



Research Project (IT 4010)
4th year

Research Logbook

TeaBot

Tea Plantation Preservation Using an Intelligent Robot

2023-044

IT20011970

Bamunusinghe G.P.

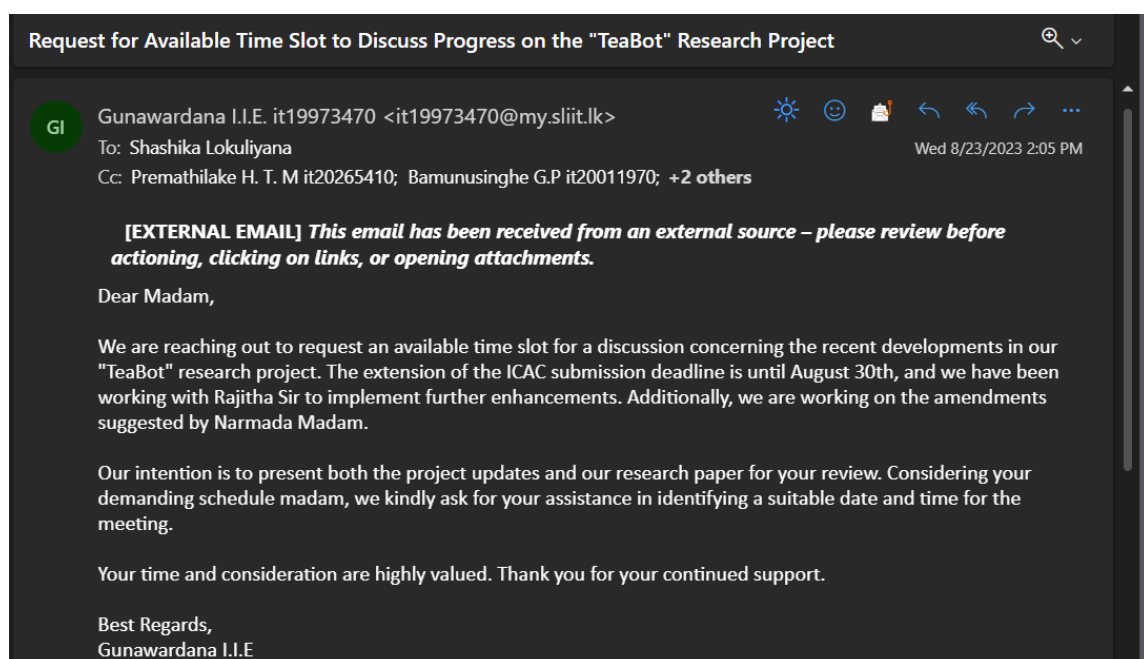
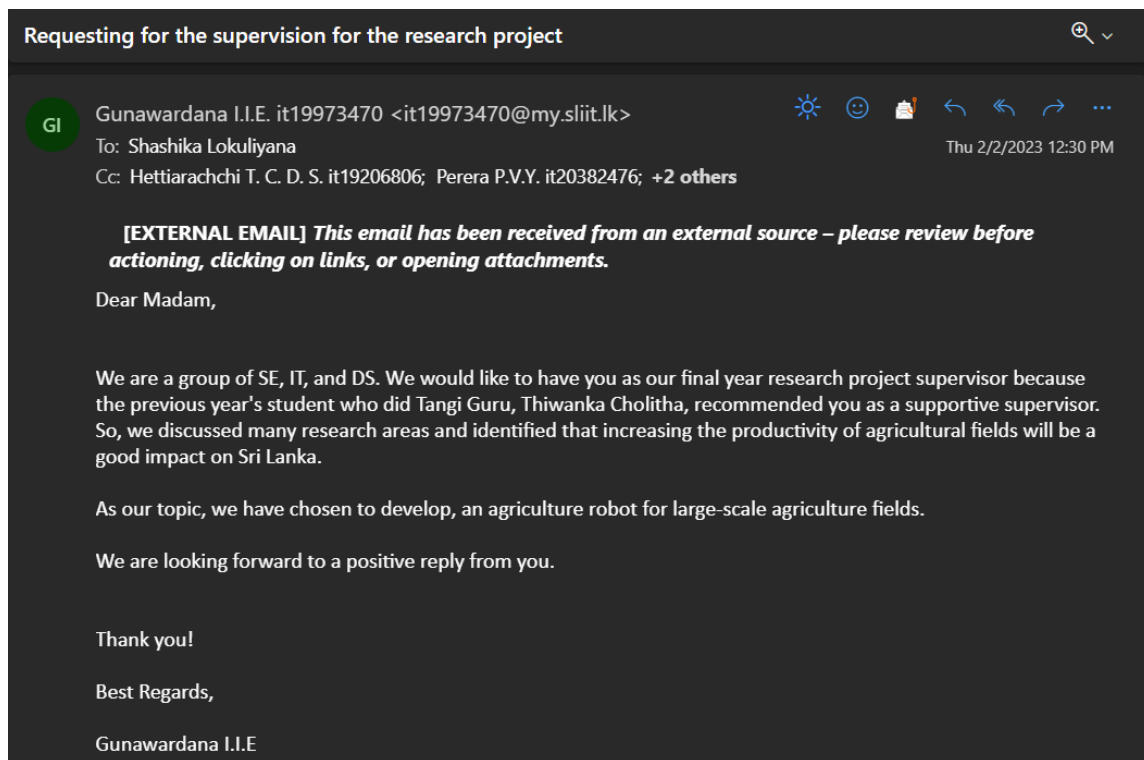
In partial fulfillment of the requirements for the
Bachelor of Science Special Honors Degree in Software Engineering
30.10.2023

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1 Supervisor, Co-Supervisor, External Supervisor Meetings, Emails, and Messages

