VIGNAN'S INSTITUTE OF INFORMATION TECHNOLOGY
(AUTONOMOUS)
(Approved by AICTE-New Delhi & Affiliated to JNTUGV, Vizianagaram)
Beside VSEZ, Duvvada, Vadlapudi Post, Gajuwaka, Visakhapatnam - 530 049.

A REPORT ON

SUMMER INTERNSHIP

Name of the Student : **JETTI VASANTHA LAXMI**

Name of the College : Vignan's Institute of Information Technology

Registration Number : **21L31A5432**

Period of Internship : From: 08-5-2023 to 03-6-2023

Year : II- B.Tech

Name of the Intern Organization : Visakhapatnam Steel Plant-RINL

Address of the Intern Organization : Visakhapatnam Steel Plant-RINL,
Ukku Nagaram,
Visakhapatnam-530031,
Andhra Pradesh, India.

An Internship Report on

PREDICTION OF STACK TEMPERATURE IN BLAST FURNACE USING MACHINE LEARNING

Submitted in accordance with the requirement for the degree of

Bachelor of Technology

By

JETTI VASANTHA LAXMI
(Roll No. 21L31A5432)

Under the Faculty Guideship of

Internal Mentor: Mrs.I.MANI KUMARI
External Mentor: Mr. T. V. Kameswara Rao

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

VIGNAN'S INSTITUTE OF INFORMATION TECHNOLOGY (A)

JUNE 2023

Student's declaration

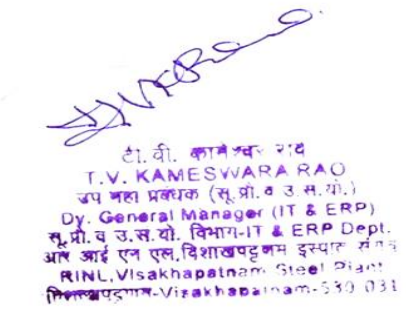
I, **Jetti Vasantha Laxmi** a student of Bachelor of Technology Program, Reg. no. **21L31A5432** of the Department **Artificial Intelligence and Data Science** of Vignan's Institute of Information Technology, do hereby declare that I have completed the mandatory internship from **8-5-2023 to 3-6-2023** in **Visakhapatnam Steel Plant** under the Faculty Guideship of **Mrs.I.Mani Kumari**, Department of **Artificial Intelligence and Data Science**, Vignan's Institute Of Information Technology.

J. Vasanthalaxmi
7-7-23.

(Signature and Date)

Official Certification

This is to certify, **Jetti Vasantha Laxmi** Reg. no. **21L31A5432** has completed her Internship in **Visakhapatnam Steel Plant** on a Project based on **Predicting the critical parameters in Blast Furnance using Machine Learning -PYTHON-T** , under my supervision as a part of partial fulfillment of the requirement for the Degree of Bachelor of Technology in the Department of **Artificial Intelligence and Data Science** , Vignan's Institute Of Information Technology.



(*Signatory with Date and Seal)*

Endorsements

Faculty guide

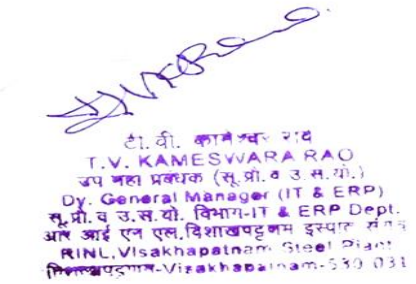
Head of the Department

Principal

Certificate from Intern Organization

This is to certify that **Jetti Vasantha Laxmi** Reg. no**. 21L31A5432** of Vignan's Institute of Information Technology under went internship in **Visakhapatnam Steel Plant** from **08-05-2023 to 05-06-2023**.

The overall performance of the intern during her internship is found to be Satisfactory.



Authorized Signature with Date and Seal

Acknowledgements

I would like to express my sincere thanks and gratitude to **Mrs. I.Mani Kumari**, Asst.Professor Dept. of **AI&DS** who is internal mentor for their able guidance and support in completing my project.

I take this opportunity to sincerely thank **Mr. T. V. Kameswara Rao**, D.G.M., IT & ERP Department, Visakhapatnam Steel Plant, who is my external mentor for guiding us with his immense knowledge and helping in complete this project successfully.

My heartful thanks to **Mr.Gowri Shankar Naik**, Department Internship Coordinator, Vignan's Institute of Information Technology who helped me in every aspect of gathering information about internship and guide me everyday on proper submission of reports.

Also, I would like to extend my heartful gratitude to the Head of the Department of AI&DS **Dr. T.V.Madhusudhan Rao**, who helped me patch this project and make it full proof of success.

My thanks to **Dr. B. Prasada Rao**, Head Internships who helped me by allowing to participate in accordance of our interested company through detailed information.

My special thanks to our principal, **Dr. J. Sudhakar** for allowing me to participate in the summer internship program on behalf of our college to gain industrial knowledge.

Then I would like to thank my parents and team members who gave their valuable support and suggestions in various phases of completion of the project.

Contents

CHAPTER 1: EXECUTIVE SUMMARY

OBJECTIVE:

This project aimed to achieve the perfect stack temperature at Visakhapatnam steel plant using machine learning techniques. Stack temperature is a critical factor that needs to be controlled to ensure optimal operations and environmental compliance. By leveraging historical data from the steel plant, we aim to develop a machine learning model that accurately predicts stack temperatures based on various process variables, ambient conditions, fuel consumption, and stack dimensions.

The methodology involves several key steps. Initially, we collected a comprehensive dataset comprising stack temperature readings and associated parameters. To ensure data quality, preprocessing techniques were applied to handle outliers, missing values, and maintain data consistency. Feature engineering techniques were then employed to extract meaningful features that influence stack temperatures, incorporating domain knowledge and understanding of the steel plant's operations.

A range of machine learning algorithms, including linear regression, decision trees, random forests, and gradient boosting, were considered for model selection. The dataset was divided into training and testing sets, allowing for model training and evaluation. Performance evaluation metrics such as mean squared error (MSE), root mean squared error (RMSE), and coefficient of determination (R-squared) were utilized to assess the model's predictive capabilities.

Through iterative optimization, including hyperparameter tuning and potential exploration of advanced algorithms like neural networks, we aimed to enhance the model's accuracy and generalizability. The final trained model was deployed to monitor stack temperatures in real-time, continuously updating predictions based on newly collected data.

OUTCOMES:

The developed machine learning model allows accurate prediction of stack temperatures, aiding in stack temperature perfection.

The deployment of the model facilitates real-time monitoring, ensuring timely adjustments and interventions to maintain stack temperature within desired thresholds.

Implementation of this project will lead to improved operational efficiency, reduced energy consumption, and enhanced environmental compliance for the Visakhapatnam steel plant. Additionally, the model can be continually updated and refined as new data becomes available, further optimizing stack temperature control and overall performance.

SUMMARY OF ACTIVITIES:

During the internship, I actively engaged in various activities, including learning Python fundamentals, Data collection and preprocessing. Exploratory data analysis. Model development and evaluation. Feature engineering: Identifying and creating relevant features to enhance the predictive power of models. Summarizing and communicating results, visualizing data, and providing actionable recommendations based on your analyses.

