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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Submitted to:

Sri Lanka Institute of Information Technology

Sri Lanka

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Date	Description	Remarks	Supervisor's Signature
16/10/2024 to 30/10/2024	1. Heald meetings with supervisor & co-supervisor to discusses the research scope. 2. Discusses and finalized the research scope. 3. Studied research papers related to Home Energy Management. 4. Outlined the research methodology including the key component.	Figure 1 - Meeting with Supervisor and Co – Supervisor	
31/10/2025 to 14/11/2024	1. Divide research components and studied each member novelty. 2. Discussed roles and responsibilities within the research team. 3. Explored on existing projects of Home Energy Management System.		
15/11/2025 to 30/11/2024	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 Devices.	Figure 2 - Meeting with Co – supervisor	
01/12/2024 to 15/12/2024	1. Gathered feedback and refined research questions based on discussion. 2. Got supervisor's & co-supervisor's signatures after meeting them. 3. Got clear out the questions regarding TAF submissions. 4. Submitting the final TAF to the course web of the getting the app approval for supervisor.	Figure 3 - Meeting with Teammates	
16/12/2024 to 30/12/2024	1. TAF evaluation was conducted & TAF results were submitted. 2. Helding meetings with supervisor and co-supervisor to discusses about further plans of the research project.	Figure 4 - Meeting with Teammates	

31/12/2024 to 14/01/2025	1. Preparation of project charter and got signature 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.	Figure 5 - Meeting with Teammates	
15/01/2025 to 31/01/2025	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.	Figure 6 - Meeting with Teammates	
01/02/2025 to 14/02/2025	1. Studied about the differences of the Arduino development boards and select best fit item for our project. 2. Discusses about other IoT components (Relays, Sensors) related to the project with co-supervisor. 3. Studied about AWS for set-up cloud environment for the project. 4. Met supervisor and get clear idea about the steps to get ready to PP1.	Figure 7 - Meeting with Teammates	
15/02/2025 to 28/02/2025	1. Studied about the AWS "IoT core" service for established the connection in between AWS and ESP32. 2. Explore about the DynamoDB for store the data get from ESP32 board. 3. Designed the basic device-to-cloud communication structure.	Figure 8 - Meeting with Teammates	
01/03/2025 to 14/03/2025	1. Configured ESP32 for MQTT connection and data publishing. 2. Established initial data storage pipeline in DynamoDB.	Figure 9 - Meeting with Supervisor	

	3. Discussed hardware progress and synchronization with other modules.		
15/03/2025 to 31/03/2025	1. Completed sensor integration (ACS712 for current, ZMPT101B for voltage). 2. Designed dynamic threshold system for relay control. 3. Conducted initial testing and calibration for accuracy.	Figure 10 - Meeting with Teammates to prepare for PP1	
01/04/2025 to 14/04/2025	1. Implemented automatic relay cutoff based on threshold values. 2. Verified MQTT publishing consistency and data accuracy in DynamoDB. 3. Successfully conducted Progress Presentation 01.		
15/04/2025 to 30/04/2025	1. Improved data accuracy using calibration formulas for current and voltage. 2. Integrated runtime tracking feature for energy consumption. 3. Met supervisors for feedback and refined design documentation.	Figure 11 - Meeting with Supervisor	
01/05/2025 to 14/05/2025	1. Added dynamic threshold fetching from backend using REST API. 2. Developed logic for total energy (kWh) and cost (LKR) calculation. 3. Tested long-term device stability under continuous operation.		
15/05/2025 to 31/05/2025	1. Deployed classification model using AWS ECR for fault tolerance instead of SageMaker. 2. Integrated the ECR container with Lambda for real-time API inference. 3. Tested end-to-end fault classification using real sensor data.	Figure 12 - Meeting with Supervisor	

01/06/2025 to 14/06/2025	1. Designed complete IoT-to-cloud architecture documentation. 2. Conducted field testing with multiple smart plugs for reliability analysis. 3. Debugged MQTT latency and optimized data flow.		
15/06/2025 to 30/06/2025	1. Implemented WebSocket API in Laravel for real-time updates on dashboard. 2. Validated synchronization between AWS DynamoDB and local RDS replica. 3. Met supervisor to present performance evaluation results.	Figure 13 - Meeting with Teammates	
01/07/2025 to 14/07/2025	1. Improved data visualization responsiveness on React dashboard. 2. Added dynamic gauge charts for real-time current and power. 3. Linked device status indicators and relay control through APIs.		
15/07/2025 to 31/07/2025	1. Conducted internal testing with the team and presented updates to supervisor. 2. Documented IoT hardware circuit diagrams and firmware architecture.		
01/08/2025 to 14/08/2025	1. Improved performance of WebSocket events for faster data updates. 2. Prepared content for Progress Presentation 02.		
15/08/2025 to 31/08/2025	1. Completed PP2 demonstration successfully. 2. Prepared the IoT hardware and cloud integration documentation.		
01/09/2025 to 14/09/2025	1. Conducted long-duration performance testing for smart plug network. 2. Recorded data consistency under multiple network conditions.	Figure 14 - Meeting with Supervisor	

15/09/2025 to 30/09/2025	1. Presented Progress Presentation 02 successfully and gathered feedback for improvements. 2. Started drafting final report sections related to implementation and evaluation.		
01/10/2025 to 14/10/2025	1. Finalized documentation, report, and presentation slides. 2. Performed complete system integration testing. 3. Prepared content for the final presentation and system demonstration. 4. Met with supervisor to review the report draft and finalize improvements.		
15/10/2025 to 31/10/2025	1. Finalized and formatted the final research report with appendices and references. 2. Prepared and rehearsed the final presentation and demo with team members. 3. Presented Final Presentation and Website evaluation VIVA. 4. Created a static website for project commercialization. 5. Uploaded all project documents and presentation slides to the course web.		