1.1 Meetings with Supervisor and co-supervisor



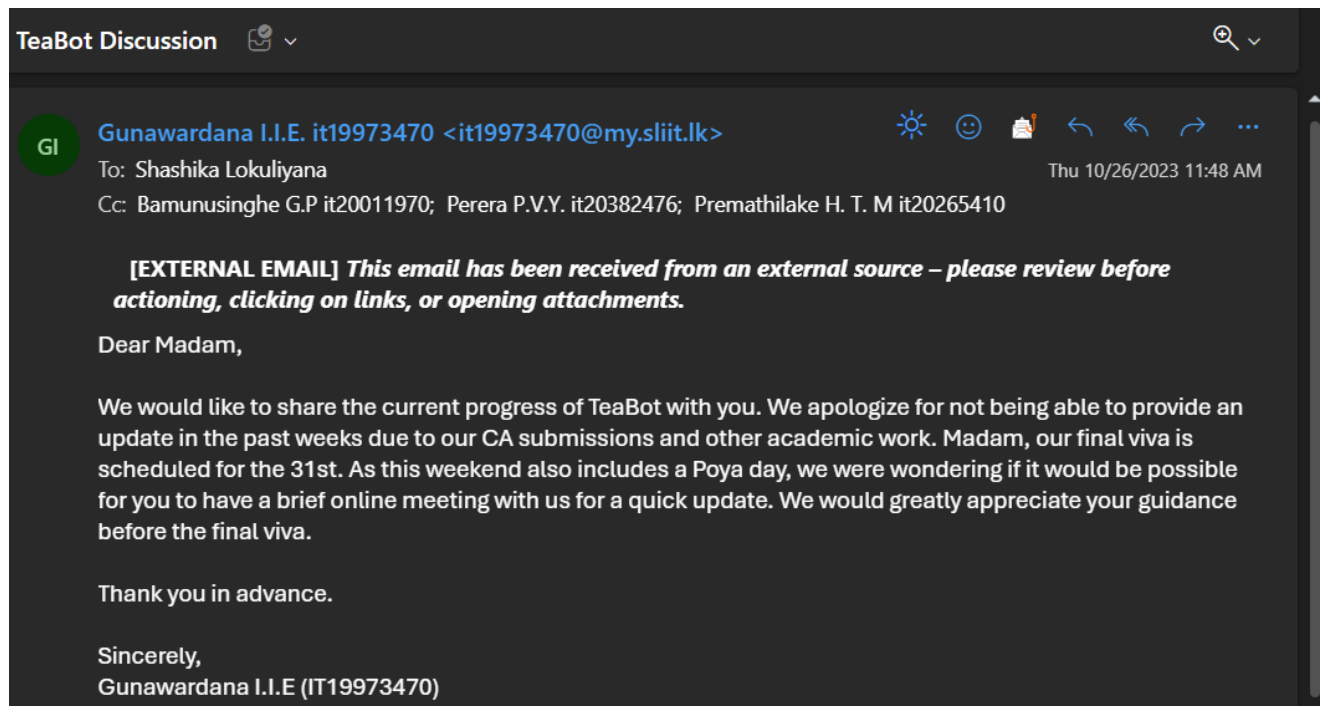
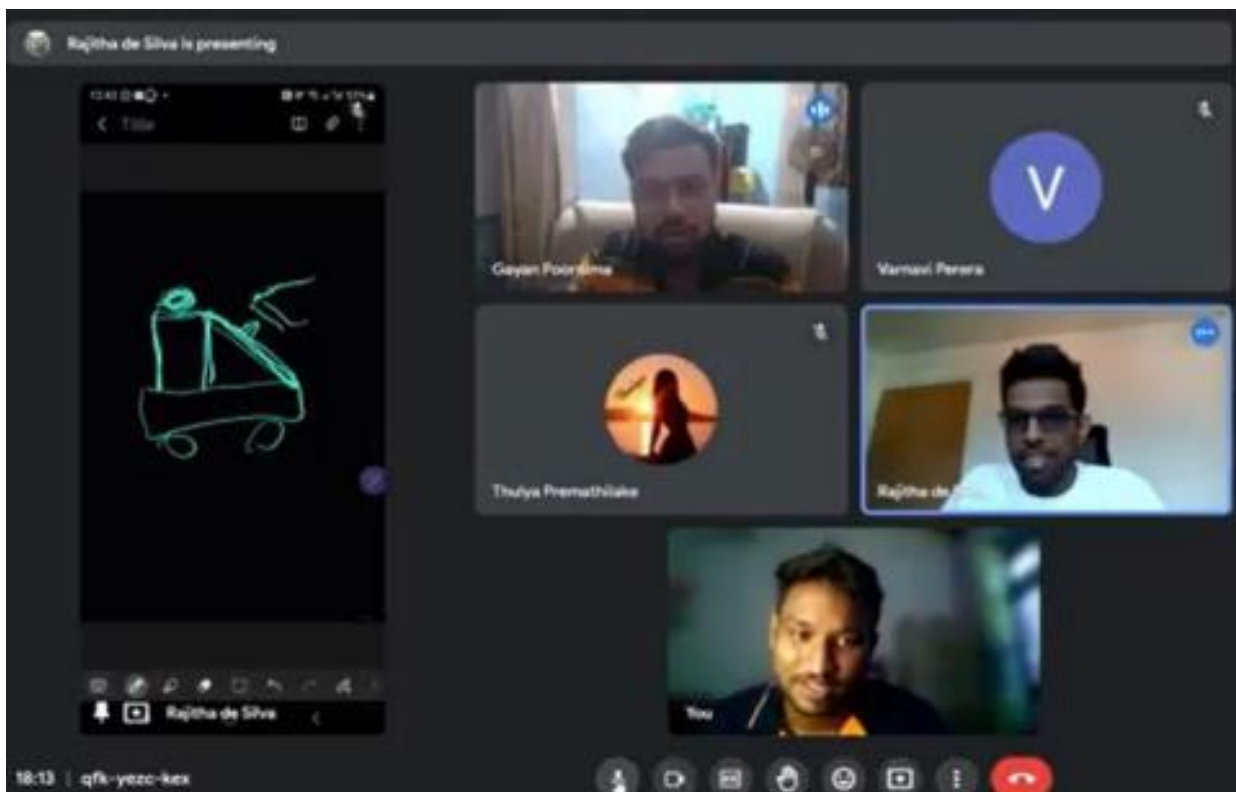
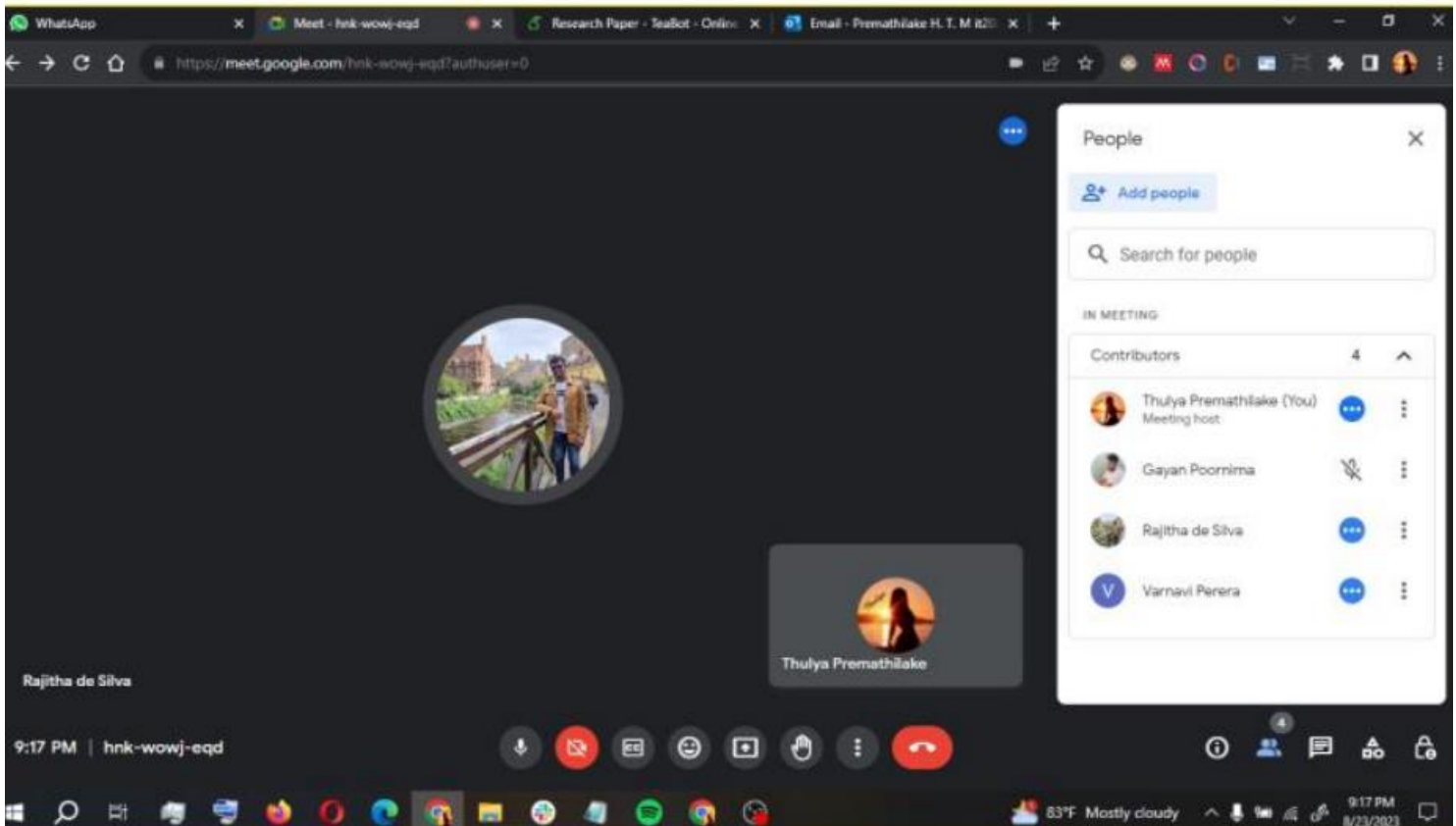
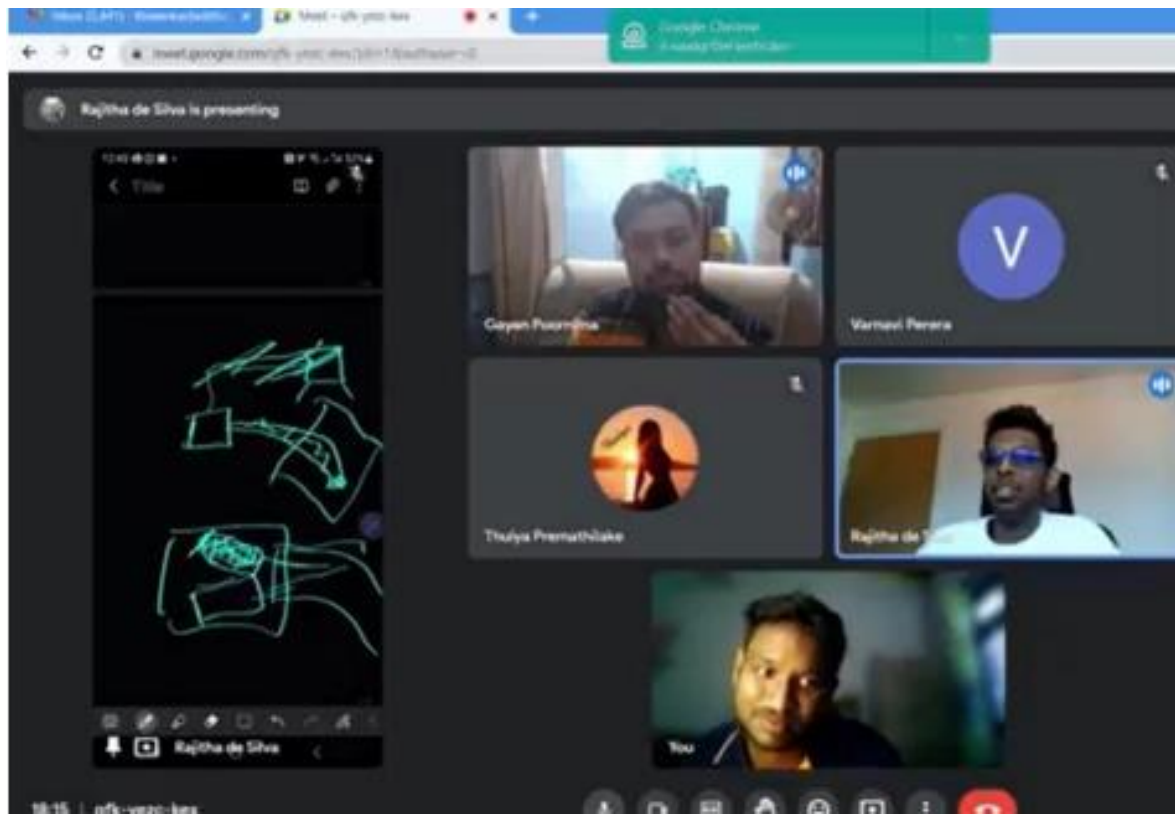


Figure 1.1.1: NBQSA Meeting

- The emails send to our supervisor and co-supervisor requesting time slots for meetings are represented in this section.

1.2 Meetings with External Supervisor





1.3 Meetings with the team

General

Posts

Files

Tasks

+

Meet

1

...

Wednesday, June 21, 2023

PI

Premathilake H. T. M it20265410 6/21 10:08 PM

https://drive.google.com/drive/folders/1rKJn0XN3R-n/N6H_Z0FXxVsrBd-3HVL3?usp=sharing

Reply

PI

Premathilake H. T. M it20265410 6/21 10:15 PM

Task	2022				2023											
	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Topic Selection																
Requirement Gathering																
Project Charter																
Project Proposal Document																
Project Proposal Presentation																
System Designing																
Implementation																
Progress Presentation 1																
Research Paper																
Testing																
Final Report																
Progress Presentation 2																
Logbook & Website																
Final Presentation																
Final Report																

Reply

Thursday, June 29, 2023

Meeting in "General" ended:

PI

PI

GI

PI

Reply

General

Posts

Files

Tasks

+

Meet

1

...

PI

Premathilake H. T. M it20265410 9/2 6:52 PM

PP2 Slides.pptx

PI

Perera P.V.Y. it20382476 9/2 7:00 PM

Algorithm development for stem identification

calculating the position of the end of the stem

capturing a frame from the video through the webcam

Meeting ended: 3h 56m

PI

PI

Reply

Sunday, September 3, 2023

General started

Collapse all

Recording has started

Recording has stopped. Saving recording...

Meeting

Recorded by: Perera P.V.Y. it203...