CONCLUSION:

This internship provided me with valuable hands-on experience, enhancing my technical skills in Python programming, Data collection and preprocessing, Exploratory data analysis, Feature engineering It also improved my problem-solving abilities, teamwork skills, time management, and adaptability to a virtual work environment. Overall, the internship at Skill Vertex was a rewarding and enriching experience, contributing to my professional growth and preparing me for future career opportunities in the software development industry.

CHAPTER 2: OVERVIEW OF THE ORGANIZATION

INTRODUCTION:

Rashtriya Ispat Nigam Ltd, (RINL), also known as Vizag Steel, is a public steel producer based in Visakhapatnam, India. RINL is the corporate entity of VSP, India's first shore-based integrated steel plant built with state-of-the-art technology. It is Founded in 1971, the plant focuses on producing value-added steel, producing 5.773 million tons of hot metal, 5.272 million tons of crude steel and 5.138 million tons of saleable steel.

A VSP is a 7.3 MTPA facility. 3.0 MTPA liquid steel capacity; it went into operation in 1992. In April 2015 and December 2017, respectively, the company finished boosting its capacity to 6.3 MTPA and 7.3 MTPA. The company's sole subsidiary, Eastern Investment Limited Mineral (EIL), has 51% of the stock. The business has two other subsidiaries, both of which are located in Orissa.

The decision of the Government of India to set up an integrated steel plant at Visakhapatnam was announced by then Prime Minister Smt. Indira Gandhi in Parliament on 17 January 1971. VSP is the first coastal-based integrated steel plant in India, 16km west of Vishakhapatnam, bestowed with modem technologies; VSP has an installed capacity of 3 million tons per annum of liquid steel and 2.656 million tons of saleable steel. The saleable steel here is in the form of wire rod coils, Structural, Special Steel, Rebar, Forged Rounds, etc. At VSP, there lies emphasis on total automation, seamless integration and efficient upgradation. This result in a wide range of long and structural products to meet stringent demands of discerning customers in India’

HOUSE" Quality Standards status during such 1997-2000. as JIS, DIN, Having BTS, established BS, etc. RINL—VSP a fairly dependable was awarded export "Star market, Trading VSP. Plans to make a continuous presence in the export market.

Different section at the RINL-VSP:

- Coke oven and coal chemicals plant
- Sinter plant
- Blast Furnace
- Steel Melt Shop
- Continuous casting machine
- Light and medium machine mills
- Calcining and refractive materials plant

- Rolling mills
- Thermal power plant
- Chemical power plant

VISION:

To be a globally recognized and respected steel plant, known for its excellence in quality, innovation, and sustainability, contributing to the growth and development of the steel industry and the communities we serve.

MISSION:

1. To produce high-quality steel products that meet the diverse needs of our customers, both in domestic and international markets.

2. To continuously innovate and adopt advanced technologies to improve our production processes, enhance efficiency, and reduce environmental impact.

3. To ensure the safety and well-being of our employees by maintaining a culture of safety, providing training and development opportunities, and fostering a supportive work environment.

4. To actively contribute to the economic growth and social development of the region by creating job opportunities, supporting local suppliers, and engaging in community initiatives.

5. To uphold ethical business practices, promote transparency, and adhere to the highest standards of corporate governance.

Objectives:

1. Increase Production Capacity: Focus on upgrading and expanding the plant's infrastructure and equipment to increase production capacity, allowing for higher output and meeting the growing demands of the market.

2. Quality Excellence: Strive for excellence in product quality by implementing stringent quality control measures, adhering to international standards, and continuously improving processes to ensure that the steel products meet or exceed customer expectations.

3. Operational Efficiency: Enhance operational efficiency by optimizing resource utilization, streamlining production processes, and implementing advanced technologies to minimize waste, reduce costs, and improve overall productivity.

4. Environmental Sustainability: Promote environmental sustainability by adopting eco-friendly practices, implementing energy-saving measures, reducing emissions, and implementing waste management strategies to minimize the ecological impact of the plant's operations.

5. Employee Development and Safety: Prioritize the safety and well-being of employees by maintaining a strong safety culture, providing training and development opportunities, and creating a supportive work environment that fosters employee growth, engagement, and satisfaction.

CHAPTER 3: INTERNSHIP PART

During the internship at the steel plant in Visakhapatnam, as a intern I was involved in activities and responsibilities related to achieving stack temperature perfection using machine learning. The intern's tasks included data collection, preprocessing,
Feature engineering, model selection, training, evaluation, optimality, deployment, and monitoring.

Working conditions:

We intern's worked in an industrial environment within the steel plant. This involved adhering to safety protocols and wearing appropriate personal protective equipment (PPE) to ensure a safe working environment. We intern's collaborated with a team of professionals, including engineers, data scientists, and plant operators.We interns are assigned with teams and the members of team are from various collages across INDIA.

Weekly work schedule:

The intern followed a regular work schedule of approximately 48 hours per week, Monday toSaturday. However, occasional flexibility was required to accommodate specific tasks or urgent requirements.

Equipment used:

We intern's utilized various equipment and tools for data analysis, model development, and monitoring. This includes computer systems with appropriate software and programming languages for data preprocessing, machine learning algorithms, and visualization. Additionally, we have used data logging devices and sensors for real-time data acquisition from the steel plant.

Tasks performed:

Data Collection:

Gather historical data related to stack temperatures from the steel plant in Visakhapatnam. The data should include a range of parameters such as ambient temperature, process variables, fuel consumption, stack dimensions, and stack temperature readings. The data is collected from the Vizag steel plant (VSP) for five months (01-07-2021 to 01-12-2021) at an interval of 10 minutes. The collected information has 25406 rows, and 25 columns contain many missing values and other errors.

Data Pre-processing: Clean the collected data by removing any outliers, missing values, or inconsistencies. Perform exploratory data analysis (EDA) to gain insights into the data distribution and correlations among variables. Normalize or scale the data if required to ensure uniformity. The

parameters were analysed, and the crucial input and output parameters were selected based on a correlation matrix between the parameters. The wrangled data enables us to predict the output after distinct intervals (the data collected had these parameters instantaneously described). So, the final data consists of 21486 rows, 1 8 columns (for I hour interval); 21475 rows, 18 columns (for 3- hour interval) and 21454 rows, 18 columns (for 6-hour interval).

Feature Engineering:
Extract meaningful features from the collected data that can potentially influence stack temperatures. This may involve domain knowledge and understanding of the steel plant's operations. Feature engineering can include variables such as process parameters, environmental conditions, and fuel characteristics.

Model Selection: Choose an appropriate machine learning algorithm for the task. Regression algorithms such as linear regression, decision trees, random forests, or gradient boosting can be considered depending on the complexity of the problem and the available data.

Data Split: Divide the dataset into training and testing sets. The training set will be used to train the model, while the testing set will be used for evaluating its performance. Model Training: Train the selected machine learning model using the training dataset. The model will learn the relationship between the input features (process variables, environmental conditions, etc.) and the target variable (stack temperature).

Model Evaluation: Evaluate the trained model's performance using the testing dataset. Common evaluation metrics for regression tasks include mean squared error (MSE), root mean squared error (RMSE), and coefficient of determination (R-squared). Assess the model's ability to predict stack temperatures accurately.

Model Optimization: Fine-tune the model parameters or explore ensemble techniques to improve its performance if necessary. This can involve hyperparameter tuning or using more advanced algorithms like neural networks if the initial results are not satisfactory. 85% with 60% of state-0, which is best case.