Figures (Meeting Screenshots)

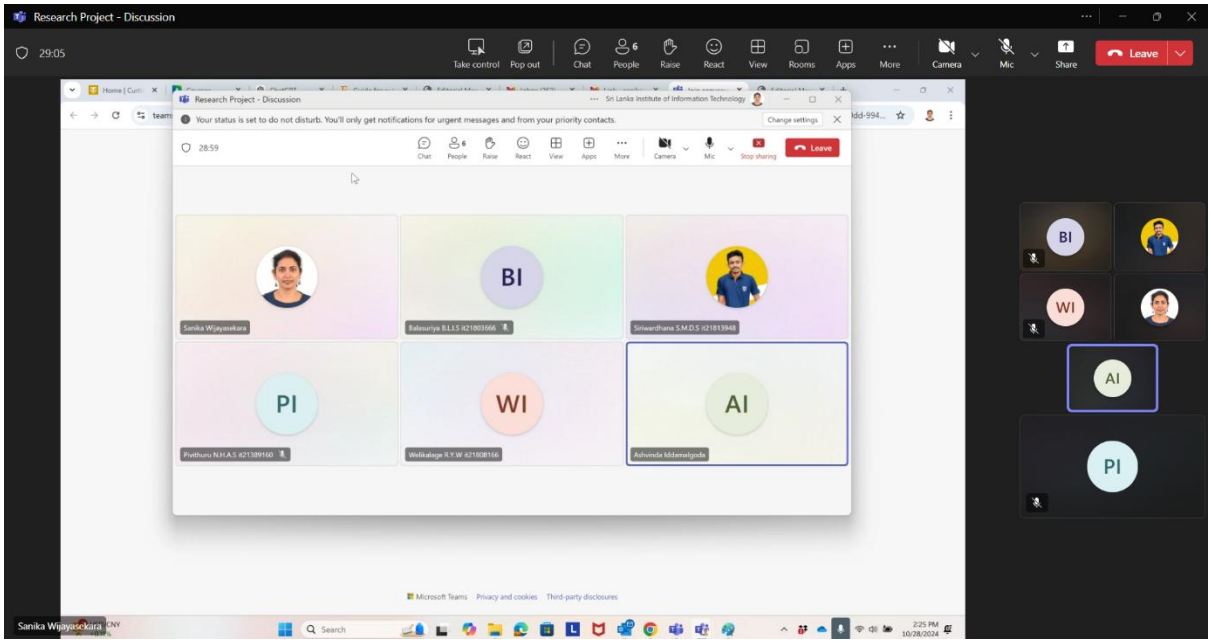

Figure 1 - Meeting with Supervisor and Co – Supervisor

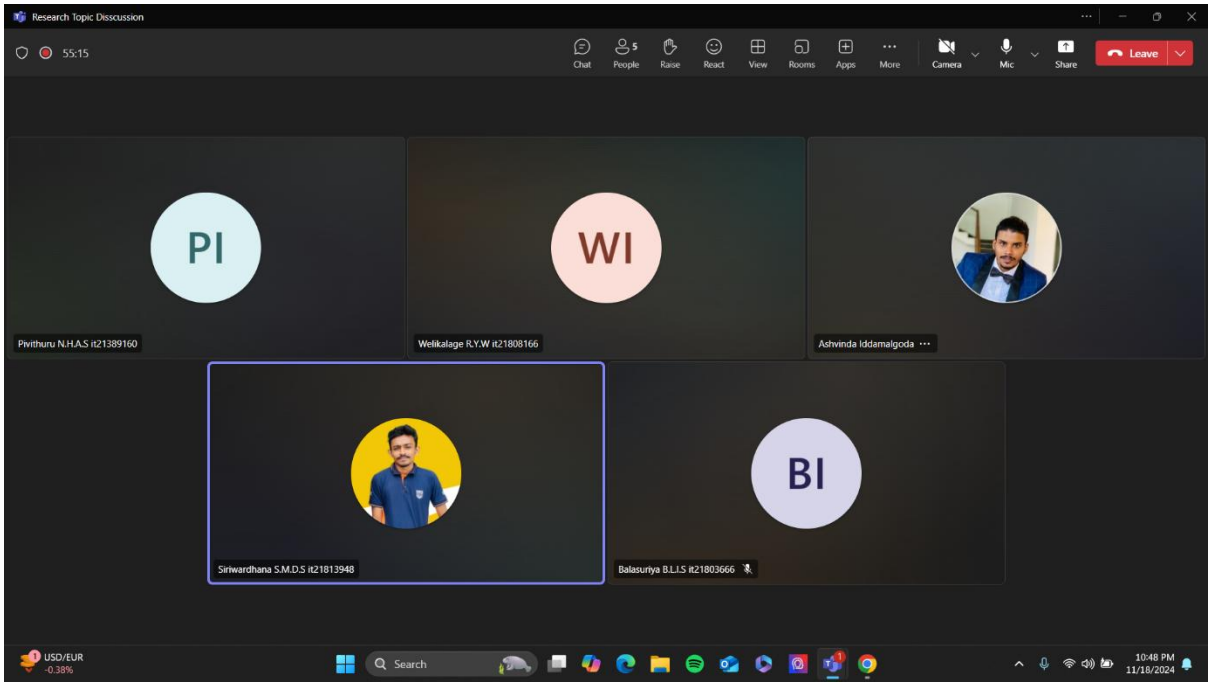

