Research Project
(Comprehensive Design and Analysis Project) - IT4010
[2025/FEB]

Logbook

An Intelligent Electricity Management Unit: AI-Driven Power Forecasting and Personalized Consumption Insights with Application Integration

Group ID: R25-065

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BSc (Hons) in Information Technology Specializing in Information Technology

Department of Information Technology

Submitted to:

Sri Lanka Institute of Information Technology

Sri Lanka

25 October 2025

Date	Description	Remarks	Supervisor's Signature
4th December 2024 – 15th December 2024	1. Held meetings with supervisor & co-supervisor to discuss the research scope. 2. Discussed & finalized the research scope. 3. Studied research papers related to Home Energy Management. 4. Outlined the research methodology including the key components.	Figure 1 - Meeting with Supervisor and Co – Supervisor	
16th December 2024 – 30th December 2024	1. Divide research components and study each member's novelty. 2. Discussed roles and responsibilities within the research team. 3. Explored existing projects of Home Energy Management System.	Figure 2 - Meeting with Co – supervisor	
31st December 2024 – 14th January 2025	1.TAF form submission preparation. 2. Held meetings with supervisor to get instructions regarding TAF submission 3. Get instructions from co – supervisor to prepare IoT Hardware device.	Figure 3 - Meeting with Teammates	
15th January 2025 – 31st January 2025	1. Made the original Proposal Report with clear problem identification, objectives, and methodology. 2. Made presentation slides to present the proposal presentation. 3. Final Project Proposal Report submitted, and final presentation was conducted.	Figure 4 - Meeting with Teammates	
1st February 2025 – 14th February 2025	1. Finished Stage 5 of AI/ML course. 2. Explored Generative AI models for personalized recommendations for project scope. 3. Met supervisor and got clear idea about the steps to get ready for PP1.		
15th February 2025 – 28th February 2025	1. Studied the steps to build an AI model. 2. Explored foundation models like Granite-13 by IBM, LLaMA-2-70B, GPT-Neo, and GPT-4 as suitable LLMs for personalized recommendations. 3. Found two datasets from Kaggle to test the model using Hugging Face Transformers. 4. Decided to use both RAG and Fine-Tune processes to train the model.	Figure 5 - Meeting with Teammates	

01st March 2025 – 15th March 2025	1. Conducted literature review on AI-based forecasting and energy optimization techniques. 2. Prepared for Progress Presentation I by summarizing completed milestones (TAF, proposal, AI/ML study progress). 3. Designed system architecture and finalized data pipeline structure for IoT data collection. 4. Progress Presentation I conducted on 24th March 2025 and received feedback from panel members.		
16th March 2025 – 31st March 2025	1. Designed the AI module structure integrating forecasting and recommendation components. 2. Defined input–output parameters for energy prediction using historical IoT data.	Figure 10 - Meeting with Teammates to prepare for PP1	
01st April 2025 – 15th April 2025	1. Collected and preprocessed IoT datasets for training and testing the AI models. 2. Cleaned data, removed outliers, and normalized features (voltage, current, and energy).		
16th April 2025 – 30th April 2025	1. Initiated development of the Generative AI component for personalized energy-saving recommendations. 2. Explored Hugging Face Transformers library for LLM integration. 3. Tested prompt templates for energy-related suggestions. 4. Supervisor advised to start writing research paper and gave instructions to write correctly.	Figure 6 - Meeting with Teammates	
01st May 2025 – 15th May 2025	1. Studied core concepts of Neural Networks, Transformers, and Fine-Tuning techniques. 2. Installed and configured the Hugging Face environment and explored key libraries (Transformers, Datasets, Tokenizers). 3. Discussed feasible AI pipeline structures with supervisor	Figure 7 - Meeting with Teammates	

16th May 2025 – 31st May 2025	1. Designed the initial AI workflow integrating forecasting and recommendation modules. 2. Experimented with Hugging Face pre-trained models (DistilBERT, GPT-Neo) for energy-related text generation. 3. Received feedback to explore domain-specific fine-tuning and evaluation metrics.		
01st June 2025 – 15th June 2025	1. Implemented prototype Generative AI recommendation module using Hugging Face Transformers. 2. Experimented with prompt-based generation using GPT-Neo and LLaMA models.		
16th June 2025 – 30th June 2025	1. Learned about tokenization, attention mechanisms, and parameter efficient tuning (PEFT/LoRA). 2. Tested text-generation quality for personalized energy advice	Figure 8 - Meeting with Teammates	
01st July 2025 – 15th July 2025	1. Supervisor discussion – advised to include a data preprocessing validation layer before model training. 2. Learned about evaluation metrics (MAE, RMSE) to compare models.		
16th July 2025 – 31st July 2025	1. Began learning Fine-Tuning and PEFT (LoRA) for LLMs via Hugging Face. 2. Conducted discussion with supervisor – advised to limit training dataset size to domain-specific energy dialogues. 3. Filtered dataset to remove irrelevant text and aligned it to appliance-specific consumption patterns.	Figure 9 - Meeting with Supervisor	
01st August 2025 – 15th August 2025	1. Implemented the first prototype of the Generative AI recommendation model using GPT-Neo 1.3B. 2. Tested initial prompts for generating energy-saving advice. 3. Supervisor reviewed outputs – highlighted repetitive phrases and lack of contextual variation.		
16th August 2025 – 31st	1. Adjusted prompt templates and introduced context windows to improve diversity.	Figure 11 - Meeting with Supervisor	

August 2025	2. Modified training script to include validation loss monitoring and automatic checkpoint saving.		
01st September 2025 – 15th September 2025	1. Deployed AI model through FastAPI endpoint integrated with project website 2. Presented finalized AI progress in Progress Presentation II (15–16 Sept). 3. Recorded feedback for final model refinement.		
16th September 2025 – 30th September 2025	1. Incorporated feedback by refining prompts 2. Supervisor requested alignment of AI output examples with Final Report structure. 3. Updated report drafts and included model performance comparison tables.	Figure 12 - Meeting with Supervisor	
01st October 2025 – 15th October 2025	1. Finalized model checkpoints and uploaded trained LLM to Hugging Face Hub. 2. Supervisor reviewed AI report chapter – suggested summarizing key insights in tabular form. 3. Revised final AI documentation and graphs accordingly.	Figure 14 - Meeting with Supervisor for Final Adjustments	
16th October 2025 – 31st October 2025	1. Conducted final demonstration and VIVA (27–28 Oct 2025) showcasing personalized recommendation system. 2. Supervisor provided final comments – advised including a short limitations section for future improvements.		