Deployment and Monitoring: Deploy the trained model to monitor stack temperatures in real-time. Continuously collect new data from the steel plant and feed it into the model to update its predictions and ensure its accuracy over time.

Iterative Improvement: Regularly re-evaluate the model's performance and incorporate new data as it becomes available. Identify and rectify any issues or discrepancies to continuously enhance the model's predictive capabilities.

Skills acquired:

Through this internship, I gained practical experience and skills in several areas, including data collection, preprocessing, feature engineering, machine learning model development, evaluation, optimization, deployment, and monitoring.I developed proficiency in programming languages and tools for data analysis and machine learning. Furthermore, in the internship I gained a deeper understanding of industrial processes and their interaction with data analytics. This internship provided valuable exposure to real-world challenges in achieving stack temperature perfection in a steel plant, enhancing the problem-solving and analytical skills within an industrial context.

ACTIVITY LOG FOR WEEK-1

Day	Date	Brief description of the daily activity	Learning Outcome	Person In-Charge Signature
Day-1	8-05-2023	Reporting in L& DC.	Reporting	
Day-2	9-05-2023	Holiday.		
Day-3	10-05-2023	Holiday.		
Day-4	11-05-2023	Reporting in L&DC for safety class and then they issued gate pass and assigned teams.	Safety measures	
Day-5	12-05-2023	Reported at IT & ERP section and basic rules were explained and gave an introduction class.	Reporting	
Day-6	13-05-2023	Project assigned in ML using python and explained various parameters that need to be predicted.	Project assigned	

WEEKLY REPORT

WEEK – 1 (From Date: 8-05-2023 to Date: 13-05-2023)

Objective of the Activity Done: Reported at L&DC and IT&ERP Departments and assigned us a project.

Detailed Report:

Day1:

On the first day, I reported at Learning and Development Center (L&DC) and submitted all the forms and documents which are needed for the internship.

Day2,3:

On the next 2 days there were no internship-related activities in the company. So, It is declared as holiday.

Day4:

They divided all the interns into different batches and given gate pass for the entrance at the main gate of Visakhapatnam Steel Plant and also, they have said the basic rules and regulations which are needed to be followed inside the plant and safety measures are given. They have checked whether we have taken all safety measures such as safety shoes and helmet.

Day5:

On this day we reported at IT&ERP Department near Mr. T. V. Kameswara Rao, D.G.M., IT & ERP Department, Visakhapatnam Steel Plant. He was our guide throughout the whole project. He assigned a project for our batch based on python using Machine Learning (ML). I received a detailed explanation of the project objectives and the various parameters that need to be predicted using ML techniques.

Overall, I actively engaged with the L&DC, attending safety classes, receiving gate passes, and participating in introductory sessions. While there were a couple of holidays, I made progress by understanding the project assigned to me and getting acquainted with the ML concepts and Python programming. These activities set the foundation for the subsequent stages of the project, enabling me to start implementing ML algorithms and working towards achieving the project objectives.

ACTIVITY LOG FOR WEEK-2

Day	Date	Brief description of the daily activity	Learning Outcome	Person In-Charge Signature
Day-7	15-05-2023	Gave data and basic documentation asked us to read the documentation.	Understating of documentation	
Day-8	16-05-2023	Gave a documentation on the case study that is previously done asked us to read it do extension over the output that is obtained.	Processing the case study	
Day-9	17-05-2023	Introduction of modules and implementation of them is been learned.	Creation of modules(libraries)	
Day-10	18-05-2023	Reported at L&DC for safety class and project progress is been discussed.	Explanation of the project progress.	
Day-11	19-05-2023	Data Analysis is done on material consumption in steel plant for 4 months.	Analysis of the dataset	
Day-12	20-05-2023	Visited Blast Furnace department and SMS departments and viewed the process of making iron.	Process of iron making	

WEEKLY REPORT

WEEK – 2 (From Date: 15-05-2023 to Date: 20-05-2023)

Objective of the Activity Done: Understanding of the documentation and case study and knowing the process of iron making.

Detailed Report:

Day 7,8:

They provided us a document which is made by the previous batch on the same project and also a case study by International Journal for Scientific Research & Development (IJSRD). I went through the documentation, understanding the purpose. This helped me gain a clear understanding of the overall project architecture and how the modules contribute to achieving stack temperature perfection using machine learning.

Day 9:

As a part of learning I got to know about the modules which are being used in the python in the field of machine learning. Machine learning is the science of programming a computer by which they are able to learn from different kinds of data. Popular python libraries used in ML are pandas, NumPy, scikit-learn, matplotlib etc..

Day 10:

On every Thursday we need to go to L&DC and should explain about the progress of the project.

Day 11:

Focus was on data analysis. I worked with a dataset that consisted of material consumption in the steel plant for a period of four months. I performed exploratory data analysis (EDA) to gain insights into the consumption patterns, identify any anomalies or trends, and understand the variables' relationships.

Day 12:

To gain a deeper understanding of the steelmaking process, I visited the Blast Furnace department and the SMS (Steel Melting Shop) departments. During the visits, I observed the processes involved in making iron. This first-hand experience will enable me to better understand the variables and factors influencing stack temperatures and guide my future analysis and modeling efforts.

ACTIVITY LOG FOR WEEK-3

Day	Date	Brief description of the daily activity	Learning Outcome	Person In-Charge Signature
Day-13	22-05-2023	Explained key components that are needed to use for implementing modules. Basics of ML and Python were discussed like assigned variables and type of datatypes to be used.	Basics of machine learning	
Day-14	23-05-2023	Functions used for data processing and cleaning of data is been explained and implemented.	Cleaning of the given datase	
Day-15	24-05-2023	Splitting techniques for training and testing the data is been learned and implemented.	Implementation of splitting methods	
Day-16	25-05-2023	Reported at L&DC for safety class and project progress is been discussed.	Explanation of the project progress	
Day-17	26-05-2023	Decision tree classifier for fitting data for training is been learned and various modules used for creating a decision is been learned and implemented.	Concepts of decision tree models	
Day-18	27-05-2023	Learned the usage of data frames and implementation is been done.	Data frames implementation	

WEEKLY REPORT

WEEK – 3 (From Date: 22-05-2023 to Date: 28-05-2023)

Objective of the Activity Done: Understanding the basic concepts in ML and decision tree models. Preprocessing the dataset.

Detailed Report:

Day 13:
Focus was on the basics of machine learning (ML) and Python programming. We discussed key concepts such as assigned variables and the types of data structures to be used. I gained a solid understanding of the fundamentals, including data types, variables, and basic syntax in Python, which will serve as the foundation for implementing the modules.

Day 14:
I delved into functions used for data processing and cleaning. I learned about various techniques and functions available in Python for data preprocessing, such as handling missing values, outliers, and data normalization. Understanding these functions is crucial for ensuring data quality and preparing the dataset for model training and evaluation.

Day 15:
Today, I learned about the techniques for splitting the data into training and testing sets. I explored different splitting methods, such as random splitting and stratified splitting, to ensure representative samples for training and evaluation. I implemented these techniques in Python using libraries such as scikit-learn to partition the data effectively.

Day 16:
On every Thursday we need to go to L&DC and should explain about the progress of the project.

Day 17:
I learned about the different modules used to create a decision tree, such as the splitting criteria, tree depth, and leaf node conditions. Understanding these modules and their impact on the decision tree model is crucial for accurately predicting stack temperatures.