3h 9m

This recording is set to expire. View or change the expiration date [here](#). [Learn more](#)

Meeting ended: 12h 20m

GI

PI

PI

PI

Reply

General
Posts
Files
Tasks
+

Meet

PP2 Slide Deck ended: 1h 16m

Reply

PP2 Slides started

Collapse all

Perera P.V.Y. it20382476 8/27 4:41 PM
 Mobile-UNet employs depth-wise separable convolutions and skip-connectors to efficiently capture features in the given inputs. Mobile-UNet's decoder network uses up-sampling feature maps and concatenation with skip connectors to reconstruct high-resolution segmentation maps from the compact feature representations generated by the encoder, ensuring precise navigation path prediction.
 [See less](#)

Meeting ended: 1h 32m

Reply

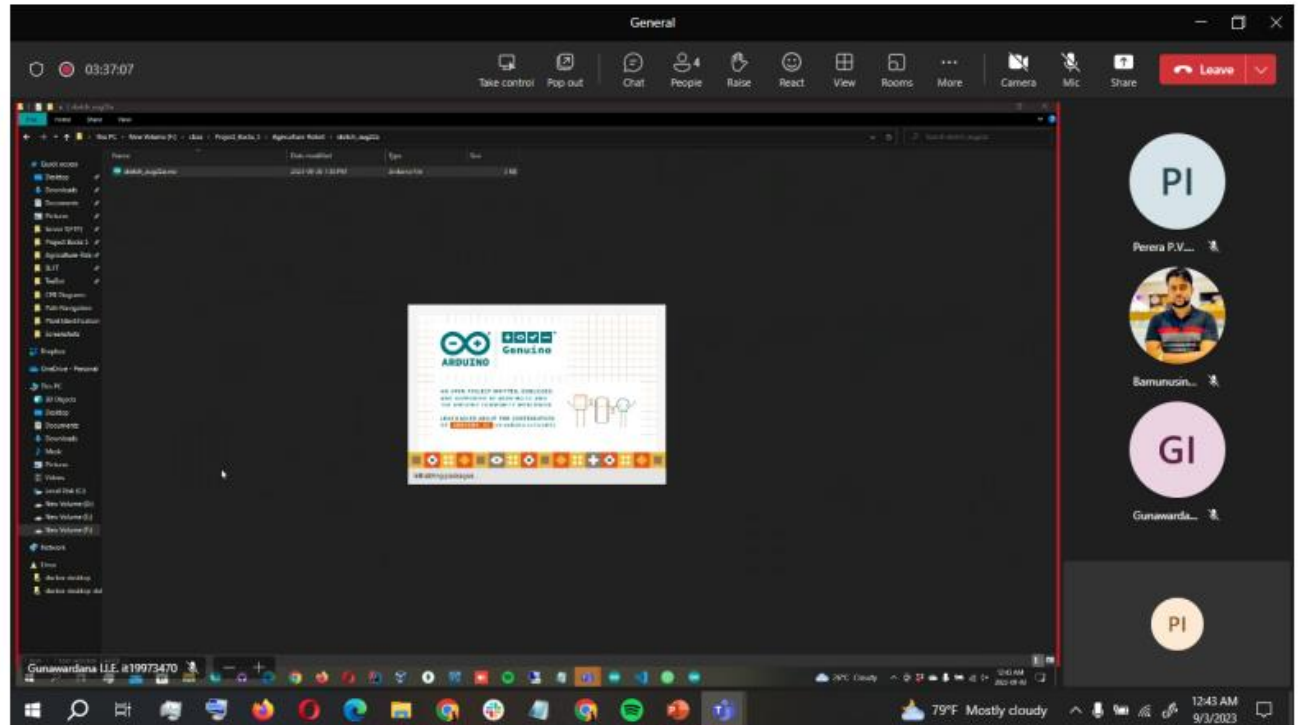
General
Posts
Files
Tasks
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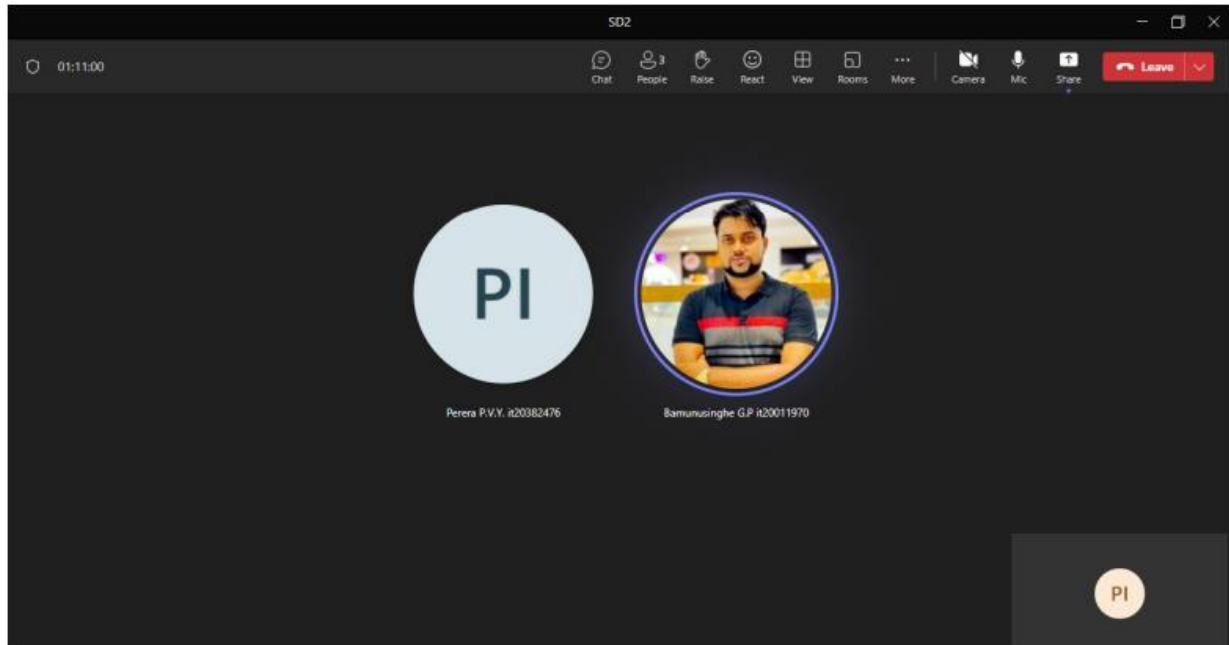
Meet

New
 Upload
 Share
 Copy link
 Sync
 Download
 ...
 All Documents*

... > General > Bamunusinghe G.P it20011970, Perera P.V.Y. it20382476, Premathilake H. T. M it20265410

Name	Modified	Modified... Add column
Modified By : Premathilake H. T. M it20265410 (1)		
Recordings	March 3	Premathilake H. T. ...
Modified By : Perera P.V.Y. it20382476 (4)		
agri robot.pdf	February 8	Perera P.V.Y. it2038...
IT4010-TAF (2).docx	February 8	Perera P.V.Y. it2038...
TA (1).docx	February 8	Perera P.V.Y. it2038...
TA.docx	February 8	Perera P.V.Y. it2038...
Modified By : Bamunusinghe G.P it20011970 (1)		
Submitted Docs	March 13	Bamunusinghe G.P...





1.4 Emails to the Supervisor

Requesting for the supervision for the research project

GI

Gunawardana I.I.E. it19973470 <it19973470@my.sliit.lk>
To: Shashika Lokuliyana
Cc: Hettiarachchi T. C. D. S. it19206806; Perera P.V.Y. it20382476; +2 others

Thu 2/2/2023 12:30 PM

[EXTERNAL EMAIL] This email has been received from an external source – please review before actioning, clicking on links, or opening attachments.

Dear Madam,

We are a group of SE, IT, and DS. We would like to have you as our final year research project supervisor because the previous year's student who did Tangi Guru, Thiwanka Cholitha, recommended you as a supportive supervisor. So, we discussed many research areas and identified that increasing the productivity of agricultural fields will be a good impact on Sri Lanka.

As our topic, we have chosen to develop, an agriculture robot for large-scale agriculture fields.

We are looking forward to a positive reply from you.

Thank you!

Best Regards,

Gunawardana I.I.E

Requesting for the co-supervision for the research project

GI

Gunawardana I.I.E. it19973470 <it19973470@my.sliit.lk>
To: Narmada Gamage
Cc: Hettiarachchi T. C. D. S. it19206806; Perera P.V.Y. it20382476; +2 others

Thu 2/2/2023 12:35 PM

[EXTERNAL EMAIL] This email has been received from an external source – please review before actioning, clicking on links, or opening attachments.

Dear Madam,

We are a group of SE, IT, and DS. We would like to have you as our final year research project co-supervisor because the previous year's student who did Tangi Guru, Thiwanka Cholitha, recommended you as a supportive co-supervisor. So, we discussed many research areas and identified that increasing the productivity of agricultural fields will be a good impact on Sri Lanka.

As our topic, we have chosen to develop, an agriculture robot for large-scale agriculture fields.

We are looking forward to a positive reply from you.

Thank you!

Best Regards,

Gunawardana I.I.E

Requesting for an Available Time Slot on 23rd Sunday to Discuss "TeaBot" Research Project



Gunawardana I.I.E. it19973470 <it19973470@my.sliit.lk>



To: Shashika Lokuliyana

Wed 4/19/2023 11:25 AM

Cc: Perera P.V.Y. it20382476; Premathilake H. T. M it20265410; Bamunusinghe G.P it20011970

[EXTERNAL EMAIL] This email has been received from an external source – please review before actioning, clicking on links, or opening attachments.

Dear Madam,

You mentioned us previously to meet on 23rd of Sunday after 12:30 PM to discuss the progress of our "TeaBot" research project. Could you kindly let me know if there is any availability on Sunday 23rd to discuss about the research?

Thank you for your time and consideration.

Best regards,

Gunawardana I.I.E (IT19973470)



Discuss the TeaBot Research

Follow up ▾

⌚ This event occurred 6 months ago (Sun 4/23/2023 11:45 AM - 12:15 PM)

📍 Microsoft Teams Meeting;
Teams meeting

👤 Gunawardana I.I.E. it19973470 <it19973470@my.sliit.lk> invited you [Didn't respond 4](#)

Messages

Meeting Details



[EXTERNAL EMAIL] This email has been received from an external source – please review before actioning, clicking on links, or opening attachments.

Discuss the TeaBot Research

Organizer



Gunawardana I.I.E. it19973470
Sent on Friday, 4/21/2023 at 9:23 AM

▾ Didn't respond: 4



Shashika Lokuliyana
Required



Perera P.V.Y. it20382476
Required



Premathilake H. T. M it20265410
Required



Bamunusinghe G.P it20011970
Required

Microsoft Teams meeting

Join on your computer, mobile app or room device
[Click here to join the meeting](#)

Meeting ID: 443 648 677 991

Passcode: rnxrt6

[Download Teams](#) | [Join on the web](#)

Requesting for an Available Time Slot on 14th Sunday to Discuss "TeaBot" Research Project

GI

Gunawardana I.I.E. it19973470 <it19973470@my.sliit.lk>

To: Shashika Lokuliyana

Cc: Perera P.V.Y. it20382476; Premathilake H. T. M it20265410; Bamunusinghe G.P it20011970

Wed 5/10/2023 5:48 PM

[EXTERNAL EMAIL] This email has been received from an external source – please review before actioning, clicking on links, or opening attachments.

Dear Madam,

As per the previous discussion, we discussed to meet again on 14th of Sunday to see the progress of our "TeaBot" research project. Could you kindly let me know if there is any availability on Sunday 14th to discuss the research?

Thank you for your time and consideration.

Best regards,

Gunawardana I.I.E (IT19973470)



TeaBot Discussion

Follow up ▾



This event occurred **5 months ago** (Tue 5/16/2023 3:00 PM - 3:30 PM)



Microsoft Teams Meeting;
Teams meeting



Gunawardana I.I.E. it19973470 <it19973470@my.sliit.lk> invited you **Declined 1, Didn't respond 3**

Messages

Meeting Details




[EXTERNAL EMAIL] This email has been received from an external source. please review before actioning, clicking on links, or opening attachments.