Figures (Screenshots)

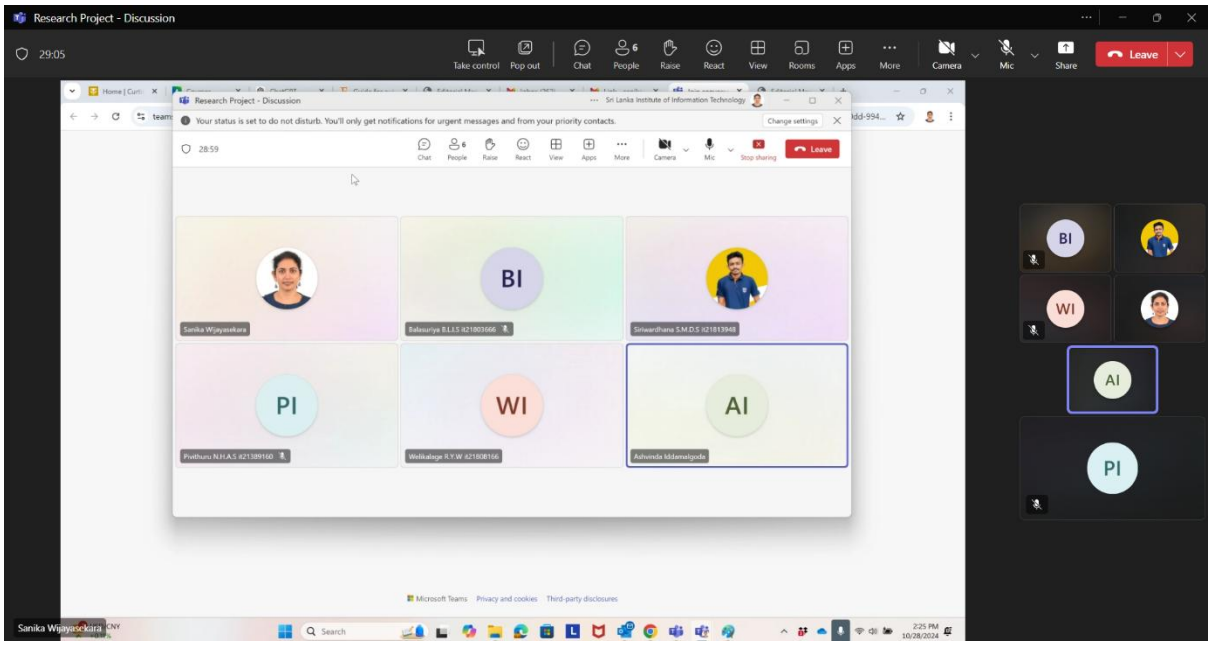


Figure 1 - Meeting with Supervisor and Co – Supervisor

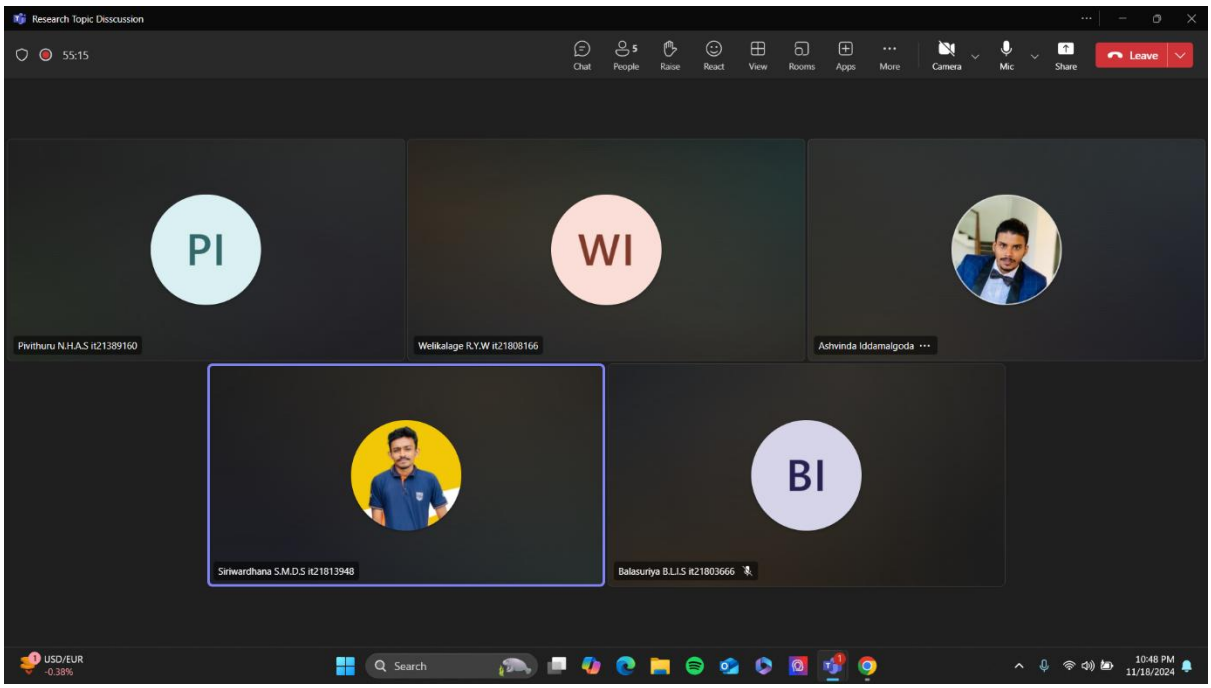


Figure 2 - Meeting with Co – supervisor

Figure 3 - Meeting with Teammates

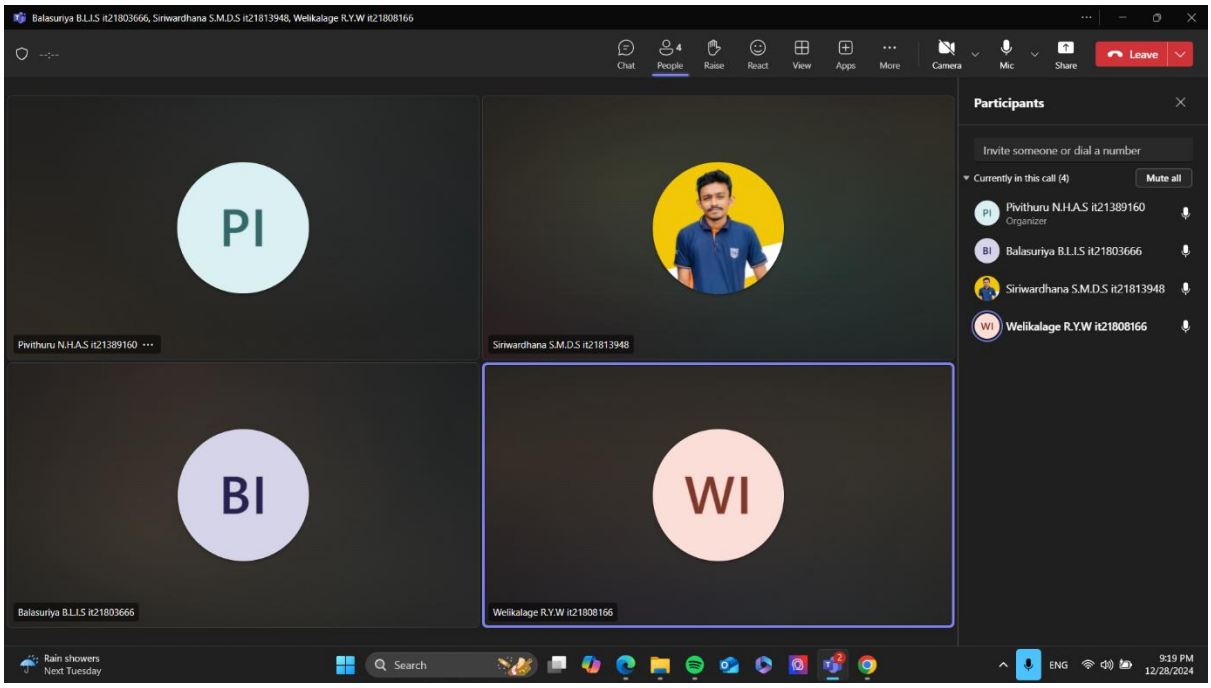
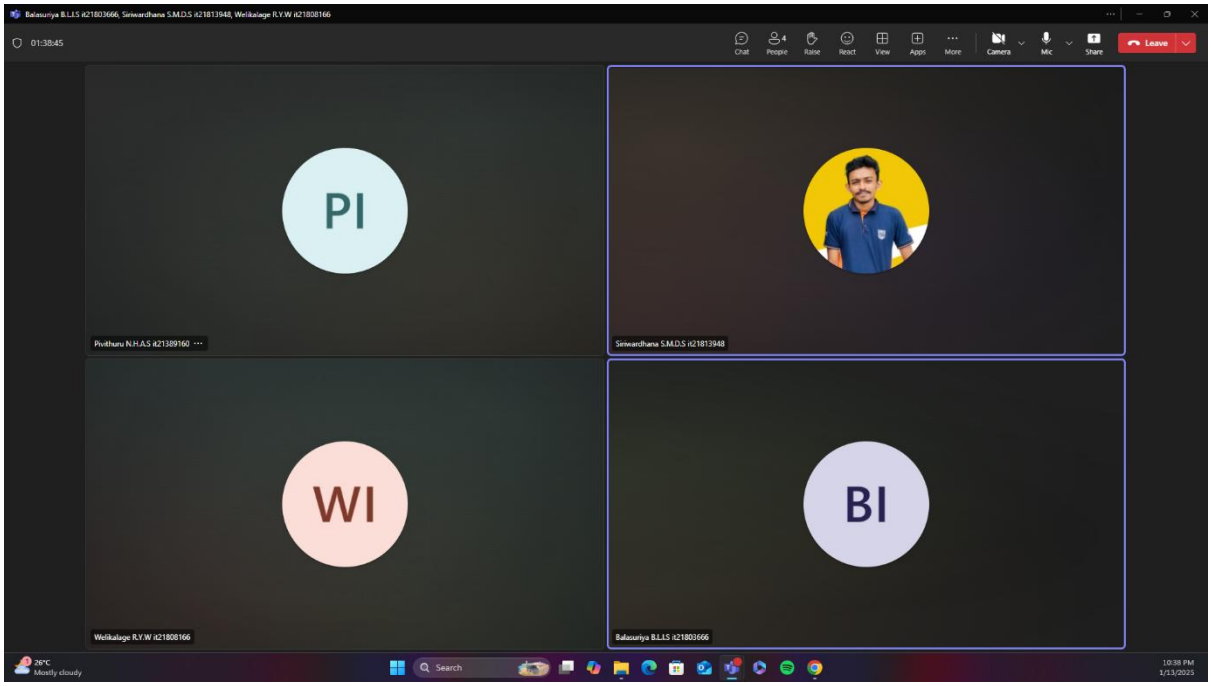