Day 18:
I learned and implemented the usage of data frames, a tabular data structure provided by libraries like pandas. I explored various operations and manipulations that can be performed on data frames, such as filtering, sorting, and aggregating data. Data frames are essential for organizing and analyzing the collected data efficiently.

ACTIVITY LOG FOR WEEK-4

Day	Date	Brief description of the daily activity	Learning Outcome	Person In-Charge Signature
Day-19	29-05-2023	Learned Random Forest classifier which builds decision tree on different sample.	Random forest classifier	
Day-20	30-05-2023	Implemented Random Forest module.	Algorithm implementation	
Day-21	31-05-2023	Prediction of data from the trained model	Understanding the model	
Day-22	1-06-2023	Reported at L&DC for safety class and project progress is been discussed.	Explanation of the project progress	
Day-23	2-06-2023	Project final review and changes were made	Review	
Day-24	3-06-2023	Submission of project.	Submission	

WEEKLY REPORT

WEEK – 4 (From Date: 29-05-2023 to Date: 3-06-2023)

Objective of the Activity Done: Understanding the concepts of random forest, training of the model and predictions on data. Submission of the project.

Detailed Report:

Day 19:

I focused on learning about the Random Forest classifier, a powerful ensemble learning technique. I gained an understanding of how it combines multiple decision trees to make predictions and how it addresses the limitations of individual decision trees. I studied the underlying algorithms and parameters used in Random Forests to optimize the model's performance.

Day 20:

I implemented the Random Forest module in Python, using libraries such as scikit-learn. I trained the Random Forest classifier using the preprocessed data and tuned the hyperparameters to improve its accuracy and generalization capabilities. I carefully validated the model's performance and made necessary adjustments to achieve optimal results.

Day 21:

With the trained Random Forest classifier, I made predictions on the data. I used the trained model to predict stack temperatures based on the selected features and input variables. I carefully evaluated the predictions using appropriate evaluation metrics to assess the model's performance.

Day 22:

On every Thursday we need to go to L&DC and should explain about the progress of the project.

Day 23:

Final review was taken by our guide Mr. T. V. Kameswara Rao. We as a group submitted our overall project report.

Day 24:

I presented my work. We prepared the project documentation and submitted the completed project. I ensured that the project was well-documented and organized for future reference.

Throughout the weeks, I maintained regular communication with my project supervisor and team members to discuss progress and seek guidance. The daily activities were focused on learning and implementing the Random Forest classifier, making predictions, and finalizing the project for submission. These activities were crucial in completing the project successfully and achieving the goal of stack temperature perfection using machine learning.

CHAPTER 4: OUTCOMES DESCRIPTION

During my experience working on achieving stack temperature perfection using machine learning in the steel plant in Visakhapatnam, I observed a work environment that was characterized by effective people interactions, well-maintained facilities, clear job roles, established protocols and procedures, disciplined practices, and a strong sense of teamwork and mutual support.

People Interactions:

Interactions with colleagues, including engineers, data scientists, and plant operators, were frequent and collaborative. There was an open and supportive atmosphere where team members were willing to share knowledge, provide guidance, and address any questions or concerns. Regular communication channels, such as meetings and discussions, fostered effective collaboration and enabled effective progress in the project.

Facilities and Maintenance:

The facilities within the steel plant were well-maintained, providing a conducive environment for work. The availability of necessary equipment and resources, such as computers with required software and data acquisition systems, ensured smooth implementation of the project. Regular maintenance and upkeep of the equipment and infrastructure contributed to a seamless workflow and productivity.

Clarity of Job Roles:

The job roles and responsibilities of each team member, including interns like myself, were clearly defined. This clarity helped us understand our specific tasks and how they fit into the overall project objectives. Regular communication and coordination with supervisors and team members ensured that everyone was aligned with their respective roles and contributed to the project's success.

Protocols, Procedures, and Processes:

The steel plant had established protocols, procedures, and processes in place, particularly with regards to safety and operational guidelines. Compliance with these protocols was emphasized, and regular safety classes were conducted to ensure a safe working environment. Standard operating procedures (SOPs) were followed for data collection, preprocessing, model development, and deployment, ensuring consistency and efficiency in the project implementation.

Discipline and Time Management:

There was a strong emphasis on discipline and time management in the work environment. Timely reporting, adherence to work schedules, and meeting project deadlines were prioritized. Regular progress meetings and project reviews helped in tracking the project's progress and ensuring that timelines met.

Teamwork and Mutual Support:

Teamwork was highly valued and encouraged in the work environment. Colleagues supported each other, shared knowledge and expertise, and collaborated to overcome challenges and achieve project goals. The sense of mutual support created a positive work atmosphere and enhanced the overall productivity and success of the project.

Motivation and Harmonious Relationships:

There was a strong sense of motivation and drive among team members. The challenging nature of the project, coupled with the shared goal of achieving stack temperature perfection, fostered a motivated work environment. Harmonious relationships among team members further contributed to a positive work atmosphere and enhanced collaboration and productivity.

Space and Ventilation:

The workspaces provided within the steel plant were adequate and well-ventilated. The availability of comfortable workstations and sufficient space facilitated a conducive work environment, enabling us to focus on our tasks effectively.

Overall, the work environment in the steel plant in Visakhapatnam provided a conducive setting for achieving stack temperature perfection using machine learning. Effective people interactions, well-maintained facilities, clear job roles, established protocols and procedures, disciplined practices, strong teamwork and mutual support, motivation, and a comfortable workspace contributed to a productive and harmonious work environment.

Skills:

Real time technical skills:

During the project on achieving stack temperature perfection using machine learning in the steel plant in Visakhapatnam, I acquired several real-time technical skills and gained hands-on experience that were directly related to the job requirements. These skills include:

1. Data Analysis and Preprocessing: I gained proficiency in analyzing large datasets related to material consumption in the steel plant. I learned how to preprocess the data by handling missing values, outliers, and performing data normalization

2. Machine Learning Modeling: I acquired practical knowledge in applying machine learning algorithms for stack temperature prediction. I learned about different models, such as decision trees and random forests, and their implementation using Python libraries like scikit-learn. I gained expertise in training, tuning hyperparameters, and evaluating the performance of these models.

3. Feature Engineering: I learned the importance of feature engineering in improving model accuracy. By studying the domain knowledge of the steel plant operations, I identified relevant features that influenced stack temperatures. I gained hands-on experience in creating new features, selecting meaningful variables, and transforming data to enhance the predictive capabilities of the models.

4. Model Evaluation and Validation: I acquired skills in assessing the performance of machine learning models. I learned various evaluation metrics, such as accuracy, precision, recall, and F1 score, and applied them to measure the effectiveness of the stack temperature prediction models. I gained practical experience in performing cross-validation and train-test splits to validate the models' performance.

5. Python Programming: Throughout the project, I extensively used Python programming language for data analysis, preprocessing, modeling, and visualization. I strengthened my programming skills by working with libraries such as pandas, NumPy, and matplotlib. This hands-on experience enabled me to efficiently manipulate and analyze data and implement machine learning algorithms.

6. Data Visualization: I learned how to effectively visualize and interpret data using plots, charts, and graphs. I utilized Python libraries such as matplotlib and seaborn to create visual representations of the data, helping me to gain insights, identify patterns, and communicate the findings effectively.