To discuss the teabot research

Organizer

GI Gunawardana I.I.E. it19973470
Sent on Monday, 5/15/2023 at 4:25 PM

✓ No: 1

 **Shashika Lokuliyana**
Required

✓ Didn't respond: 3

PI Perera P.V.Y. it20382476
Required

P Premathilake H. T. M it2026...
Required

Microsoft Teams meeting

Join on your computer, mobile app or room device

[Click here to join the meeting](#)

GI

Gunawardana I.I.E. it19973470 <it19973470@my.sliit.lk>

To: Shashika Lokuliyana; Narmada Gamage

Cc: Premathilake H. T. M it20265410; Perera P.V.Y. it20382476; Bamunusinghe G.P it20011970

Wed 8/16/2023 10:28 AM



Intelligent Agriculture Robot ...

662 KB

[EXTERNAL EMAIL] This email has been received from an external source – please review before actioning, clicking on links, or opening attachments.

Dear Madam,

I hereby attached the final version (up to now) of the paper. We only submitted the paper to the ICAC. Because of the busy with project work, we were bit late to complete the paper and we had only the time to do only Rajitha sir's comments. But we heard yesterday, the ICAC deadline was extended. So, we hope to do another amendments given by Narmada madam and do some improvements and resubmit the paper to the ICAC.

Madam, shall we arrange a meeting to share the updates on the project? Can you provide us a free date and a time slot to discuss the project? We will explain the source codes and the functionalities of the robot on the meeting day.

Thank you

Regards,
Gunawardana I I F

Request for Available Time Slot to Discuss Progress on the "TeaBot" Research Project



Gunawardana I.I.E. it19973470 <it19973470@my.sliit.lk>



To: Shashika Lokuliyana

Wed 8/23/2023 2:05 PM

Cc: Premathilake H. T. M it20265410; Bamunusinghe G.P it20011970; +2 others

[EXTERNAL EMAIL] This email has been received from an external source – please review before actioning, clicking on links, or opening attachments.

Dear Madam,

We are reaching out to request an available time slot for a discussion concerning the recent developments in our "TeaBot" research project. The extension of the ICAC submission deadline is until August 30th, and we have been working with Rajitha Sir to implement further enhancements. Additionally, we are working on the amendments suggested by Narmada Madam.

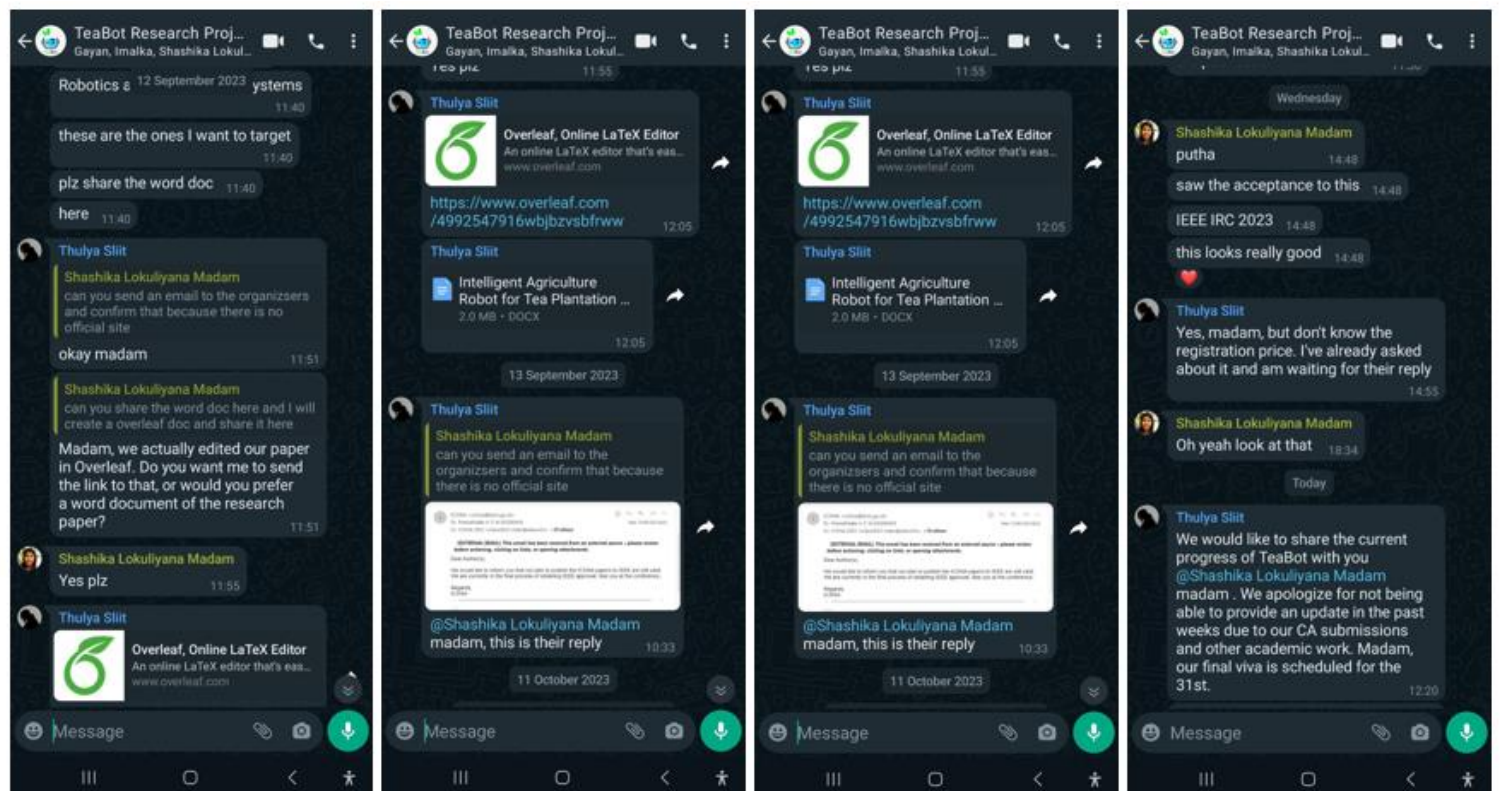
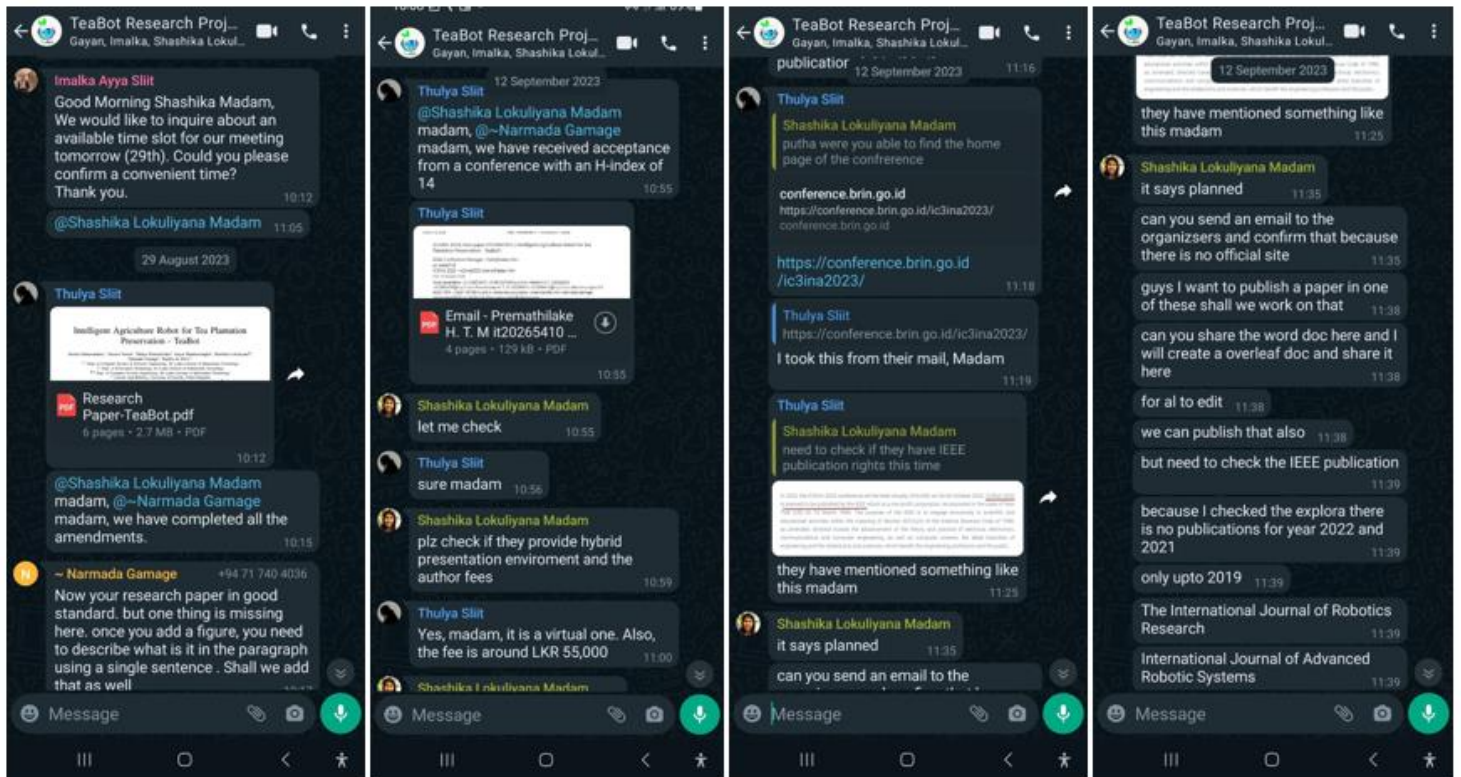
Our intention is to present both the project updates and our research paper for your review. Considering your demanding schedule madam, we kindly ask for your assistance in identifying a suitable date and time for the meeting.

Your time and consideration are highly valued. Thank you for your continued support.