Figure 4 - Meeting with Teammates



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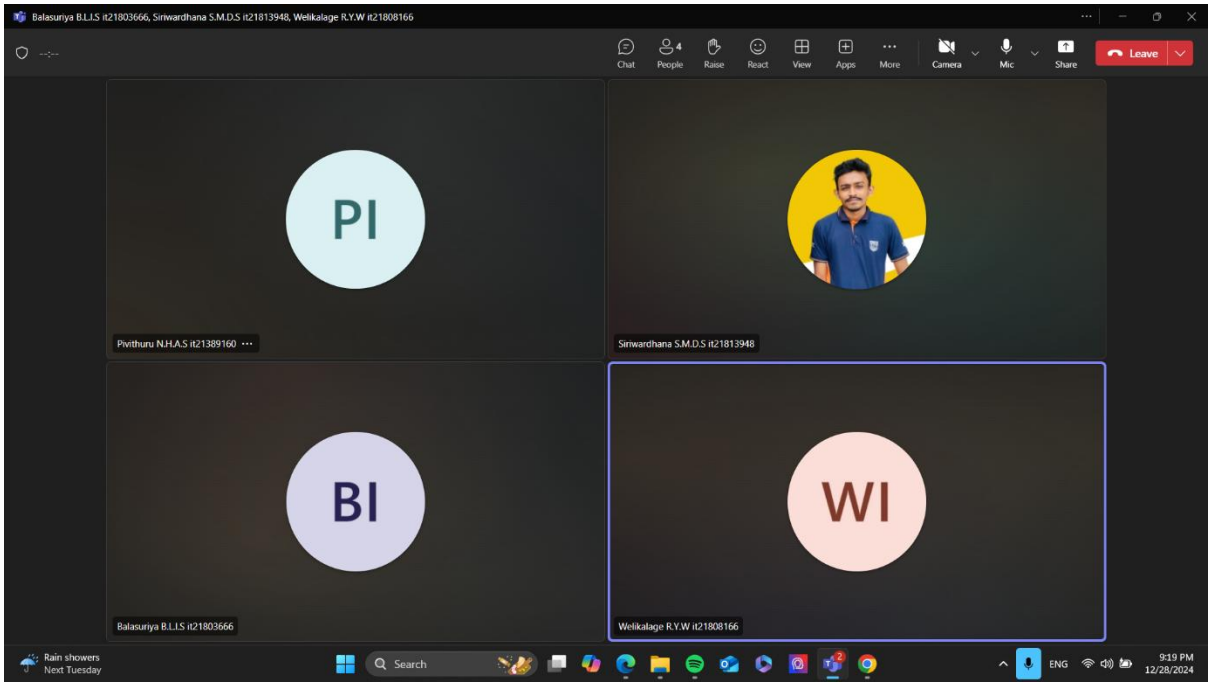