Overall, through this project, I gained practical, real-time technical skills that are directly applicable to the job of achieving stack temperature perfection using machine learning in a steel plant setting. These skills include data analysis and preprocessing, machine learning modeling, feature engineering, model evaluation and validation, Python programming, data visualization, and domain knowledge in steel plant operations.

Managerial skills:

During the project on achieving stack temperature perfection using machine learning in the steel plant in Visakhapatnam, I had the opportunity to develop and enhance several managerial skills. These skills played a crucial role in effectively planning and executing the project, fostering teamwork and collaboration, making informed decisions, and continuously improving my competencies. The managerial skills I acquired include:

1. Planning: I learned how to effectively plan project activities, set goals, and define timelines. I developed skills in breaking down the project into manageable tasks and allocating resources efficiently. This involved creating a project timeline, identifying critical milestones, and ensuring that the project progressed smoothly according to the established plan.

2. Leadership: Throughout the project, I had the opportunity to demonstrate leadership skills by taking initiative, guiding team members, and facilitating effective communication. I actively engaged with team members, listened to their perspectives, and provided guidance when needed. This helped in building a cohesive and motivated team.

3. Teamwork and Collaboration: I recognized the importance of teamwork and collaboration in achieving project objectives. I actively participated in team discussions, shared knowledge and insights, and supported fellow team members. I learned how to leverage the diverse skills and expertise of team members to accomplish tasks more efficiently**.**

4. Workmanship: I developed a strong sense of professionalism and workmanship, ensuring high-quality deliverables. I paid attention to detail, maintained accuracy in data analysis and model implementation, and consistently strived for excellence in every task. This approach helped in producing reliable results and meeting project requirements.

5. Productive Use of Time: Time management was crucial in meeting project deadlines and maximizing productivity. I learned to prioritize tasks, set realistic timelines, and allocate time effectively. By maintaining focus and avoiding distractions, I ensured that time was utilized productively to accomplish project goals.

6. Continuous Improvement: I recognized the importance of continuous learning and improvement. I actively sought opportunities to enhance my competencies through self-study, seeking guidance from supervisors and team members, and exploring additional resources. I consistently evaluated my performance and identified areas for improvement, setting weekly goals to enhance my skills and knowledge.

7. Decision Making: I developed skills in making informed decisions by carefully analyzing available data, considering different perspectives, and evaluating potential outcomes. I learned to weigh the pros and cons, consider risks, and select the most appropriate course of action. Effective decision making was essential in addressing project challenges and ensuring progress.

8. Performance Analysis: I regularly analyzed project performance and evaluated the effectiveness of the implemented machine learning models. I used performance metrics and feedback to assess the accuracy and reliability of predictions. This analysis helped in identifying areas for improvement and making adjustments to optimize the stack temperature prediction models.

By actively developing and applying these managerial skills, I was able to effectively contribute to the project's success. These skills, including planning, leadership, teamwork, workmanship, productive use of time, continuous improvement, decision making, and performance analysis, are valuable for managing and executing projects in a professional and efficient manner.

Communication skills:

Improving communication skills is crucial in any professional setting, including working on achieving stack temperature perfection using machine learning in the steel plant in Visakhapatnam. Here are some strategies and areas of focus to enhance communication skills:

1. Oral Communication:

- Practice active listening: Paying attention to others' viewpoints and opinions helps in understanding their perspectives and responding effectively.
- Develop clarity in speech: Speak clearly and concisely, enunciating words and using appropriate tone and volume.
- Use non-verbal cues: Pay attention to body language, facial expressions, and gestures to enhance the effectiveness of verbal communication.

2. Written Communication:

- Practice writing skills: Regularly engage in written communication exercises, such as drafting reports, emails, and documentation, to improve clarity, coherence, and grammar.
- Review and proofread: Always review and proofread written communication to ensure accuracy and clarity before sending it out.

3. Conversational Abilities:

- Engage in active conversations: Participate in group discussions, team meetings, and professional networking events to enhance conversational abilities.
- Practice expressing thoughts clearly: Be mindful of organizing thoughts and articulating ideas effectively to ensure smooth and engaging conversations.

4. Confidence Levels and Anxiety Management:

- Prepare in advance: Prioritize thorough understanding of the topic to boost confidence levels during discussions and presentations.
- Practice deep breathing and relaxation techniques to manage anxiety before and during important conversations or presentations.

5. Understanding Others and Being Understood:

- Practice empathy: Seek to understand others' perspectives, actively listen, and ask clarifying questions to ensure effective understanding.
- Seek feedback: Regularly ask for feedback from colleagues and supervisors to gauge the effectiveness of communication and make necessary improvements.

6. Extempore Speech and Articulating Key Points:

- Practice impromptu speaking: Engage in exercises that require thinking on your feet and delivering coherent and articulate responses.
- Develop the ability to identify and articulate key points succinctly and clearly.

7. Closing Conversations, Maintaining Niceties, and Protocols:

- Be mindful of appropriate closing statements and gestures to wrap up conversations professionally.
- Maintain niceties and follow protocols, such as using appropriate greetings, thanking others for their time, and expressing appreciation for contributions.

Improving communication skills requires consistent practice and a willingness to learn from experiences. Engaging in relevant training programs, seeking feedback from mentors or colleagues, and consciously implementing the strategies mentioned above will contribute to enhancing communication skills over time.

Enhancing the abilities :

Enhancing abilities in group discussions, participation in teams, contribution as a team member, and leading a team/activity is essential for successful collaboration on achieving stack temperature perfection using machine learning in the steel plant in Visakhapatnam. Here are some ways to improve these skills:

1. Group Discussions:

- Prepare beforehand: Research and gather information related to the discussion topic to contribute meaningfully during group discussions.
- Actively listen: Pay attention to others' perspectives and ideas, and actively engage by asking relevant questions and providing constructive feedback.
- Respect others' opinions: Foster an inclusive and open environment by acknowledging and valuing diverse viewpoints.

2. Participation in Teams:

- Take initiative: Proactively offer assistance, suggest ideas, and take on additional responsibilities to contribute to the team's goals.
- Collaborate effectively: Communicate openly, share knowledge and expertise, and seek input from others to foster collaboration and achieve collective objectives.
- Respect team dynamics: Understand and respect the roles and strengths of team members, ensuring everyone's contributions are valued and recognized.

3. Contribution as a Team Member:

- Offer unique perspectives: Share insights and ideas based on personal experiences, research, or domain knowledge to contribute to innovative solutions.
- Be accountable: Take ownership of assigned tasks, meet deadlines, and communicate progress and challenges to the team regularly.
- Support teammates: Offer assistance, provide constructive feedback, and encourage fellow team members to maximize productivity and motivation.

4. Leading a Team/Activity:

- Develop leadership skills: Seek opportunities to take on leadership roles in smaller projects or activities to practice decision-making, delegation, and conflict resolution.
- Communicate effectively: Clearly convey goals, expectations, and timelines to the team, ensuring everyone is aligned and informed.
- Delegate tasks: Assign responsibilities based on individual strengths and capabilities, and provide necessary support and guidance to team members.
- Encourage collaboration: Foster a collaborative and supportive environment by encouraging open communication, active participation, and idea sharing among team members.

Additionally, to enhance these abilities, it is beneficial to seek feedback from team members and supervisors, actively engage in professional development opportunities such as workshops or courses on teamwork and leadership, and reflect on past experiences to identify areas for improvement. Practicing effective communication, active listening, and problem-solving skills will contribute to becoming a more effective team member and leader.

