likely to rain we suggest the farmer not to use the fertilizer

6.2 Test Procedure

- Step 1: Choose the functionality i.e., crop prediction or yield prediction.
- Step 2: If the user chooses crop prediction: Take soil type and area as inputs. These values are given as input to the random forest implementation in the backend and the corresponding predictions are returned. The algorithm returns a list of crops along with their production predicted.
- Step 3: If the user chooses yield prediction: Take crop, soil type and area as inputs. These values are given as input to the random forest implementation in the backend and the corresponding crop yield prediction is returned. The algorithm returns the predicted production of the given crop.

6.3 Performance Outcome

In the final implementation of the application the first screen the user can view is the login page. Here, the user can register or login using his/her credentials into the application.

The system provides three main functionalities:

- ○ **Yield Prediction**: The system takes the required inputs to predict the yield of the given crop

- ○ **Crop Prediction**: For this module the system takes the required inputs i.e., soil type and area.

7 My learnings
- Studied the basics of data science and its applications. Studied about machine learning in depth. Glanced through the instructions of the internship program and understood the process.

- Went through the profile of UCT. Selected the project for the machine learning internship. Project Category: A. Agriculture, Project No. 4 Prediction of Agriculture Crop Production In India.

- Read and understood the basic concepts from the e-book Introducing-Data-Science Studied the various problems faced by farmers of India during Crop production. Went through the data of the crop production.

- -Machine-Learning. Glanced through the Impact-Of-Big-Data-On-Business and understood what is Big Data and its applications. Studied the difference between a Data scientist and the Data Analyst and how they contribute towards the project.

- Attempted the Quiz to test my intellectual capability. Gathered the information of Artificial Intelligence and Data Science and also understood the difference between the both. Learned how to map your career path with help of artificial intelligence and data science.

- Learnt about the skills which are required for artificial intelligence or data science or big data or machine learning engineer. Hence came to a conclusion that artificial intelligence and data science are inter- connected.

- So, specialization in either field requires a working knowledge of the other. To begin using ML-AI, studying data analysis is more necessary than understanding data science.

- Glanced through the introduction of Probability and statistics and revised the concepts of sample spaces, random variables, probability of an event, discrete c.r.v., probability distribution, other special distributions, large sample theory, parametric point estimation, etc.

- Learned what are the technical and non-technical skills required for a data scientist. The Top 5 Skills Crucial for Becoming A Data Scientist are Programming, Statistics and Mathematics, Machine Learning, Deep Learning and Big Data.

8 Future work scope

You can put some ideas that you could not work due to time limitation but can be taken in futureThis system is proposed to deal with the increasing rate of farmer suicides and to help them to grow financially

stronger. The Crop Recommender system helps the farmers to predict the yield of a given crop and also helps them to decide which crop to grow. Moreover, it also tells the user the right time to use the fertilizer.

Appropriate datasets were collected, studied and trained using machine learning tools. The system tracks the user location and fetches needed information from the backend based on the location. Thus, the user needs to provide limited information like the soil type and area.