Figure 6 - Meeting with Teammates

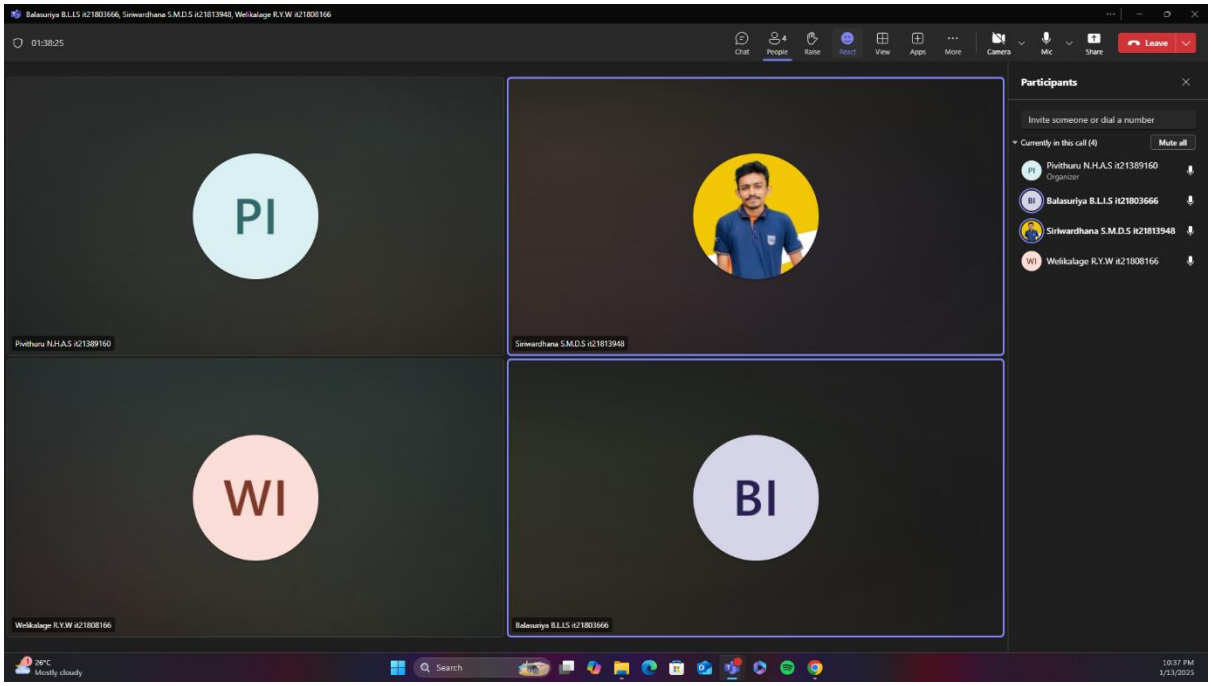


Figure 7 - Meeting with Teammates

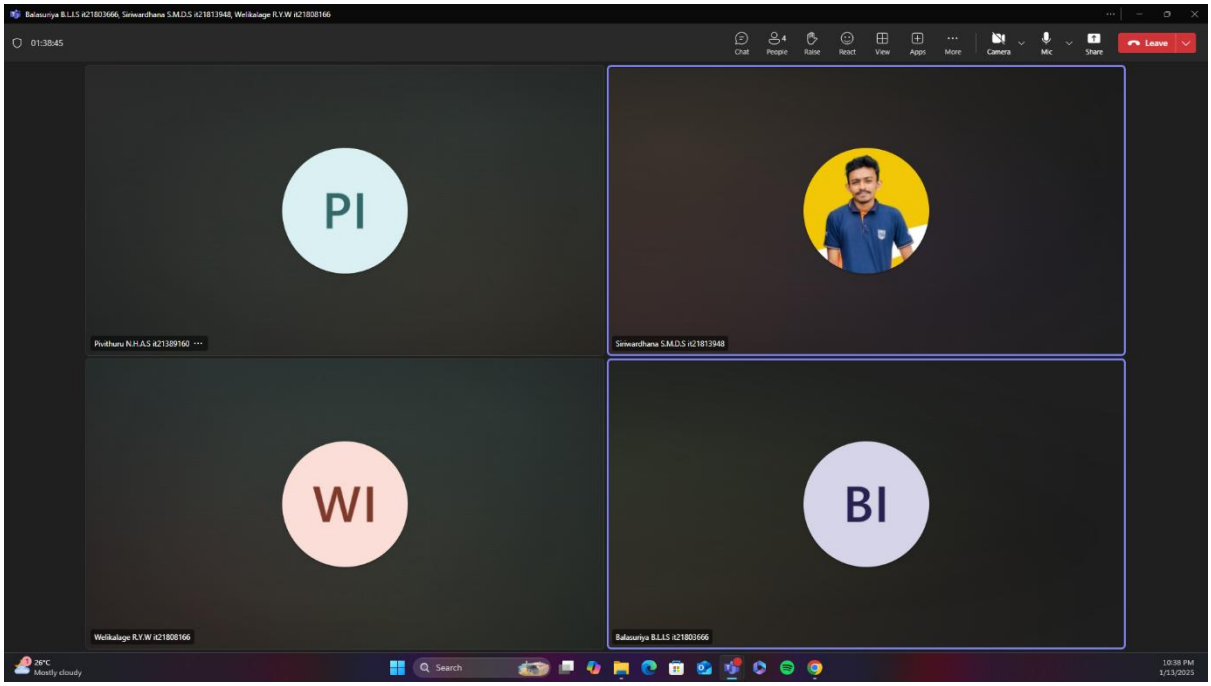


Figure 8 - Meeting with Teammates

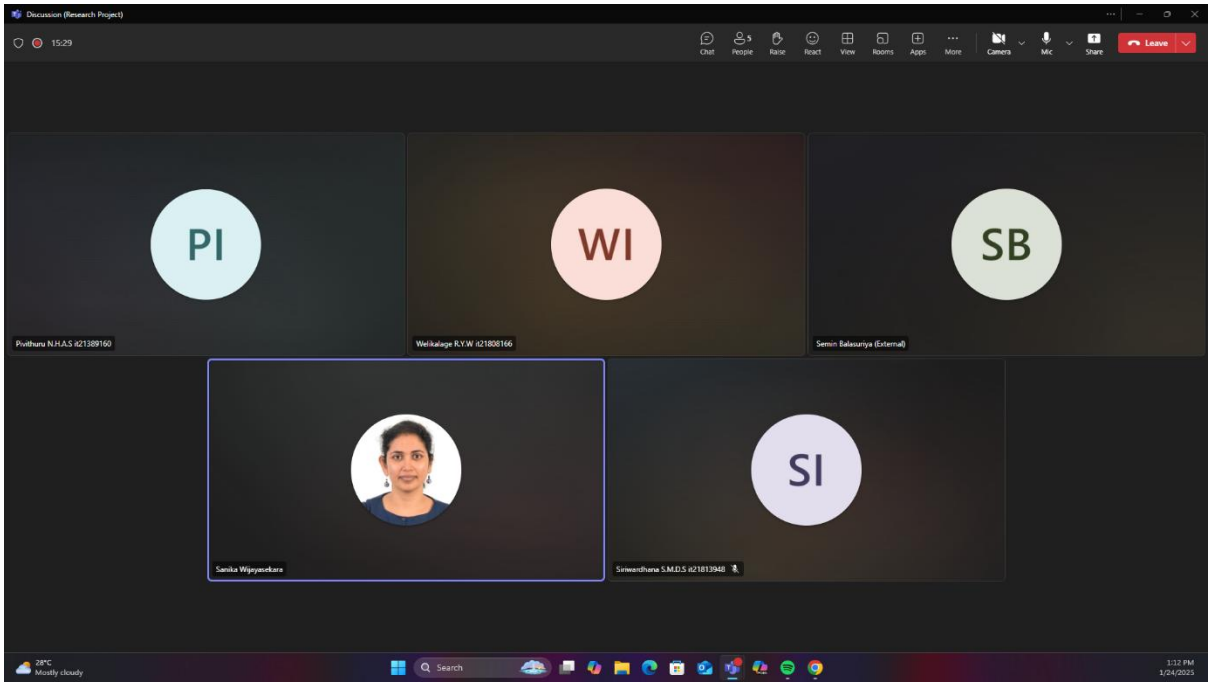


Figure 9 - Meeting with Supervisor