Figure 2 - Meeting with Co – supervisor

Figure 3 - Meeting with Teammates

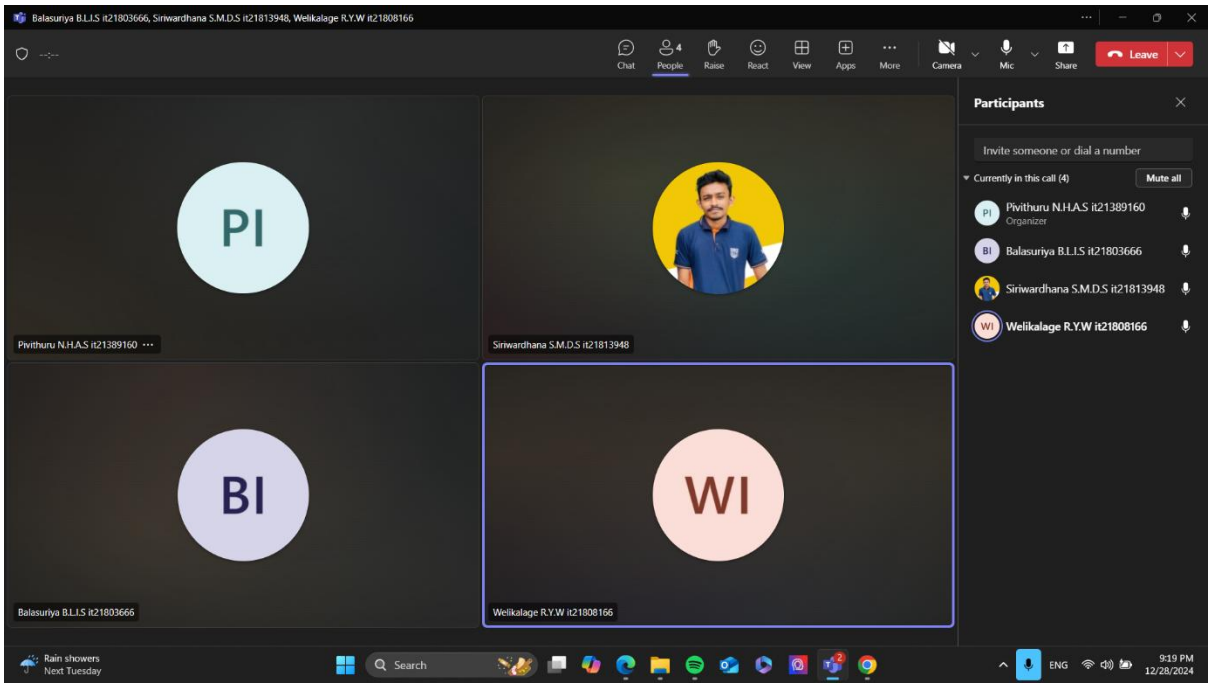

Figure 4 - Meeting with Teammates