Technological developments:

During the project on achieving stack temperature perfection using machine learning in the steel plant in Visakhapatnam, I observed several technological developments that are relevant to the subject area of training, with a focus on digital technologies. These developments have the potential to enhance the job role and improve the overall efficiency and effectiveness of stack temperature optimization. Some of the technological developments I observed include:

1. Industrial Internet of Things (IIoT): IIoT has gained prominence in the steel industry, allowing for the integration of physical machinery and digital systems. Sensors and connected devices can be deployed throughout the plant to collect real-time data on various parameters, including temperature, pressure, and flow rates. This data can then be used for analysis and decision-making, enabling proactive maintenance and optimization of stack temperatures.

2. Big Data Analytics: With advancements in data storage and processing capabilities, big data analytics has become a significant technology in the steel industry. Steel plants generate massive volumes of data, including historical production data, sensor data, and maintenance logs. By applying advanced analytics techniques, such as machine learning algorithms, data mining, and pattern recognition, valuable insights can be extracted from these large datasets to optimize stack temperature parameters.

3. Predictive Maintenance: Digital technologies, such as machine learning and predictive analytics, are being used to implement predictive maintenance strategies in steel plants. By analyzing historical data, sensor readings, and maintenance records, algorithms can identify patterns and anomalies that indicate potential equipment failures. This enables proactive maintenance, reducing unplanned downtime and optimizing stack temperature performance.

4. Cloud Computing: Cloud computing offers scalable and flexible computing resources for data storage, processing, and analysis. Steel plants can leverage cloud platforms to store and manage large volumes of data collected from different sources. This allows for efficient data sharing and collaboration among different stakeholders involved in stack temperature optimization, including data scientists, engineers, and plant managers.

5. Automation and Robotics: Automation technologies, including robotics and robotic process automation (RPA), are increasingly being utilized in the steel industry. Robotic systems can be deployed to perform repetitive tasks, data collection, and analysis, freeing up human resources for more complex

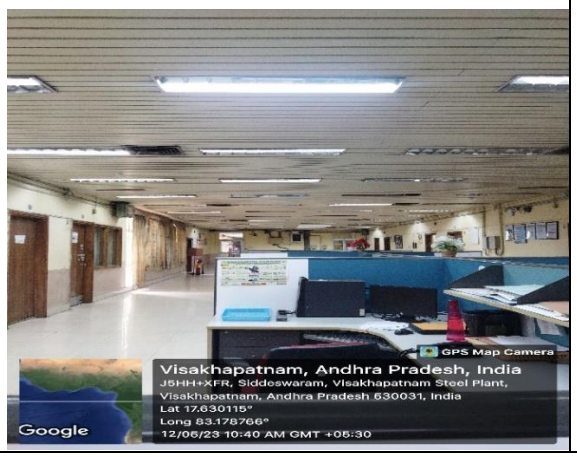
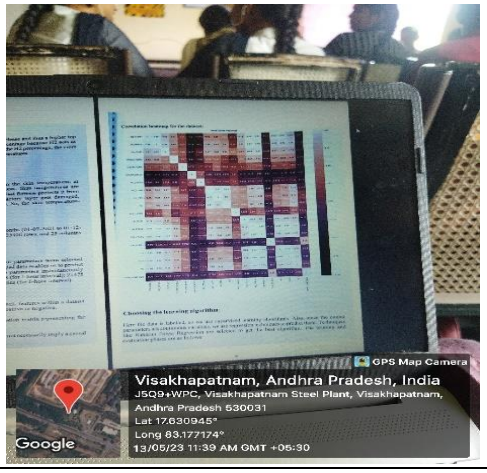
and strategic activities. This can streamline stack temperature optimization processes and improve overall operational efficiency.

6. Visualization and Dashboarding: Advanced visualization tools and interactive dashboards provide a user-friendly interface for monitoring and analyzing stack temperature data. These technologies allow for real-time visualization of key performance indicators (KPIs), trends, and anomalies. Plant operators and engineers can easily access and interpret the data, enabling faster decision-making and timely interventions to maintain stack temperature perfection.

7. Artificial Intelligence (AI) and Machine Learning (ML): AI and ML technologies are at the forefront of optimizing industrial processes, including stack temperature management. ML algorithms can analyze historical data, sensor readings, and process parameters to identify patterns, correlations, and optimal settings for maintaining stack temperature perfection. AI-based models can continuously learn from data and make real-time adjustments to optimize the performance of the steel plant.

Overall, these technological developments offer significant opportunities for enhancing stack temperature optimization in steel plants. By leveraging digital technologies such as IIoT, big data analytics, predictive maintenance, cloud computing, automation, visualization, and AI/ML, steel plants can achieve higher levels of efficiency, accuracy, and control in managing stack temperature parameters.

Daily Activity GPS Photos

Day-1, Date:08/05/2023	Day-2, Date:
	
Day-3, Date:	**Day-4, Date:11/05/2023**
	
Day-5, Date:12/05/2023	**Day-6, Date:13/05/2023**
	

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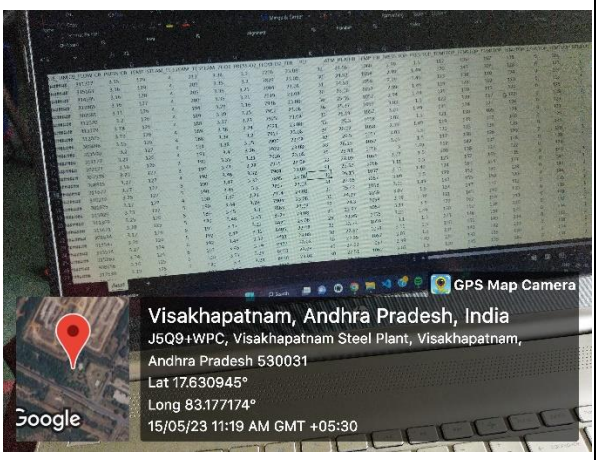	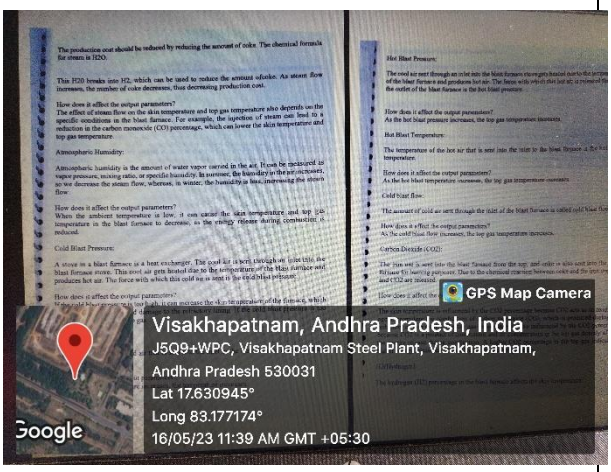
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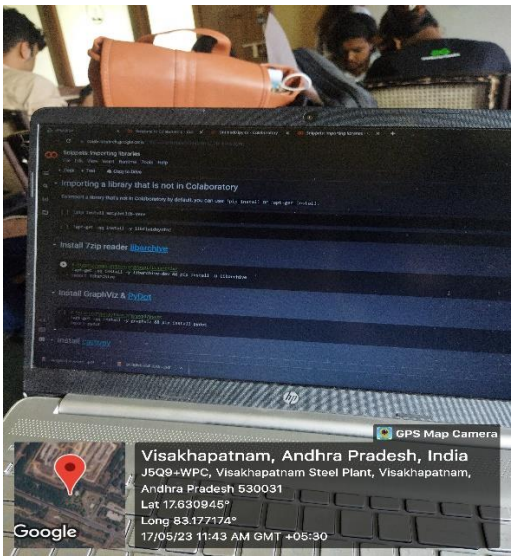	
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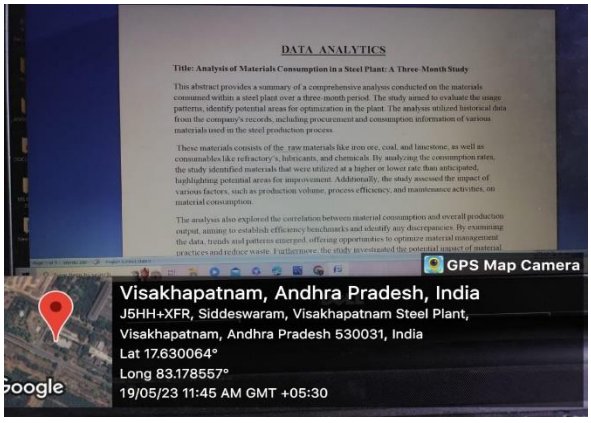	