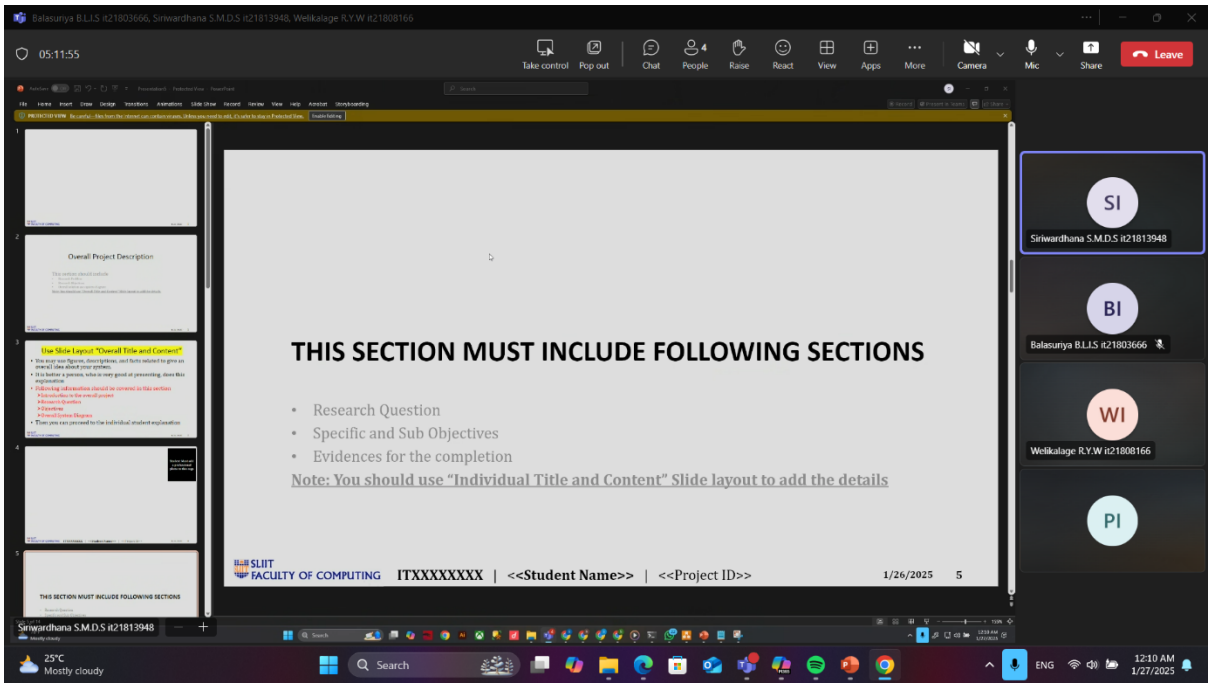
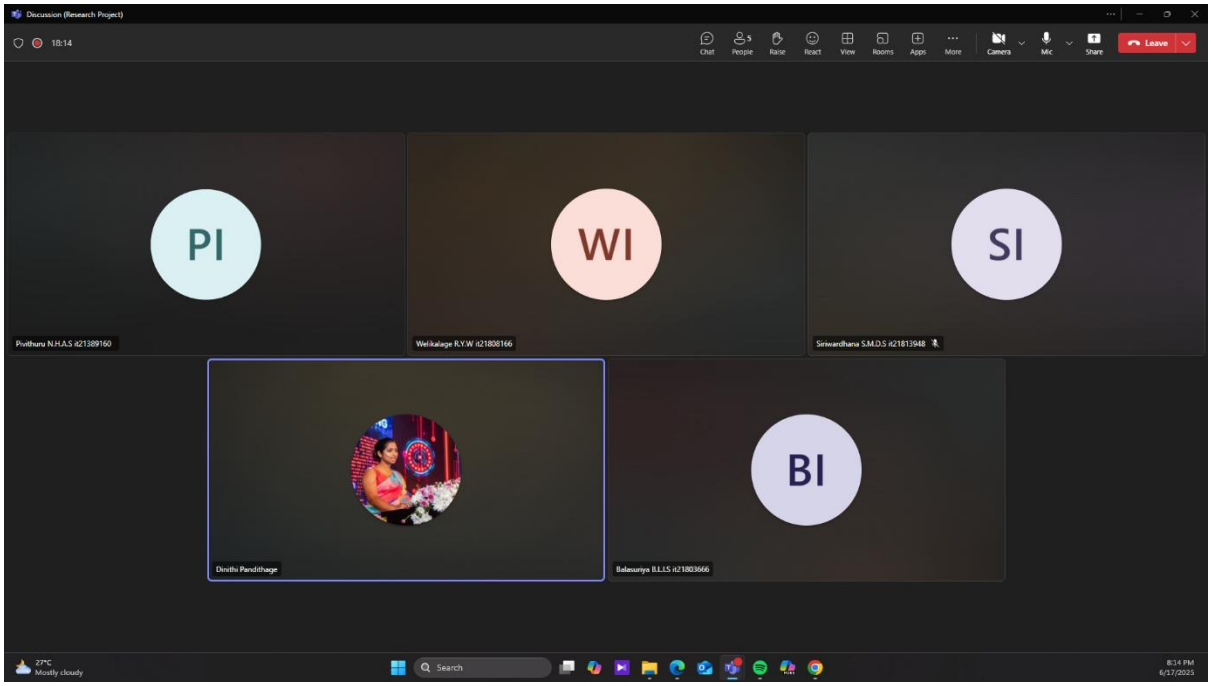


Figure 10 - Meeting with Teammates to prepare for PP1



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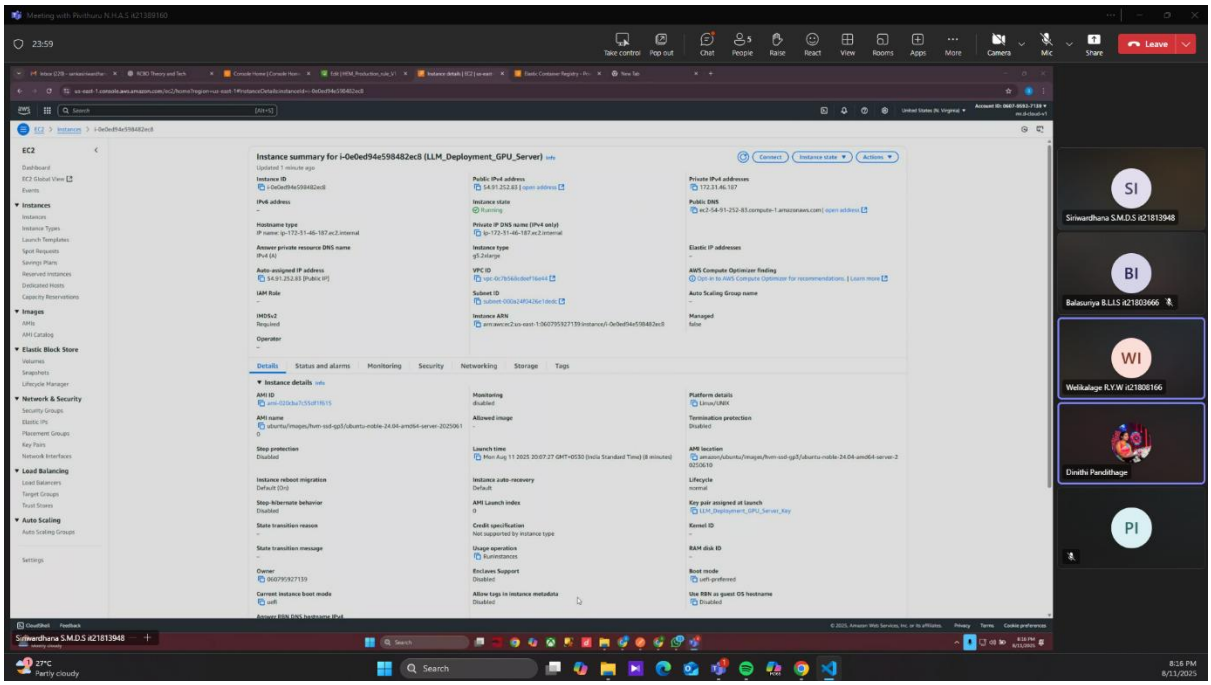