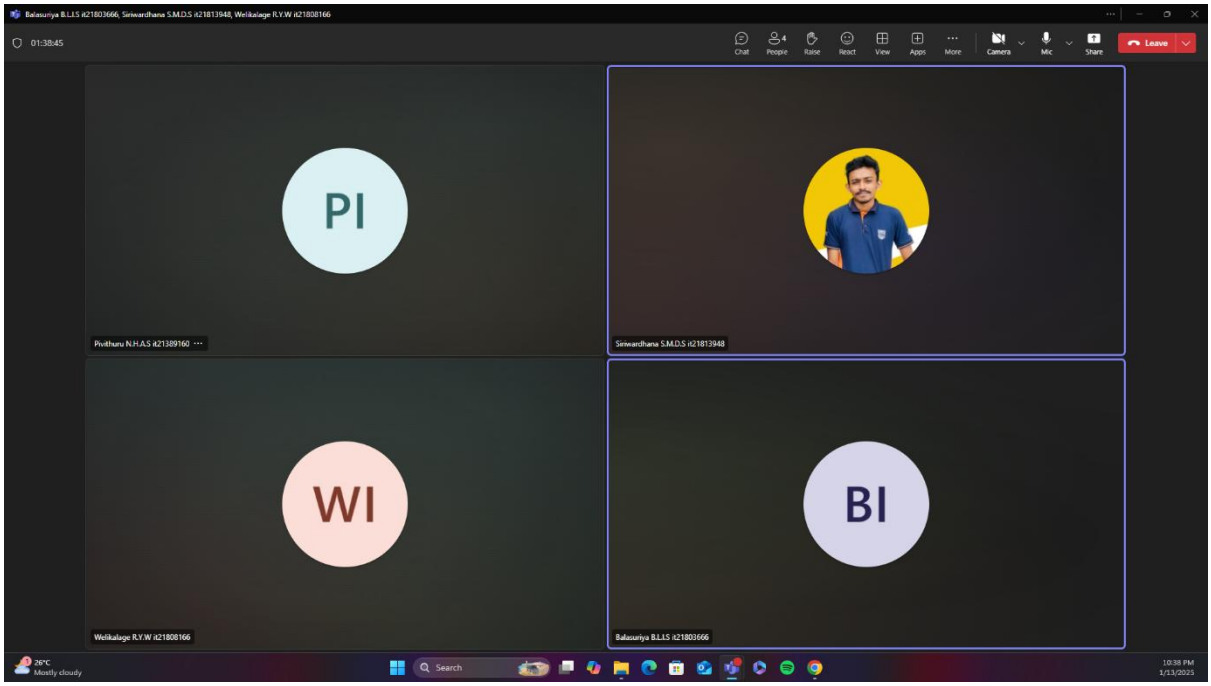

Figure 5 - Meeting with Teammates

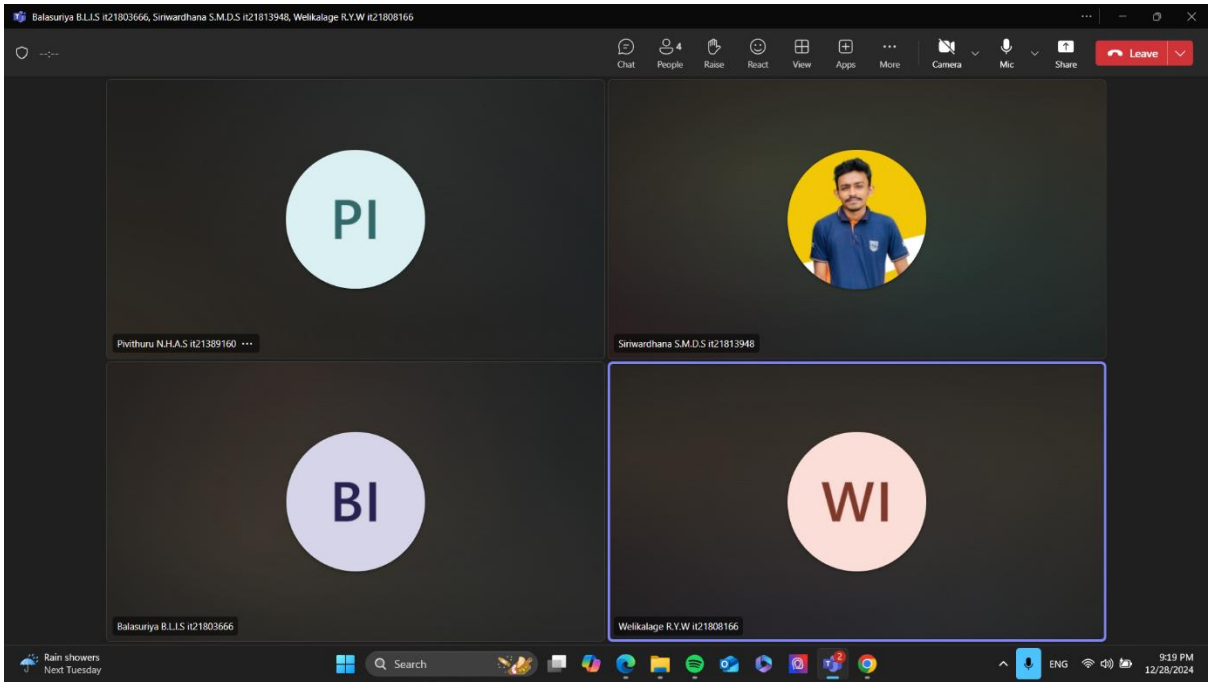

Figure 6 - Meeting with Teammates