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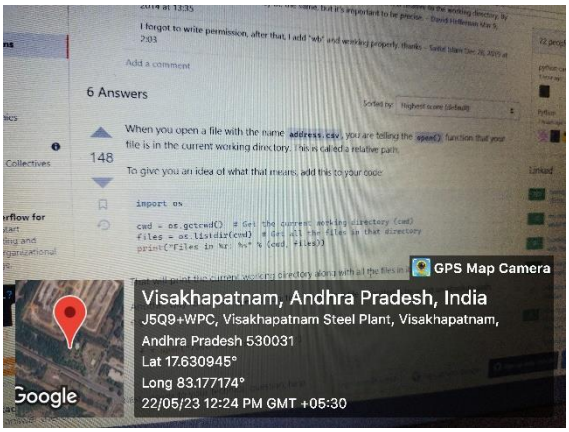	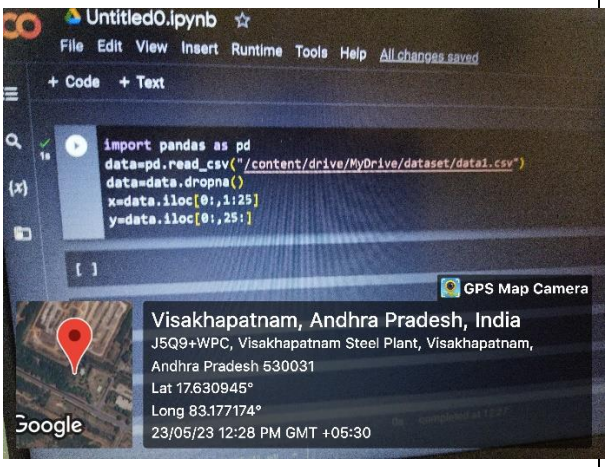
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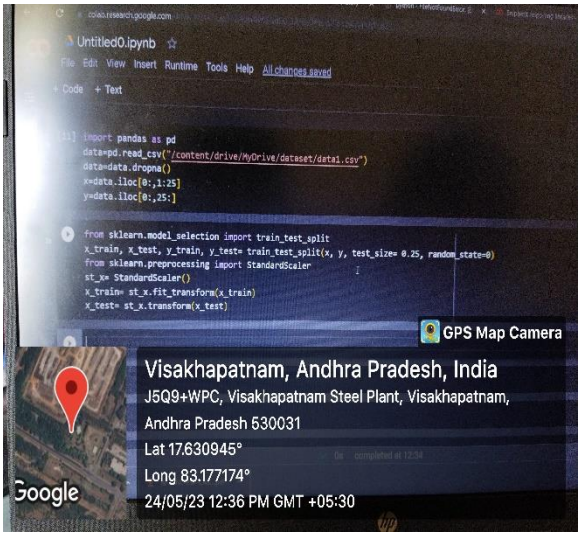	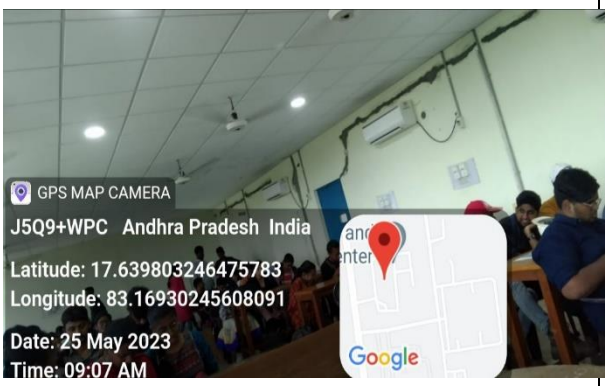
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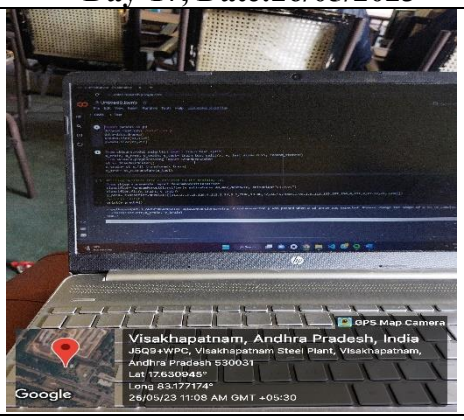	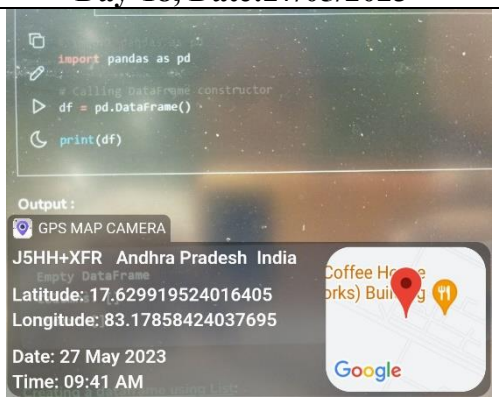