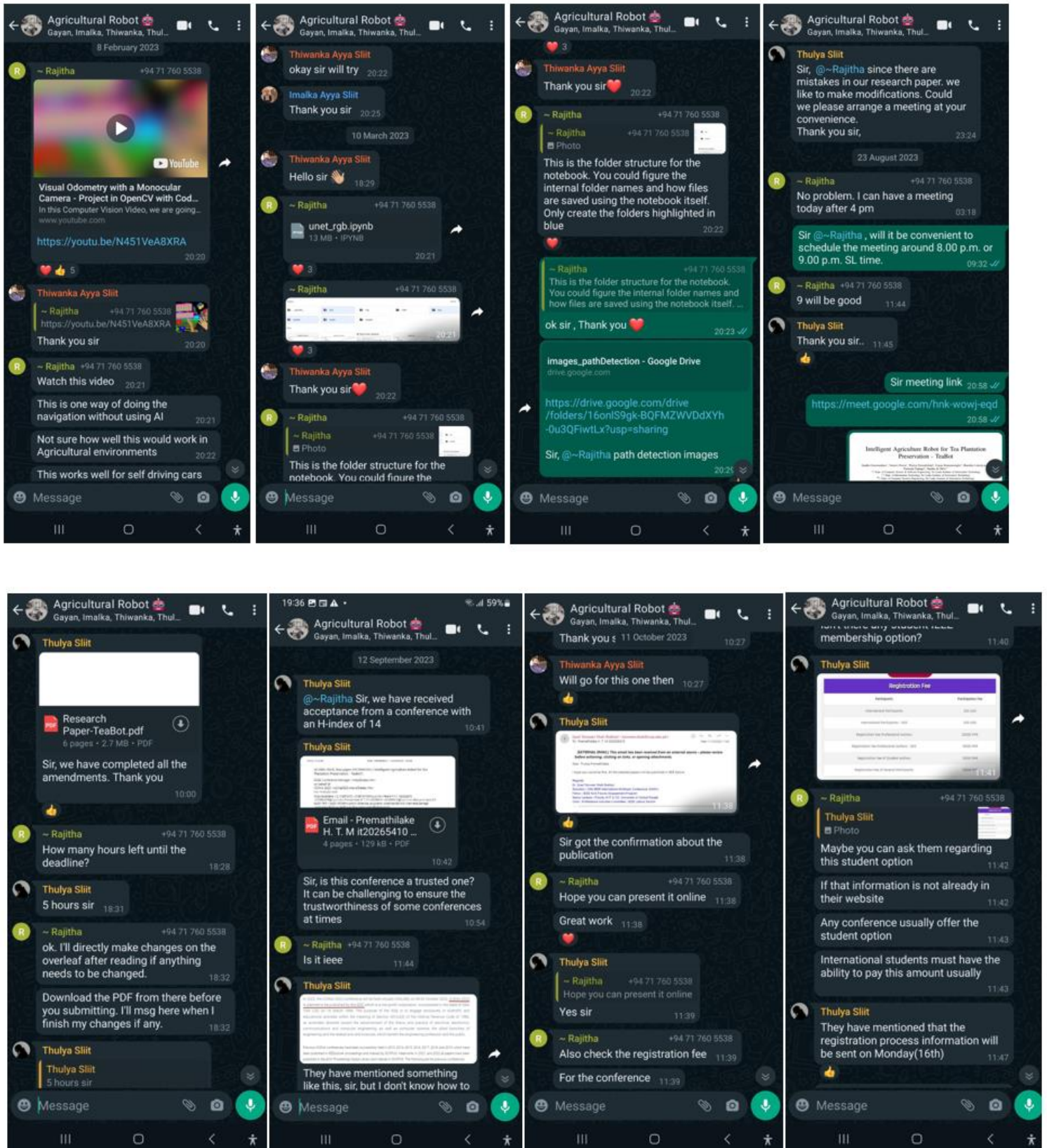
Best Regards,
Gunawardana I.I.E

1.5 Messages

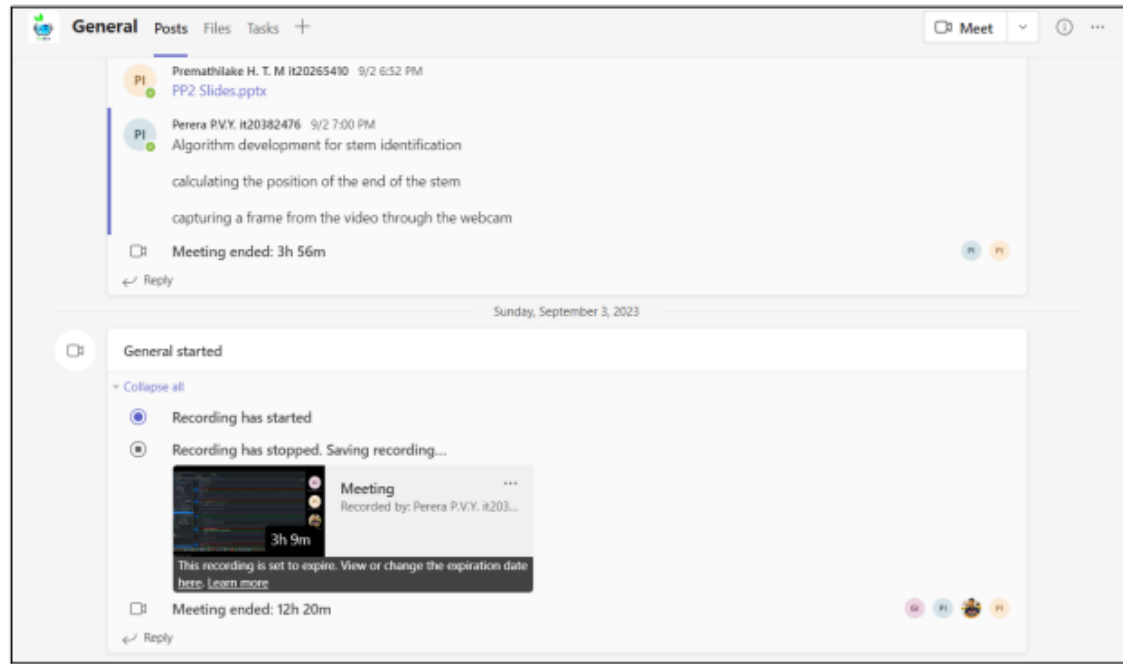
1.5.1 Messages with the supervisor



1.5.2 Messages with the External Supervisor



1.5.3 Messages in the official TeaBot Group



2 Individual Project Logs

2.1 MS Planner

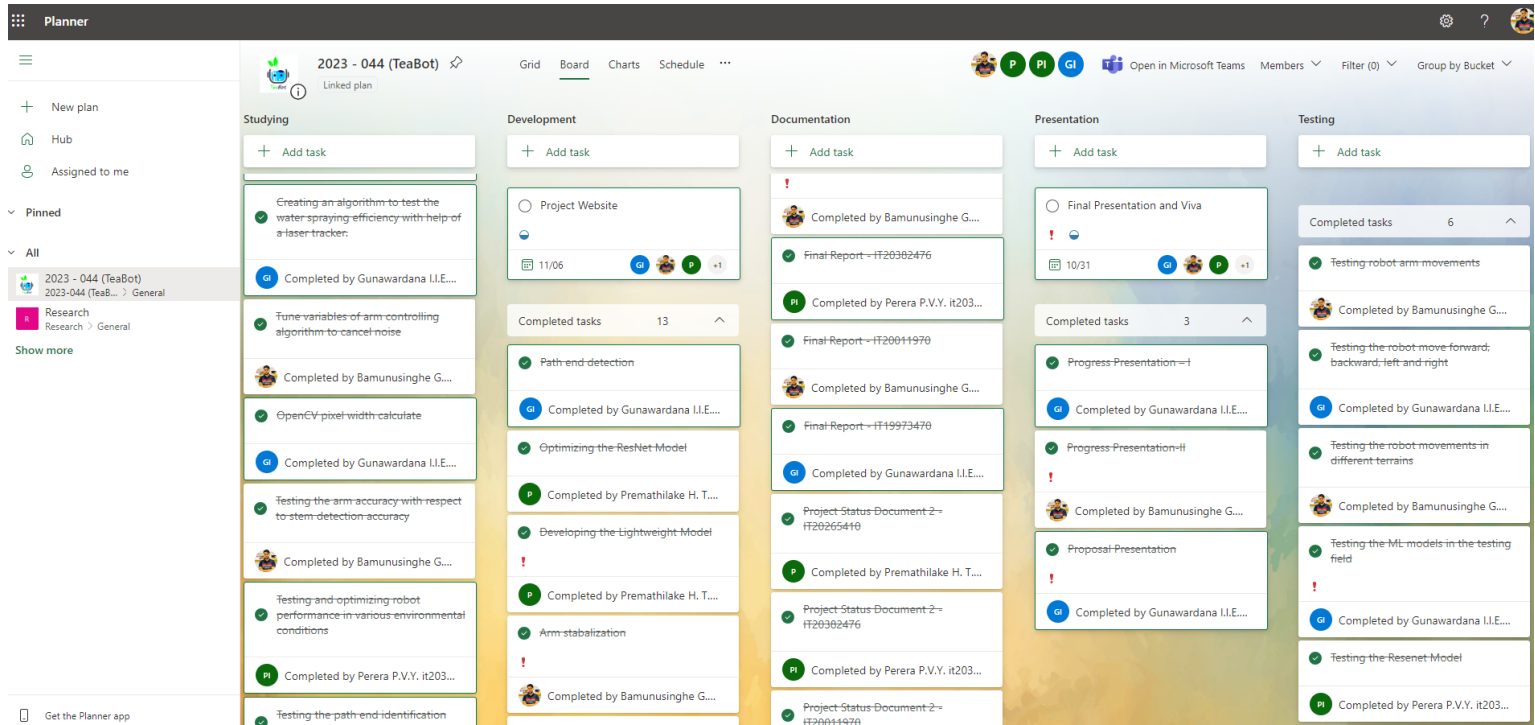


Figure 1: MS planner tasks

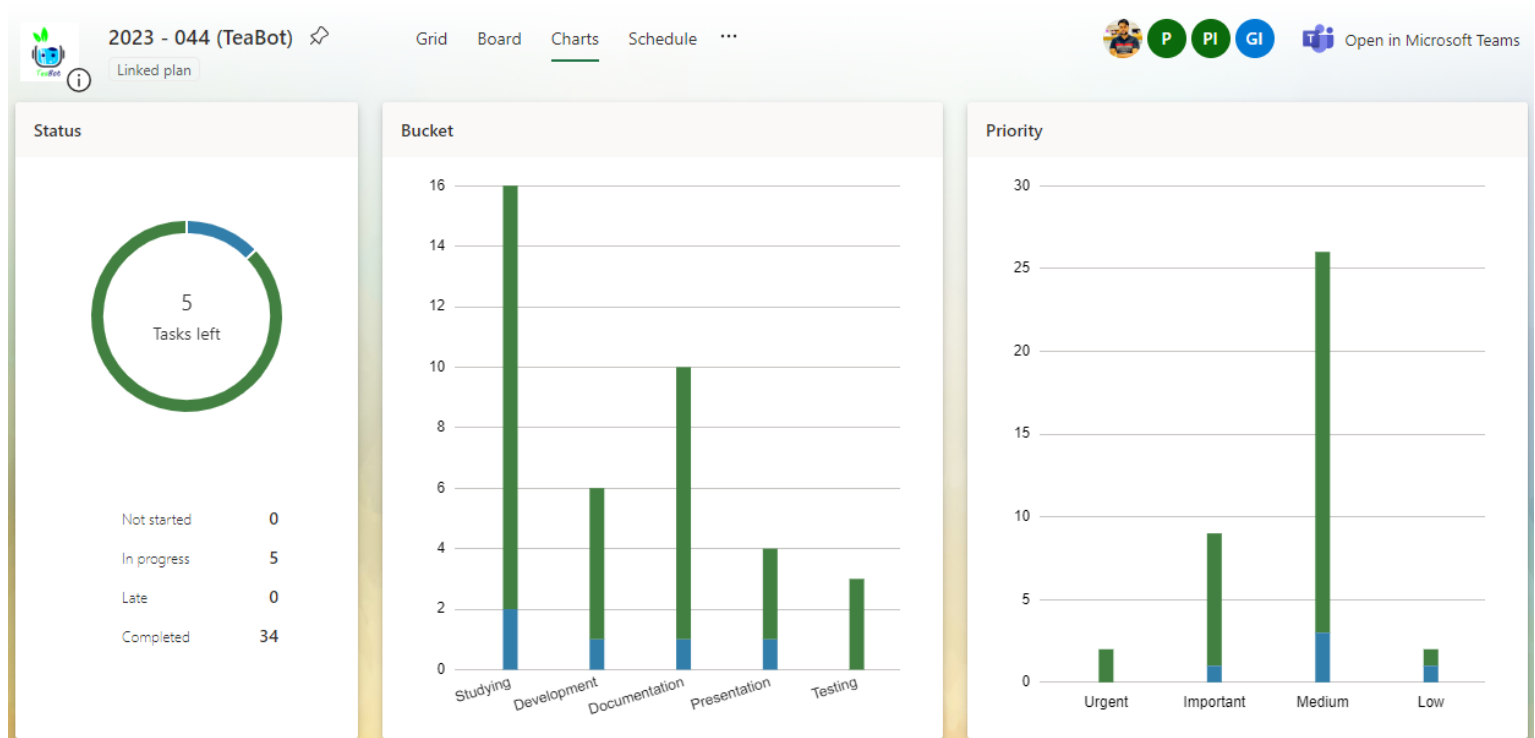
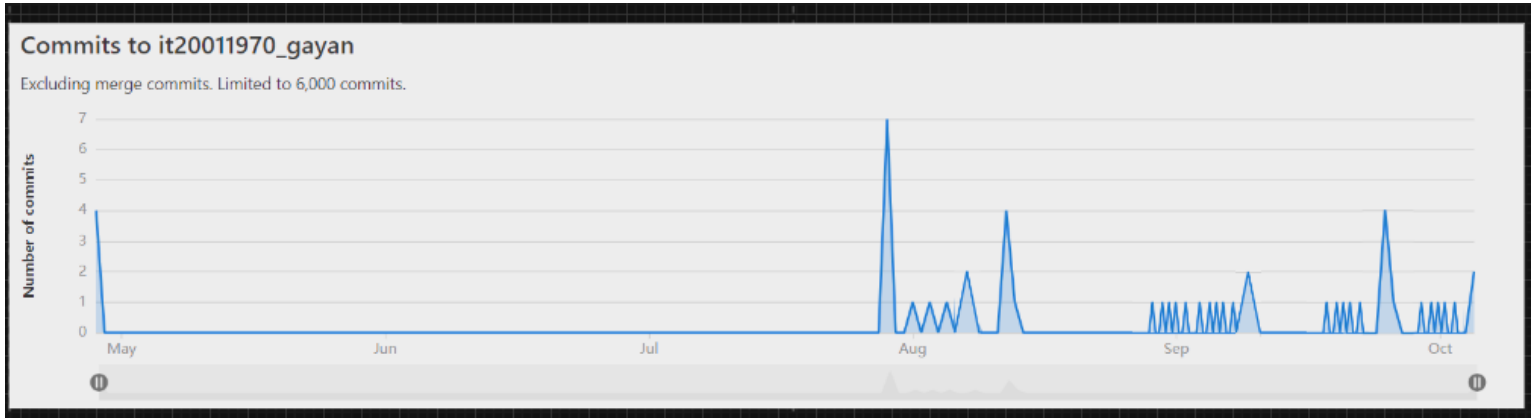


Figure 2: Chart View of Tasks



Figure 3: Completed Tasks on Teams Charts

2.2 Git Lab



GitLab Projects Groups Snippets Help Search or jump to... Sign in / Register

2023-044

Project overview

Repository

- Files
- Commits
- Branches
- Tags
- Contributors
- Graph
- Compare

Issues 0

CI / CD

Analytics

Wiki

Snippets

Collapse sidebar

2023-044 > 2023-044 > Commits

it20011970_gayan 2023-044 Filter by commit message

28 Oct, 2023 2 commits

- Add new file Bamunusinghe G.P. authored 1 day ago 800e55c1
- Add new file Bamunusinghe G.P. authored 1 day ago e85b3bec

03 Sep, 2023 5 commits

- Update rosArm-pp2.py Bamunusinghe G.P. authored 1 month ago 85dc3d85
- Update rosArm-pp2.ino Bamunusinghe G.P. authored 1 month ago 3d28d807
- Add new file Bamunusinghe G.P. authored 1 month ago e3011de9
- Add new file Bamunusinghe G.P. authored 1 month ago 7cd310b1
- Add new file Bamunusinghe G.P. authored 1 month ago 6b53a9d8

30 Aug, 2023 1 commit

- Add new file 5314227b

3 Monthly Progress

3.1 2021 November 1st to 30th

- Finding different research topics and started with the 1st day of November because the topic submission due on 10th of February, and we had our first Research Project Lecture on the 10th of November 2022. The topics were mind mapped with the components that we can do. In the meantime, we tried to find a supervisor, co-supervisor, and external supervisor. This month was utilized to have discussions and select a good topic. All the topics were discussed one by one with the supervisors and the components. After selecting the topic, the scope of the research team finalized to continue with the selected topic. Conducted a SWOT analysis to find what are the lacking parts to improve as a team.

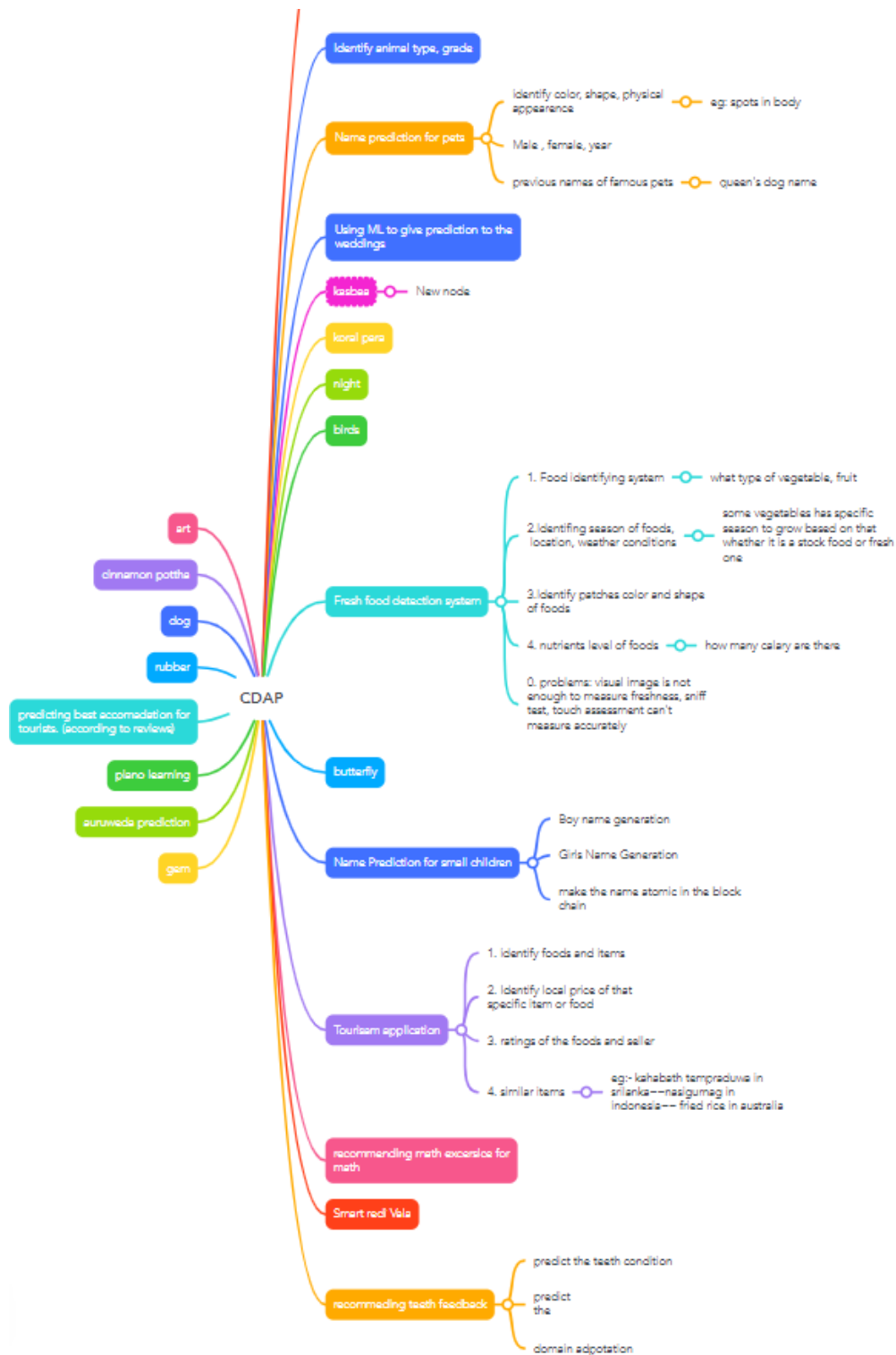