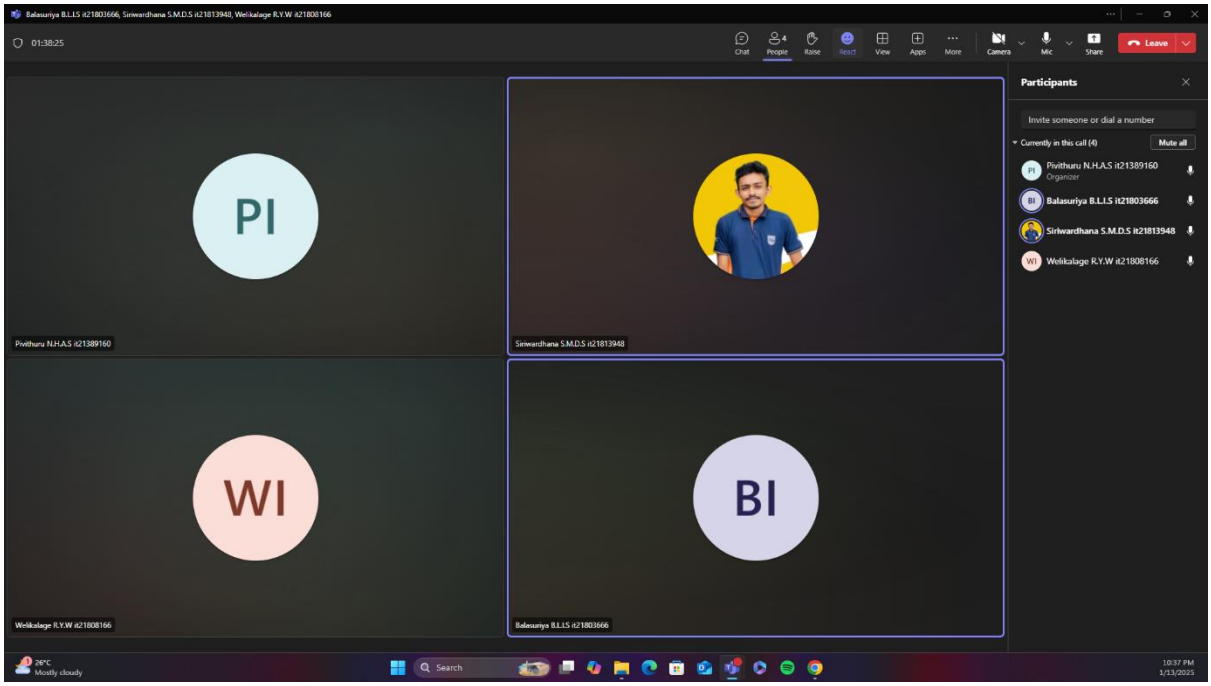

Figure 7 - Meeting with Teammates

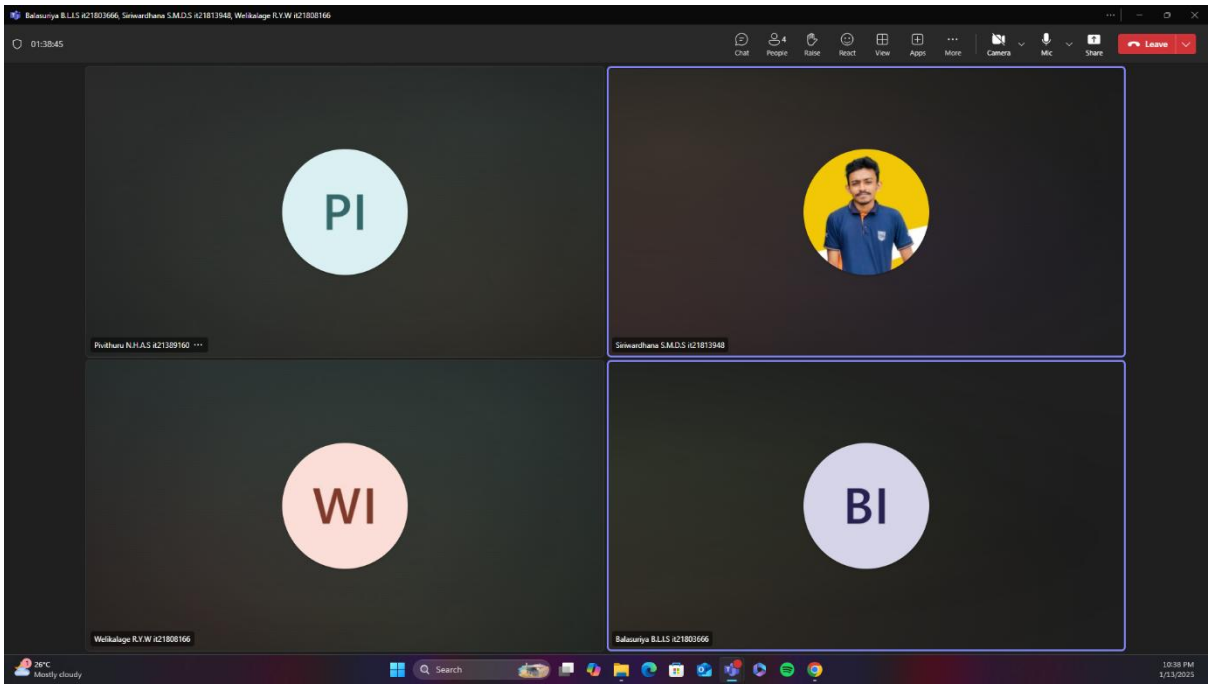

Figure 8 - Meeting with Teammates