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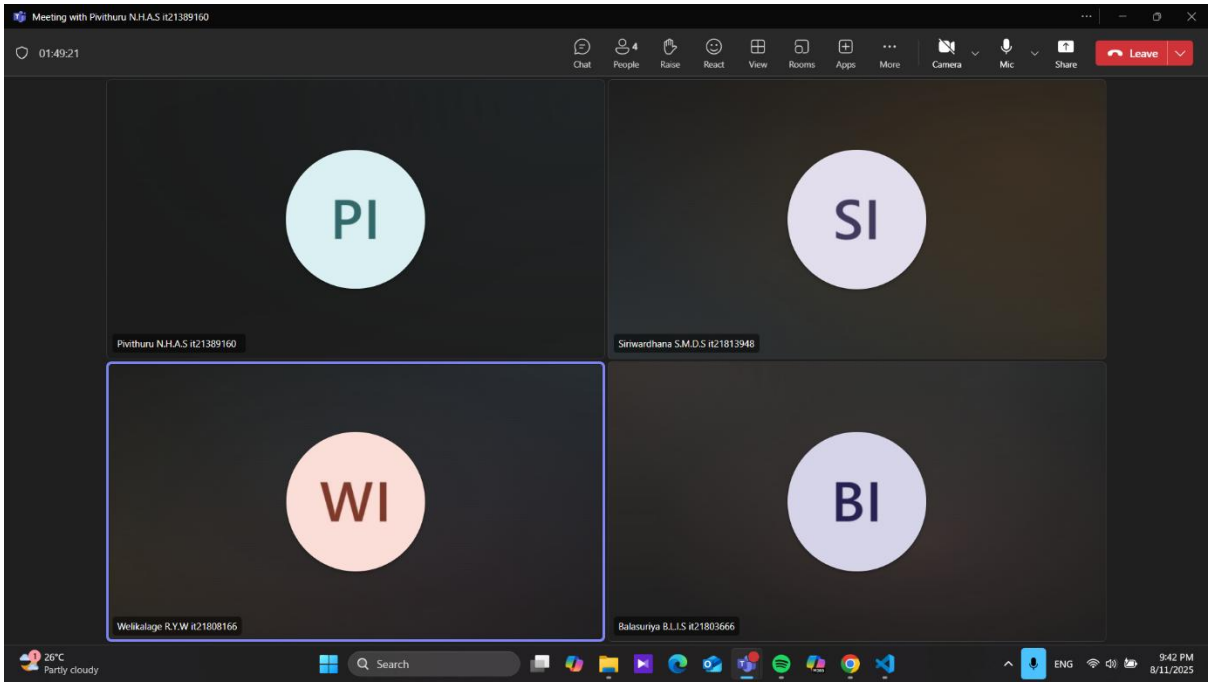

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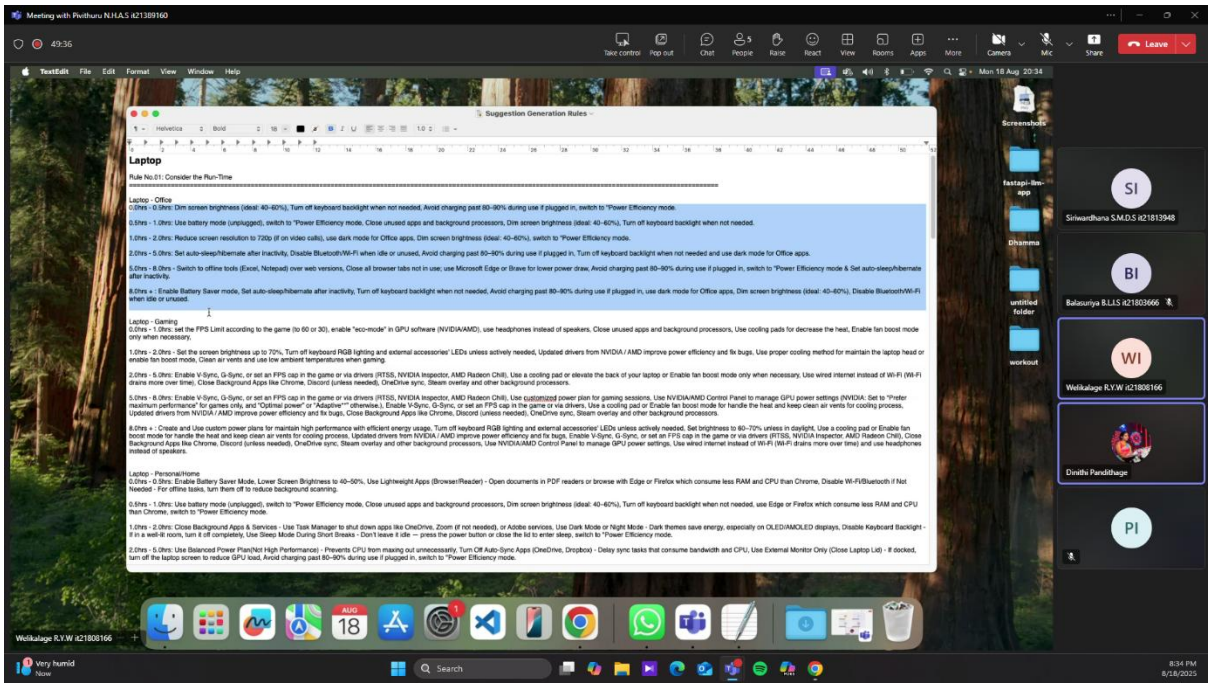
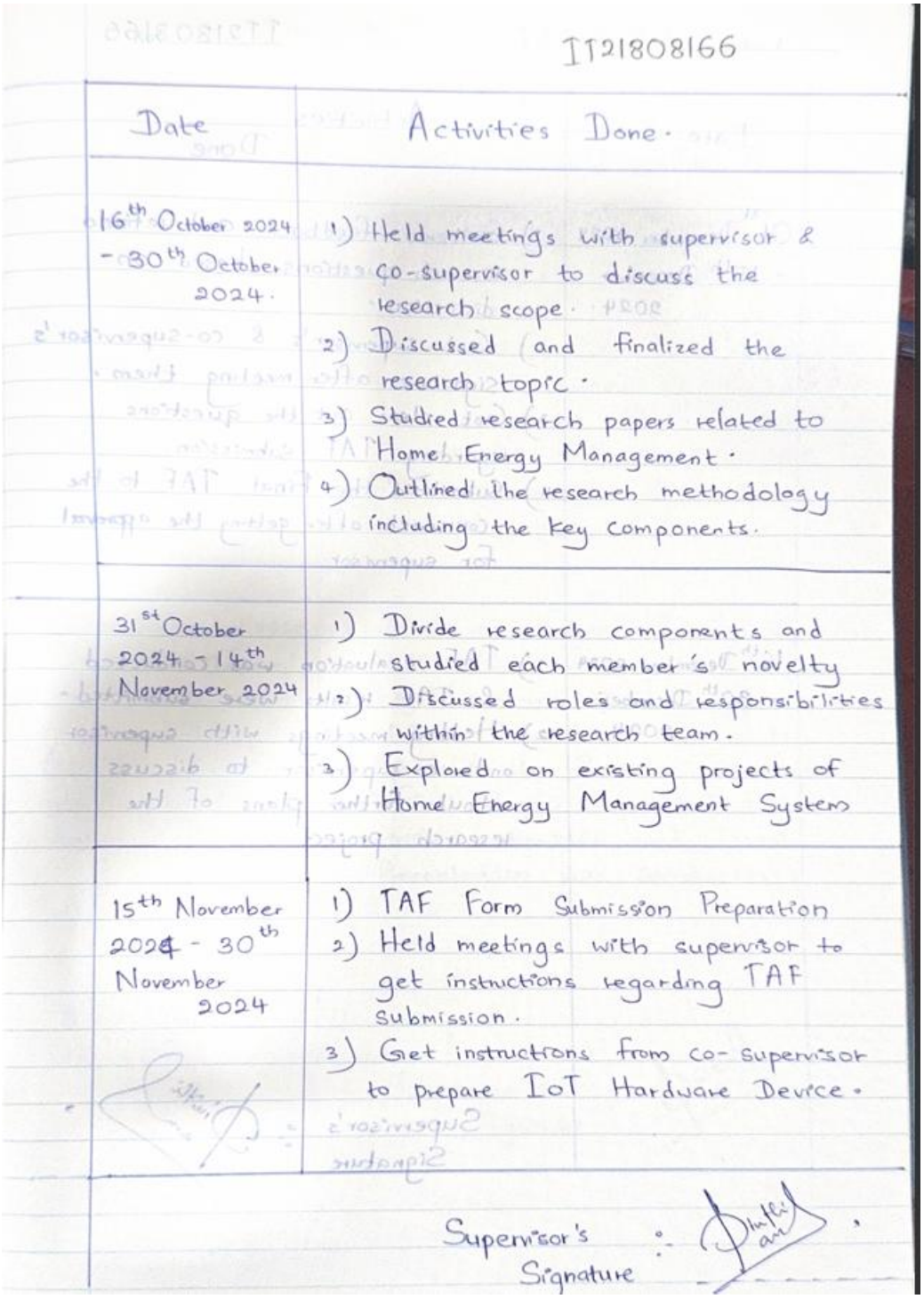