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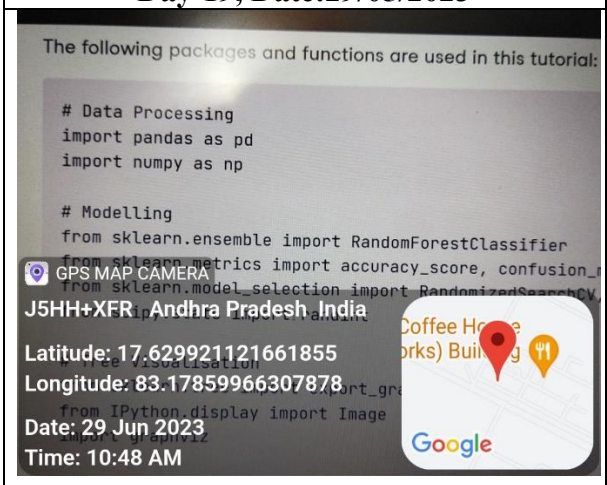	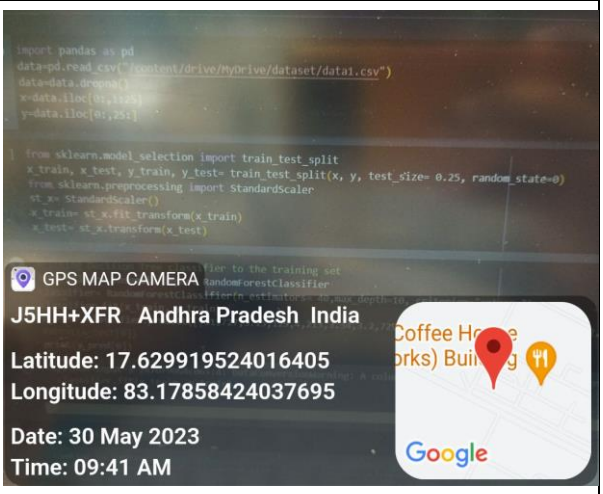
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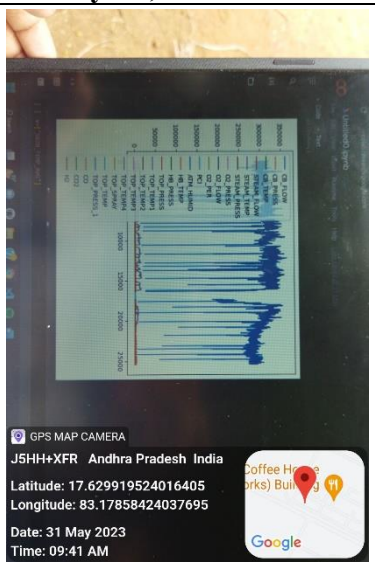	
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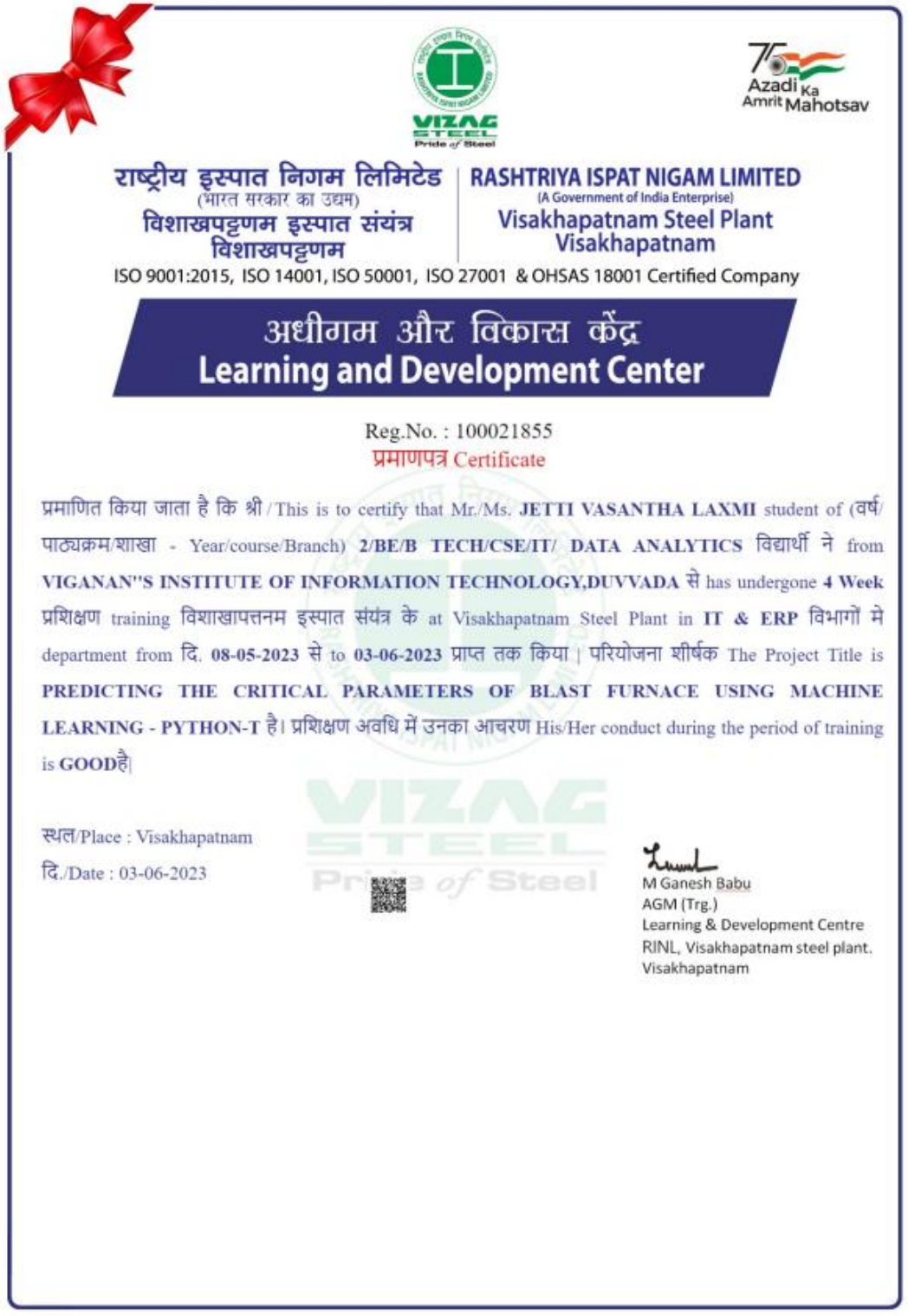
Internship Completion Certificate, Photos and Video Links



राष्ट्रीय इस्पात निगम लिमिटेड
(भारत सरकार का उद्यम)
विशाखपट्टणम इस्पात संयंत्र
विशाखपट्टणम

RASHTRIYA ISPAT NIGAM LIMITED
(A Government of India Enterprise)
Visakhapatnam Steel Plant
Visakhapatnam

ISO 9001:2015, ISO 14001, ISO 50001, ISO 27001 & OHSAS 18001 Certified Company

अधीगम और विकास केंद्र
Learning and Development Center

Reg.No. : 100021855

प्रमाणपत्र Certificate

प्रमाणित किया जाता है कि श्री / This is to certify that Mr./Ms. **JETTI VASANTHA LAXMI** student of (वर्ष/ पाठ्यक्रम/शाखा - Year/course/Branch) **2/BE/B TECH/CSE/IT/ DATA ANALYTICS** विद्यार्थी ने from **VIGANAN"S INSTITUTE OF INFORMATION TECHNOLOGY,DUVVADA** से has undergone **4 Week** प्रशिक्षण training विशाखापत्तनम इस्पात संयंत्र के at Visakhapatnam Steel Plant in **IT & ERP** विभागों मे department from दि. **08-05-2023** से to **03-06-2023** प्राप्त तक किया | परियोजना शीर्षक The Project Title is **PREDICTING THE CRITICAL PARAMETERS OF BLAST FURNACE USING MACHINE LEARNING - PYTHON-T** है। प्रशिक्षण अवधि में उनका आचरण His/Her conduct during the period of training is **GOOD**है|

स्थल/Place : Visakhapatnam
दि./Date : 03-06-2023

M Ganesh Babu
AGM (Trg.)
Learning & Development Centre
RINL, Visakhapatnam steel plant.
Visakhapatnam