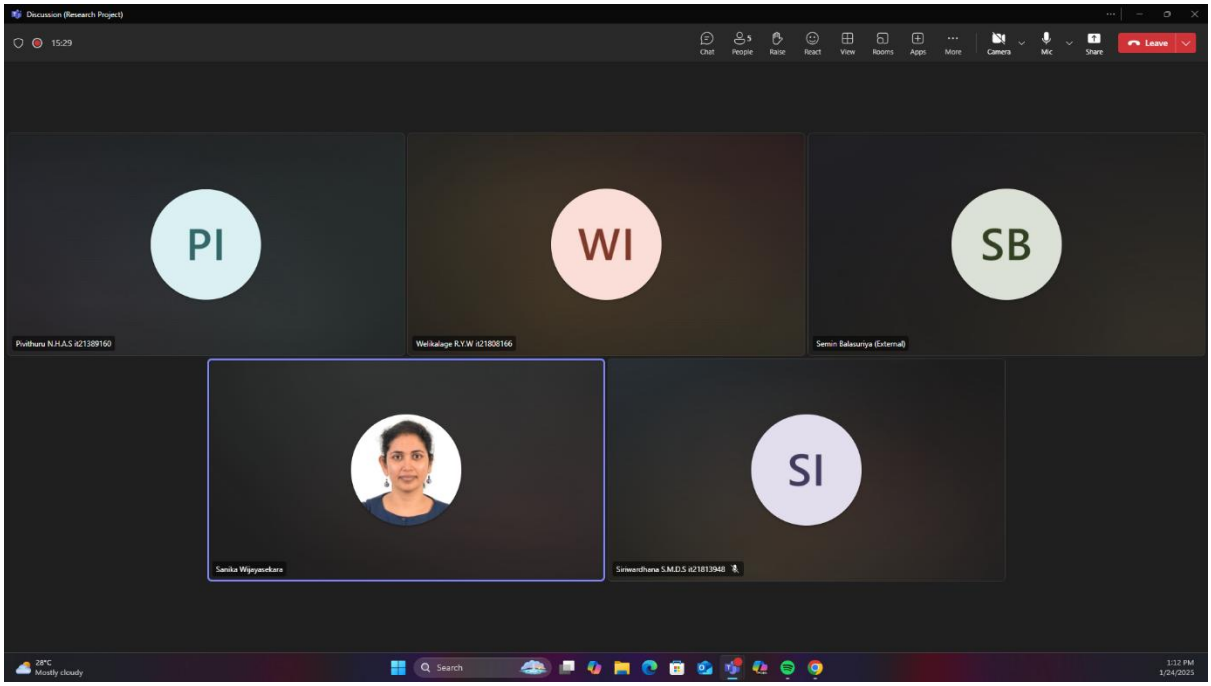

Figure 9 - Meeting with Supervisor

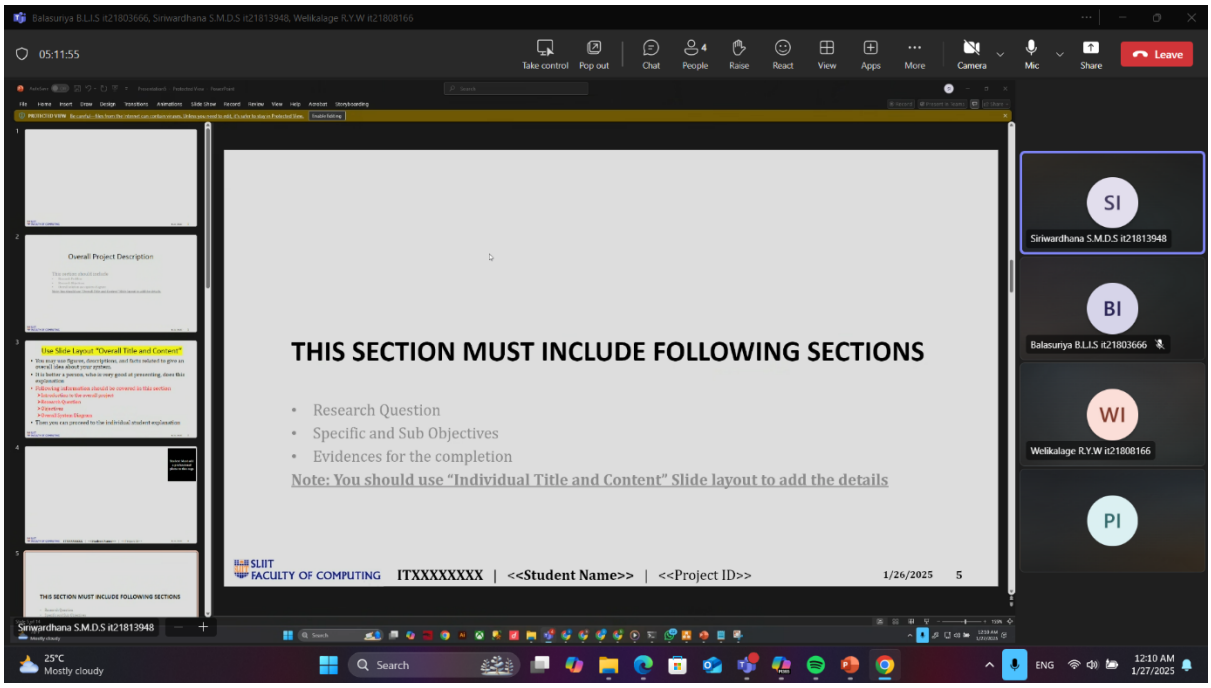

Figure 10 - Meeting with Teammates to prepare for PP1