Figure 4: Mind Maps for Topic Selection

3.2 2022 January 1st to 31st

- The topic evaluation submission was due on the 12th of December. So, the preparation of the topic evaluation started on the 1st of December. Until the 12th of December, the topic evaluation form was well fine-tuned. The document was submitted on the 12th of December and waited for the topic evaluation results. The results were released on the 28th of December. After viewing the results project charter creation will be started on the 1st of January.



IT4010 – Research Project - 2023

Topic Assessment Form

Project ID :

TMP-23-044

1. Topic (12 words max)

"TeaBot" – Tea plantation preservation using an intelligent robot.

2. Research group the project belongs to

Autonomous Intelligent Machines and Systems (AIMS)

3. Research area the project belongs to

Robotics (R)

4. If a continuation of a previous project:


Project ID	
Year	

5. Team member details

Student Name	Student ID	Specialization
Leader: Gunawardana I.I.E	IT19973470	SE
Member 2: Bamunusinghe G.P	IT20011970	SE
Member 3: Premathilake H.T.M	IT20265410	IT
Member 4: Perera P.V.Y	IT20382476	DS

- After the topic was selected with minor corrections the project charter and the cover sheet were created to be submitted on the 30th of January. After the project charter and the coversheet submission, the proposal draft creation started because the due date is on the 24th of March.

Project Registration Form-Final Year Project-202
RP-02



Sri Lanka Institute of Information Technology

PROJECT REGISTRATION FORM

(This form should be completed and uploaded to the Cloud space on or before XXXXXXXXX)

The purpose of this form is to allow final-year students of the B.Sc. (Hon) degree program to enlist in the final-year project group. Enlisting in a project entails specifying the project title and the details of four members in the group, the internal supervisor (compulsory), the external supervisor (may be from the industry), and indicating a brief description of the project. The description of the project entered on this form will not be considered as the formal project proposal. It should however indicate the scope of the project and provide the main potential outcome.