Figure 14 - Meeting with Supervisor for Final Adjustments



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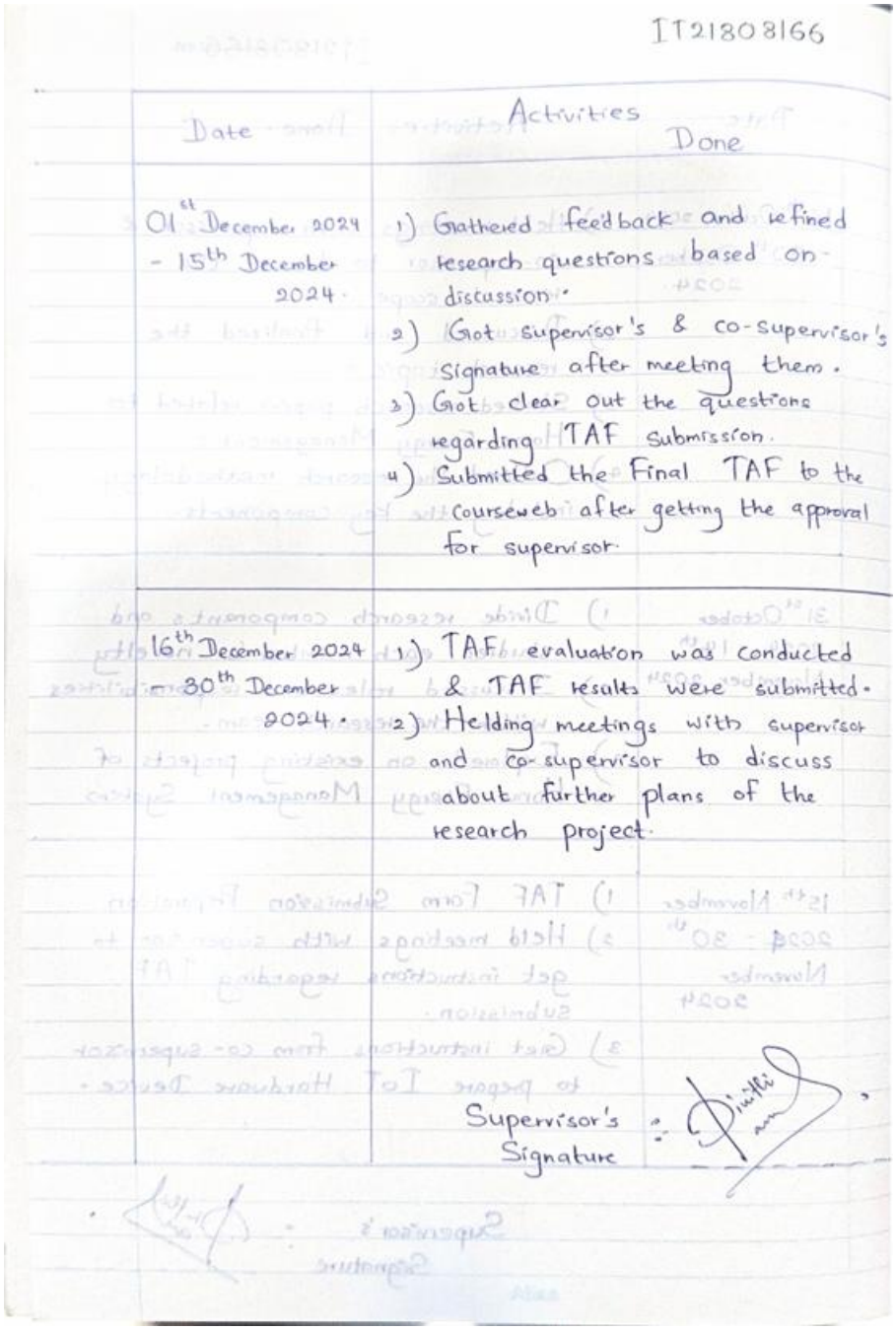
Date	Activities Done.
16th October 2024 - 30th October 2024.	1) Held meetings with supervisor & co-supervisor to discuss the research scope. 2) Discussed and finalized the research topic. 3) Studied research papers related to Home Energy Management. 4) Outlined the research methodology including the key components.
31st October 2024 - 14th November 2024	1) Divide research components and studied each member's novelty 2) Discussed roles and responsibilities within the research team. 3) Explored on existing projects of Home Energy Management System
15th November 2024 - 30th November 2024	1) TAF Form Submission Preparation 2) Held meetings with supervisor to get instructions regarding TAF submission. 3) Get instructions from co-supervisor to prepare IoT Hardware Device.

Supervisor's Signature :