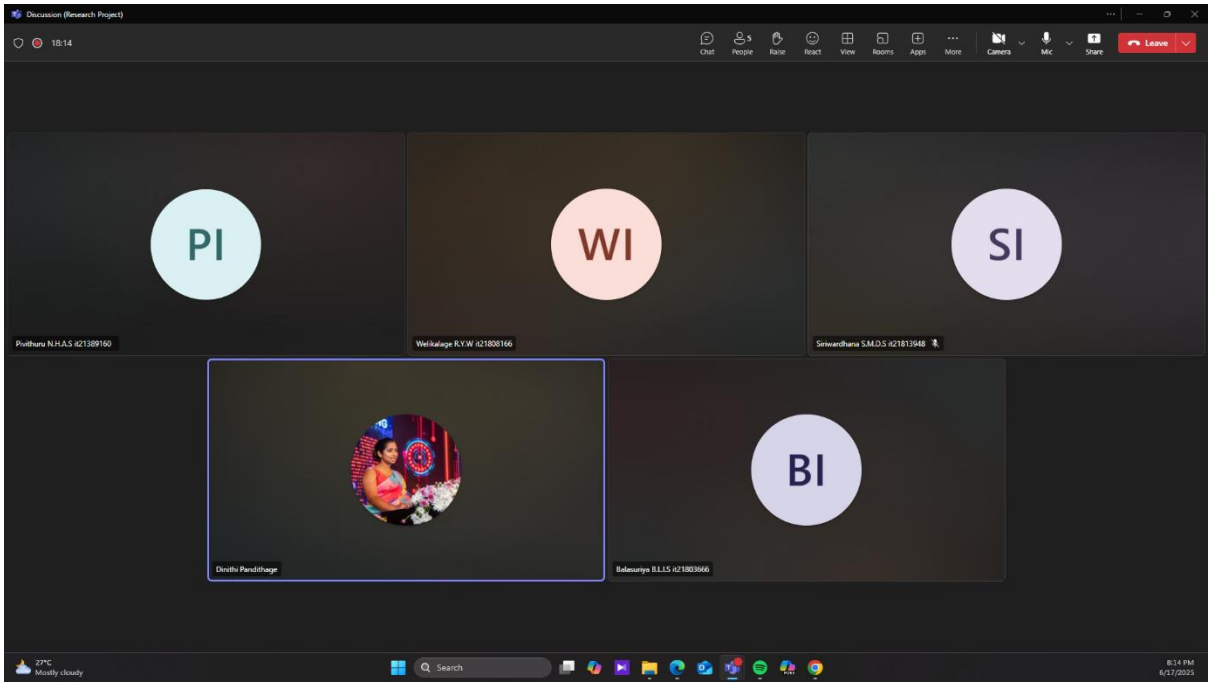

Figure 11 - Meeting with Supervisor

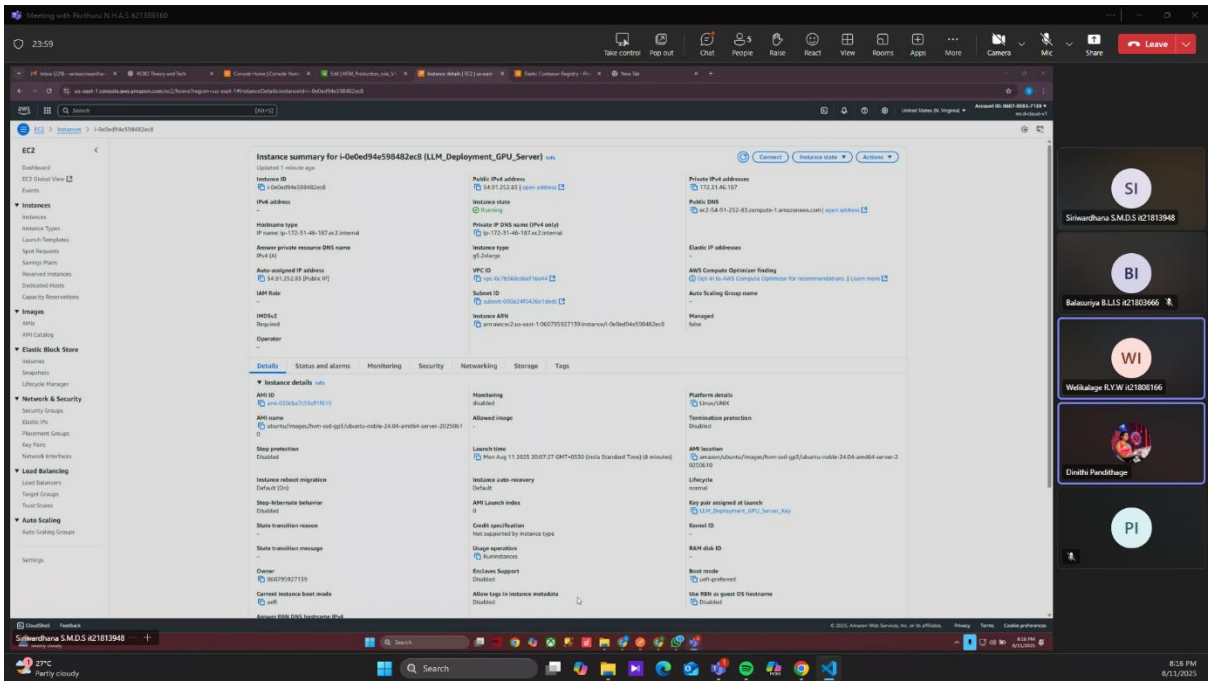

Figure 12 - Meeting with Supervisor