PROJECT TITLE (As per the accepted Topic Assessment Form)	TeaBot: Tea plantation preservation using an intelligent robot
--------------------------------------------------------------	----------------------------------------------------------------

RESEARCH GROUP (As per the Topic Assessment Form)	Robotics & Intelligent Systems
------------------------------------------------------	--------------------------------

PROJECT NUMBER	(Will be assigned by the RP Team)
----------------	-----------------------------------

PROJECT GROUP MEMBER DETAILS: (Please start with the group leader's details)

	STUDENT NAME	STUDENT NO.	CONTACT NO.	EMAIL ADDRESS
1	Gunawardana I.I.E	IT19973470	077 678 8890	it19973470@my.sliit.lk
2	Perera P.V.Y	IT20382476	071 881 8052	it20382476@my.sliit.lk
3	Premathilake H.T.M	IT20265410	076 553 5277	it20265410@my.sliit.lk
4	Bamunusinghe G.P	IT20011970	076 640 9484	it20011970@my.sliit.lk

Page | 1
Page | 2

SUPERVISOR, CO_SUPERVISOR Details

SUPERVISOR Name	CO-SUPERVISOR Name
Ms. Shashika Lokuliyana	Ms. Narmada Gamage
Signature	Signature
Attach the email as Appendix 1	Attach the email as Appendix 1
24.03.2023	24.03.2023
Date	Date

EXTERNAL SUPERVISOR Details (if any, may be from the industry)

				Attach the email as Appendix 3
Name	Affiliation	Contact Address	Contact Numbers	Signature/Date
Mr. Rajitha De Silva	University of Lincoln	rajitha@ieee.org	0717605538	<i>Rajitha</i>

ACCEPTANCE BY CDAP MEMBER (This part will be filled by the RP team)

Name	Signature	Date

Figure 3.2.2: Project Cover Sheet

- After the proposal draft document slides were created to do the proposal presentations because the presentations were on the 27th of March.

3.3 February 1st to 28th

- The suggested solution is weighed against various robot arm designs that might be required for a robot.
- In this month we got ready for our proposal presentation which will be held on 27th March.

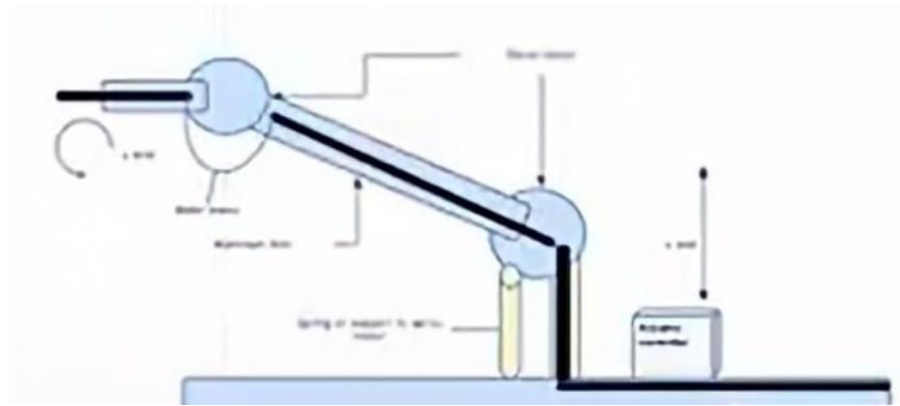


Figure 5: First prototype design

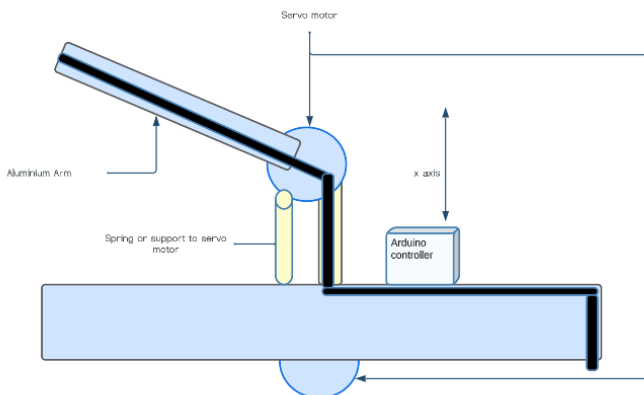


Figure 6: Second prototype design



Figure 7: Final prototype design

3.4 2022 March 1st - 31st

- The proposal presentation was held on the 27th of March 2023, and the proposal report was prepared during this phrase.
- The panel approval was received for the project.
- The report was submitted.
- In the later part of the month implementation of the project is carried out.

3.5 2022 April 1st to 30th

- After getting the panel approval the development was started.
- We visited several tea estates and analyzed the tea plantations and gap between two tea paths.
- The first cardboard robot arm prototype has been built and tested for functionality based on measurements of the robot arm.



Figure 8: Cardboard prototype

- Basic Functionalities of arm rotation, weight of the arm, and Arduino code testing has started. This was created to check the basic functionalities.

3.6 2022 May 1st to 31st

- The mechanical design for this presentation needs to be created, and we have our PP1 presentation on the 22nd.
- Previously, cardboard boxes were used for prototyping. It is difficult to test those with cardboard boxes in terms of adjacency. As a result, a mechanical design was made in order to prototype the arm and complete the design of its components.



Figure 9: Mechanical design side view



Figure 10: Mechanical design back view

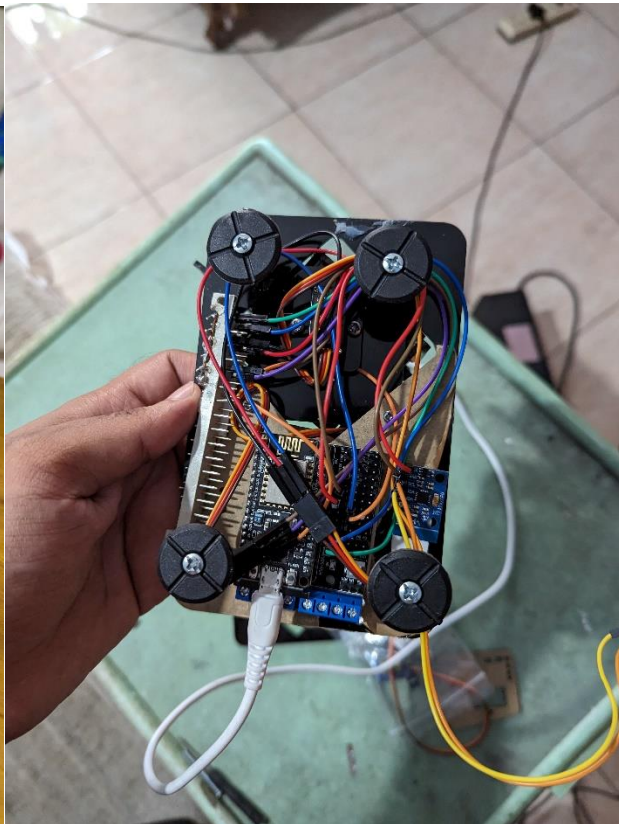
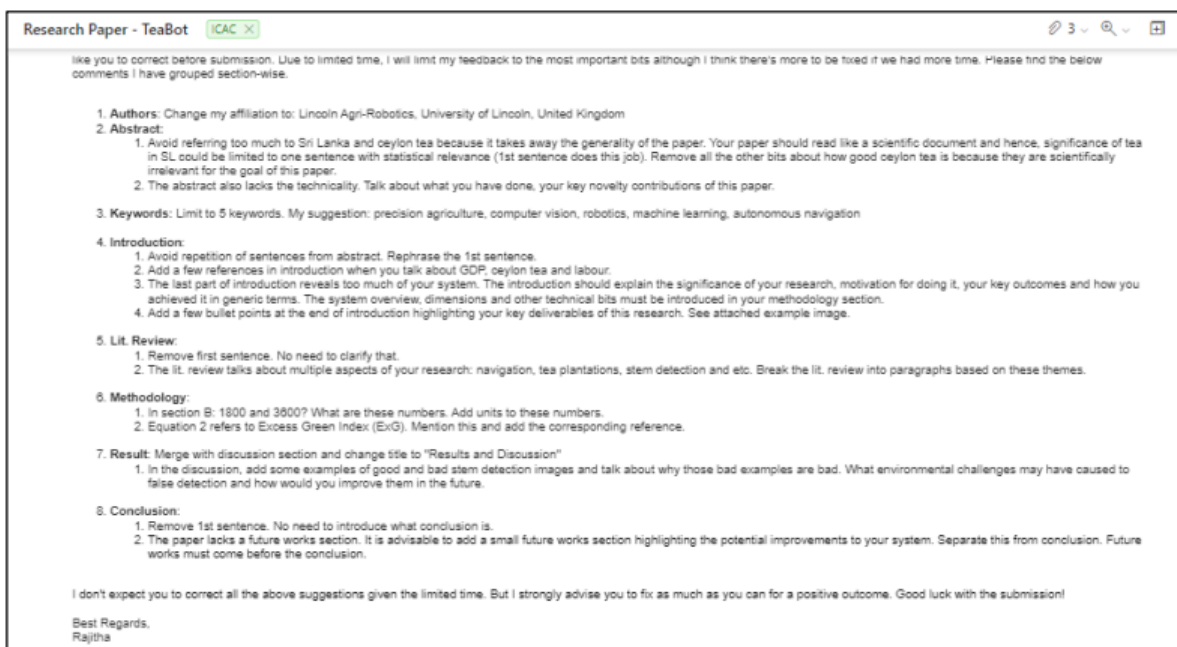
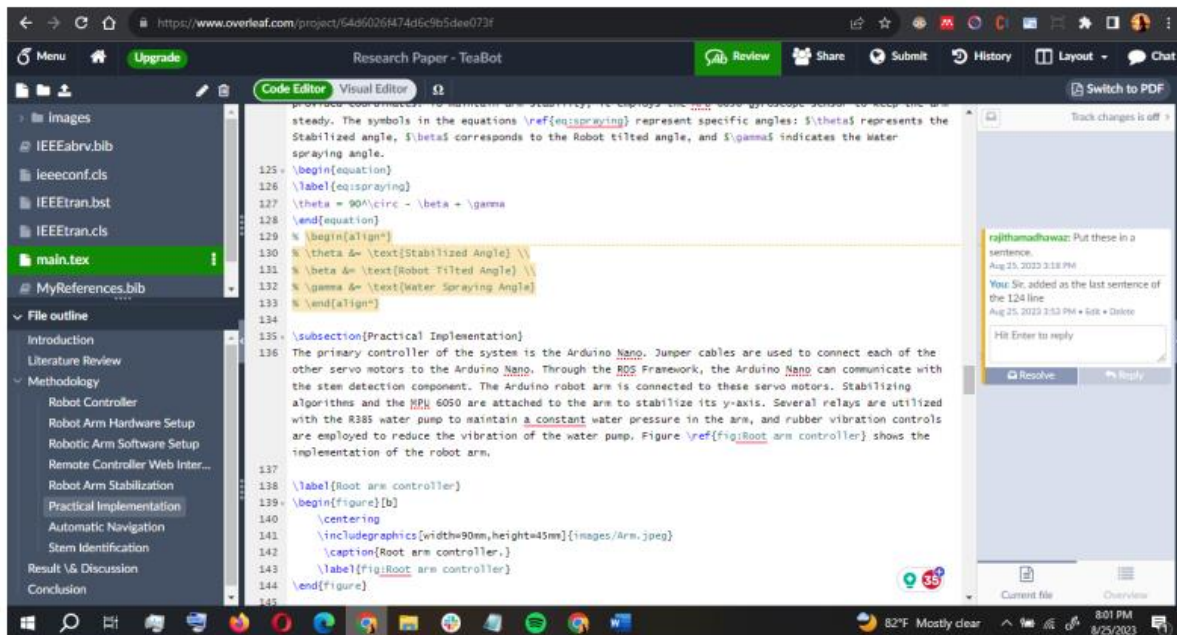


Figure 11: Mechanical interior view

3.7 2022 June 1st to 30st

- After the PP1 presentation the comments were viewed necessary adjustments were made
- The draft of the research paper was created and submitted.
- Designed robot arm for the integration.