Figure 15 - Handwritten Logbook Page with Supervisor Signature



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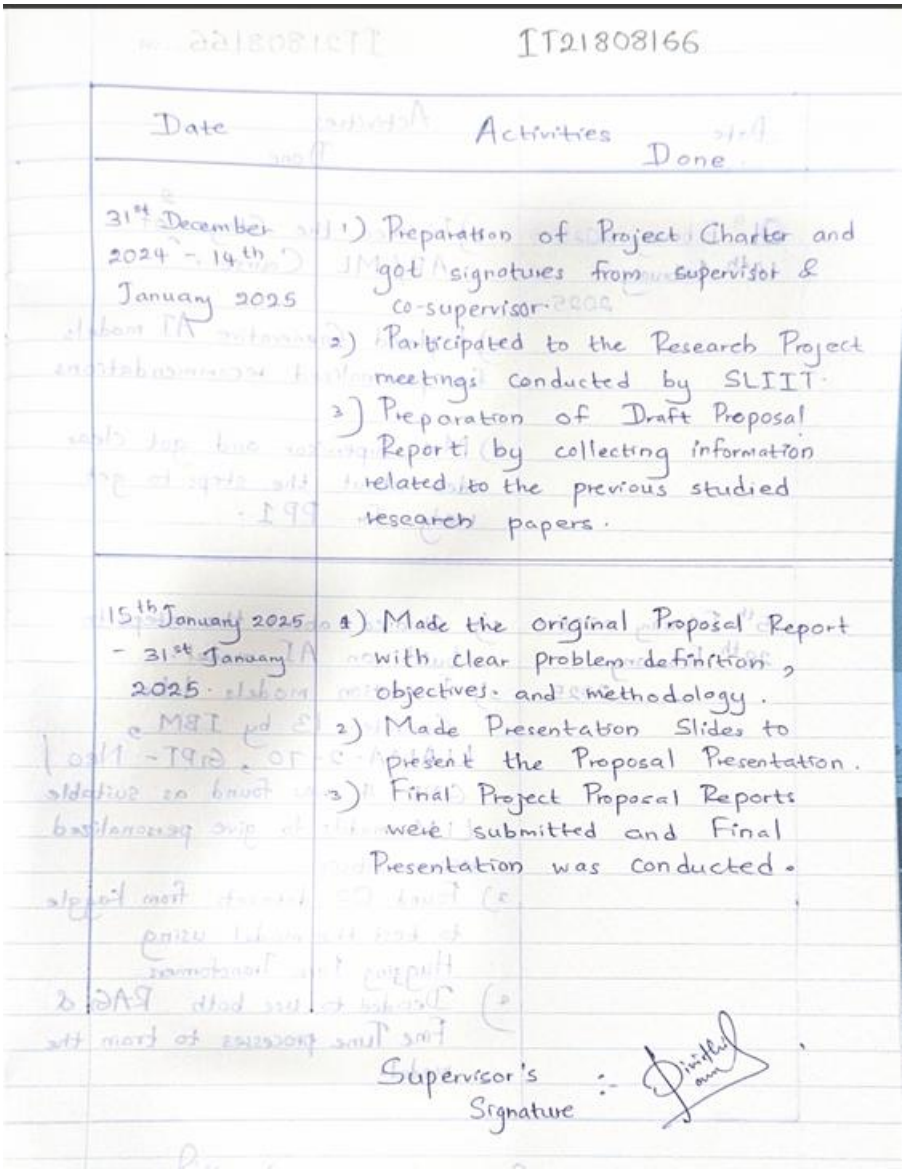
Date	Activities Done
01st December 2024 - 15th December 2024	1) Gathered feedback and refined research questions based on discussion. 2) Got supervisor's & co-supervisor's signature after meeting them. 3) Got clear out the questions regarding TAF submission. 4) Submitted the Final TAF to the courseweb after getting the approval for supervisor.
16th December 2024 - 30th December 2024.	1) TAF evaluation was conducted & TAF results were submitted. 2) Holding meetings with supervisor and co-supervisor to discuss about further plans of the research project.

Supervisor's Signature :

Figure 16 - Handwritten Logbook Page with Supervisor Signature



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Date	Activities Done
31st December 2024 - 14th January 2025	1) Preparation of Project Charter and got signatures from supervisor & co-supervisor. 2) Participated to the Research Project meetings conducted by SLIIT. 3) Preparation of Draft Proposal Report by collecting information related to the previous studied research papers.
15th January 2025 - 31st January 2025	1) Made the original Proposal Report with clear problem definition, objectives and methodology. 2) Made Presentation Slides to present the Proposal Presentation. 3) Final Project Proposal Reports were submitted and Final Presentation was conducted.

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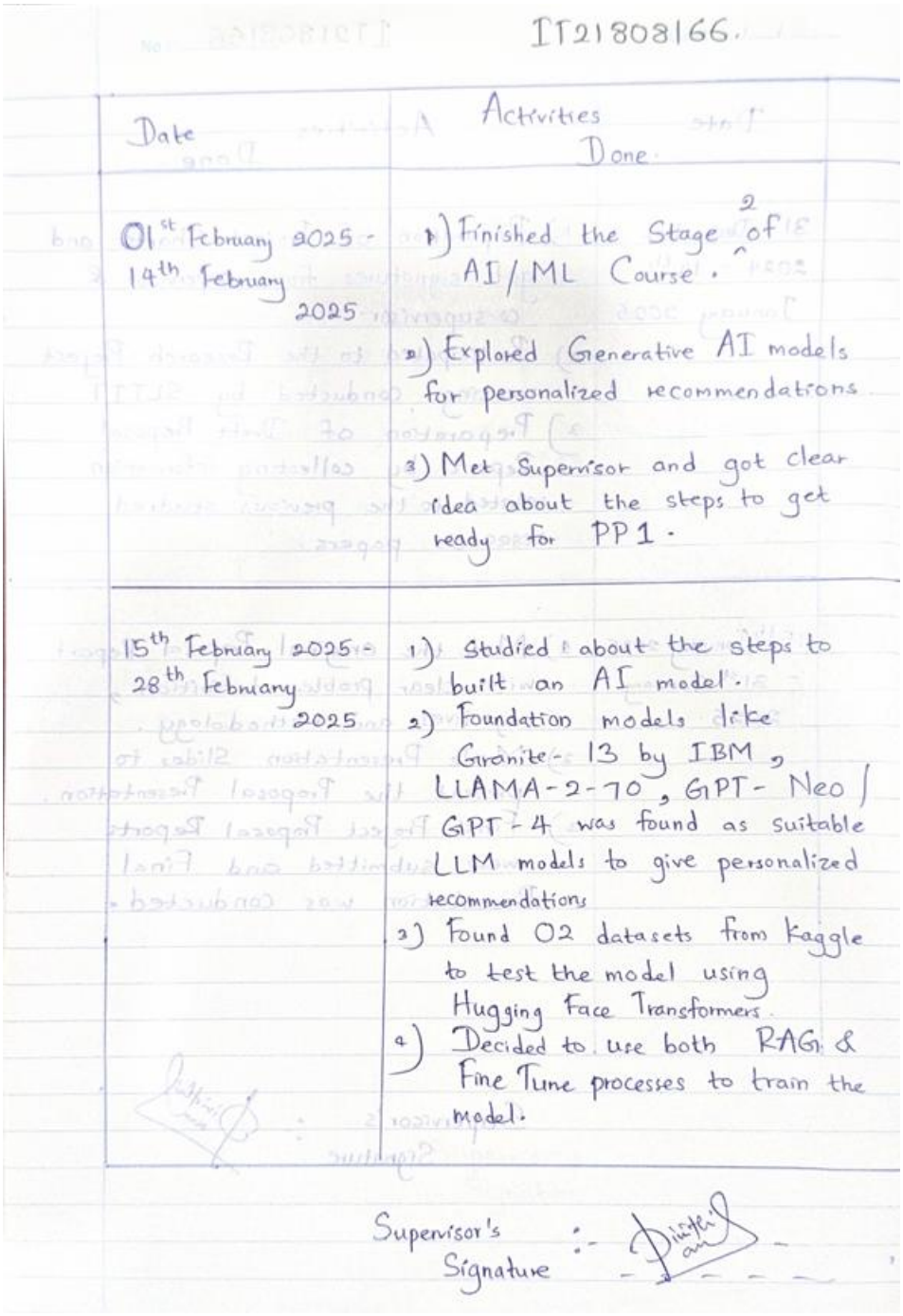

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Date	Activities Done
01st February 2025 - 14th February 2025	1) Finished the Stage 2 of AI / ML Course. 2) Explored Generative AI models for personalized recommendations 3) Met Supervisor and got clear idea about the steps to get ready for PP1.
15th February 2025 - 28th February 2025	1) Studied about the steps to built an AI model. 2) Foundation models like Granite-13 by IBM, LLAMA-2-70, GPT-Neo / GPT-4 was found as suitable LLM models to give personalized recommendations 3) Found 02 datasets from Kaggle to test the model using Hugging Face Transformers. 4) Decided to use both RAG & Fine Tune processes to train the model.

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