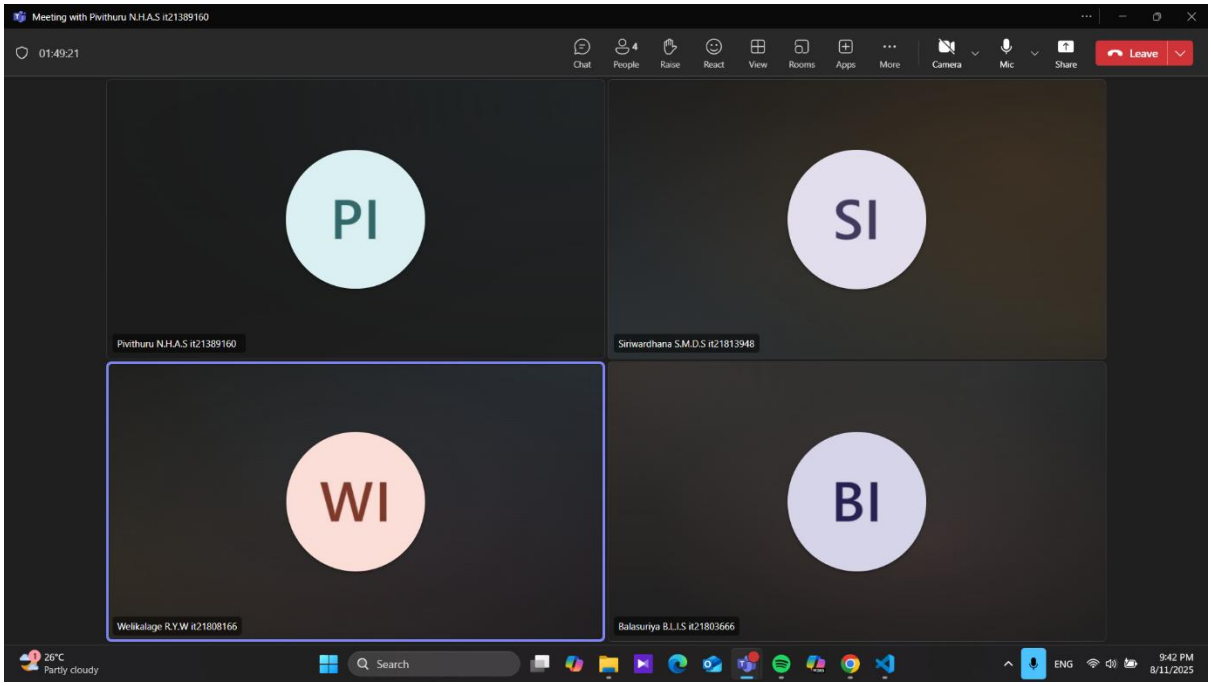

Figure 13 - Meeting with Teammates

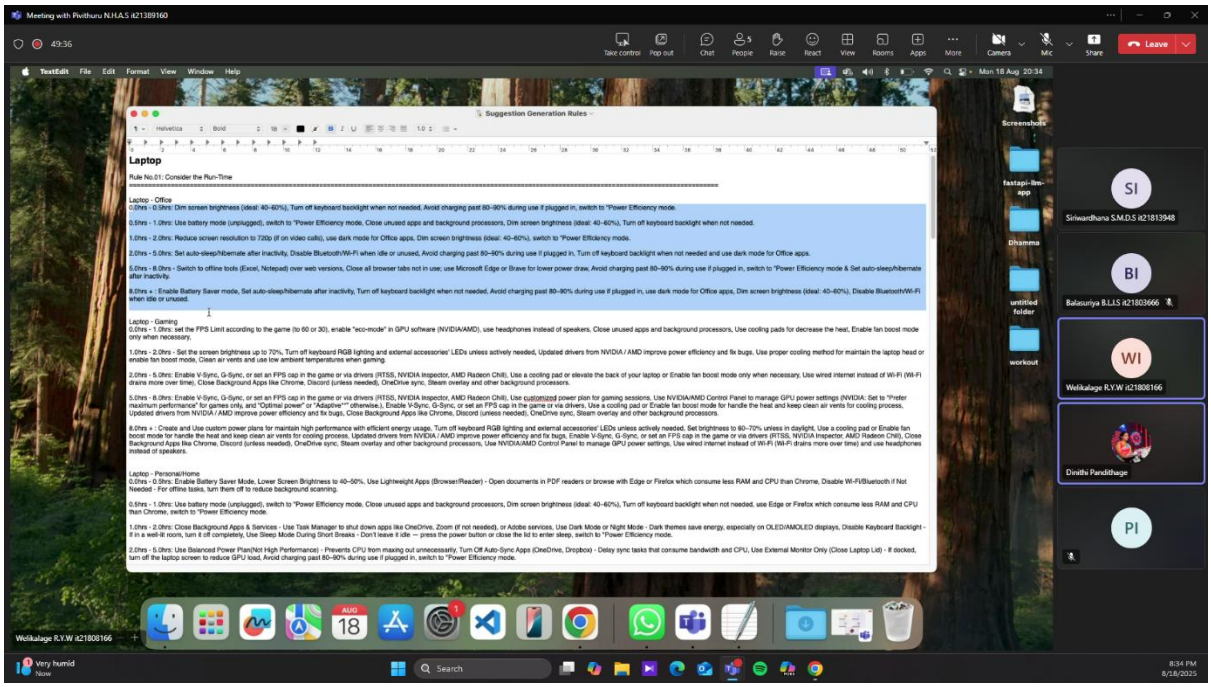

Figure 14 - Meeting with Supervisor