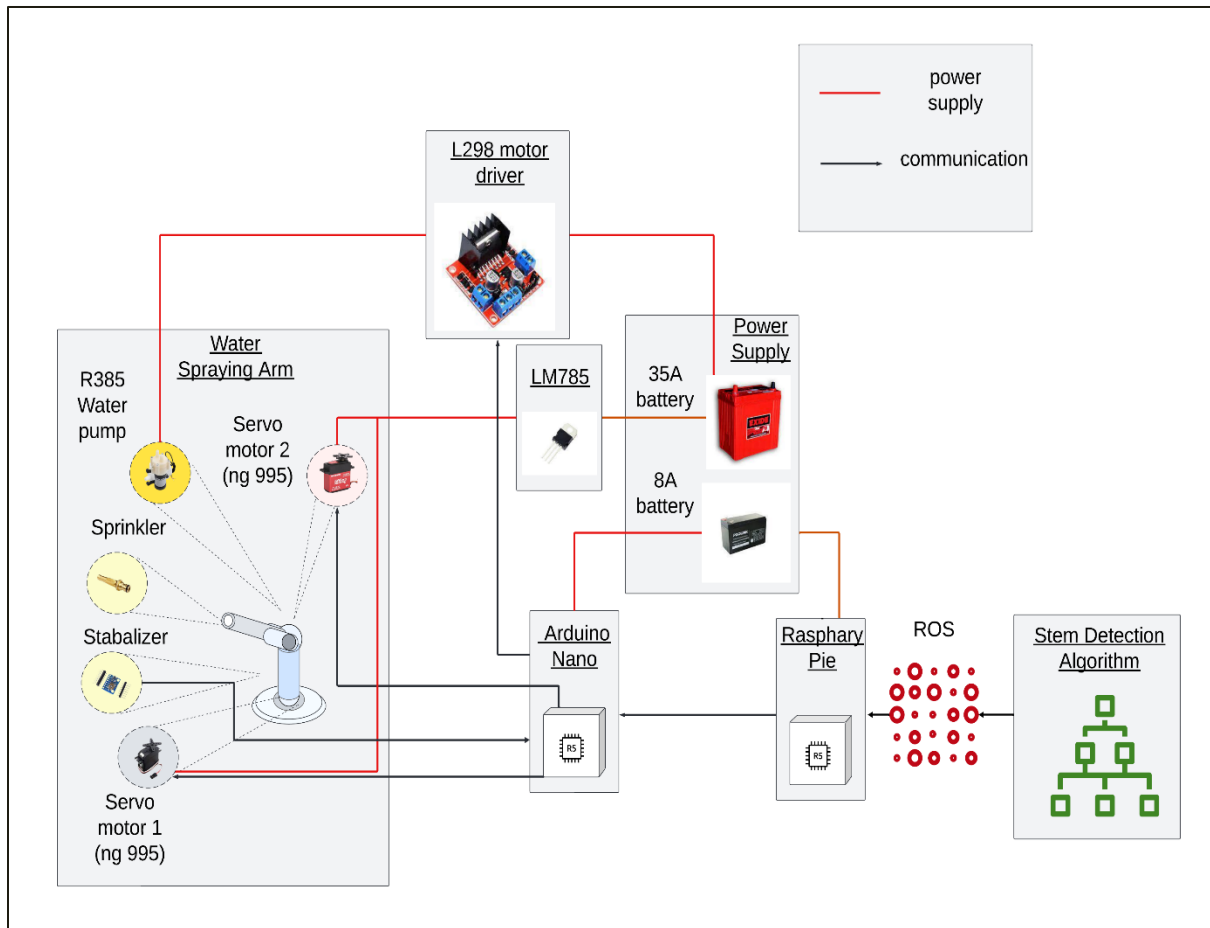


Figure 12: Robot arm overall design

3.8 2022 July 1st to 31th

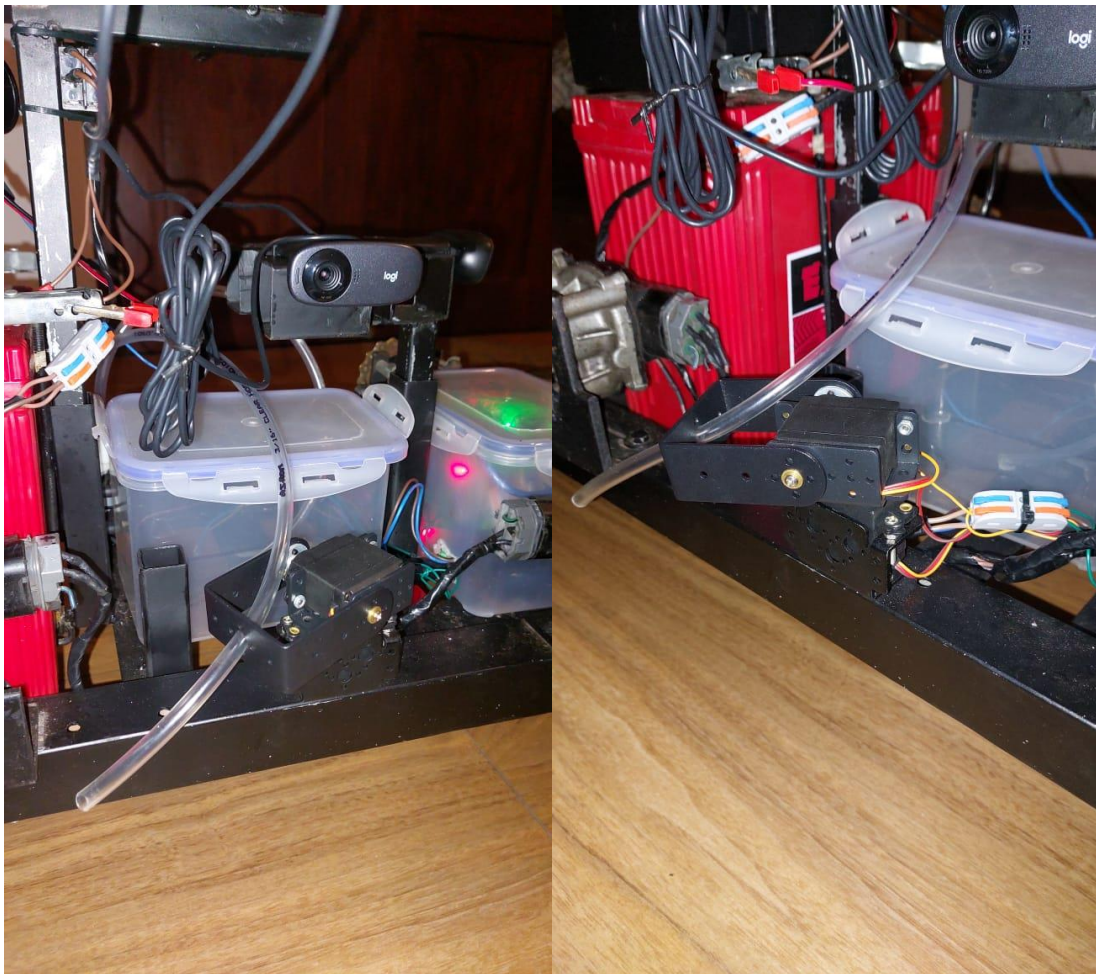
- Final report draft submission was held in 10th of September, and the PP2 was scheduled to 4th of September.
- During this month we prepared the final reports
- Integrated the project and tested it in the real environment.



Figure 13: Robot arm field testing

3.9 2022 August 1st 31st

- As a result of delays in both plant identification and plant watering, the stem detection algorithm for the robot arm is modified from a machine learning model to a computer vision algorithm during integration.
- The robot arm was modified, and the integration was once more adjusted.
- Watering speed was optimized.
- Reduce the length of the arm.

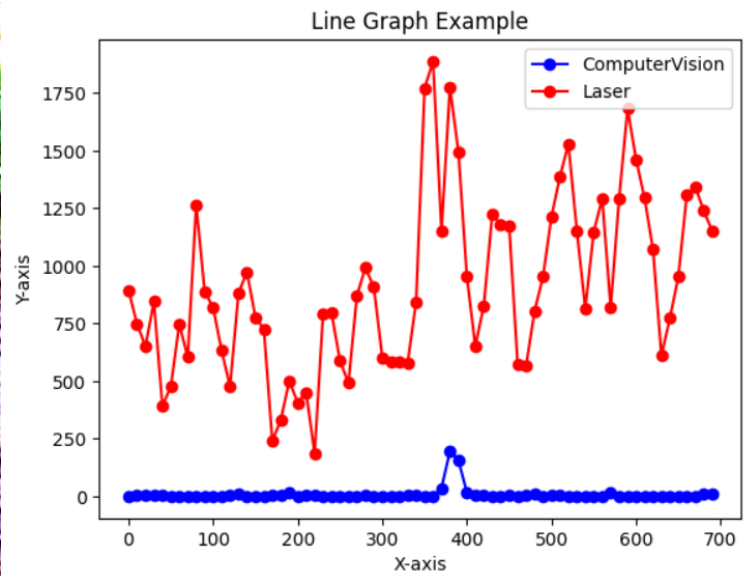


3.10 2022 September 1st to 31st

- The robot arm's pp2 integration is complete, and it operates flawlessly with computer vision coordinates and has a quick watering speed.
- 90% of the overall arm is completed and optimized.
- We prepared and submitted a Status Document-2 on the same date as the PP2 viva. This document provided a succinct status report on the project's progress, highlighting our accomplishments, milestones attained, and any modifications made in response to input from the PP2 viva.

3.11 2022 October 1st to 31st

- Laser module of the arm is installed.
- User color separation of the laser pointer to identify the coordinates of the arm.
- Robot arm optimization is completed for the final presentation.



3.12 2022 November 1st 15th

- Our research paper was completed and published.
- The final report is proofread and will be submitted on the 27th.
- Research website submission to CDAP.