



## FITNESS-RELATED COACHING AND DIET PLANNING MOBILE APPLICATION USING IMAGE PROCESSING AND MACHINE LEARNING

R24-122

Status Document 2

BSc (Hons) in Information Technology Specializing in Information Technology

Department of Information Technology

Sri Lanka Institute of Information Technology

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## 1. Updated Gantt chart of finalize Design & implementation phases



Figure 1 Gantt Chart

## 2. Work Breakdown Structure

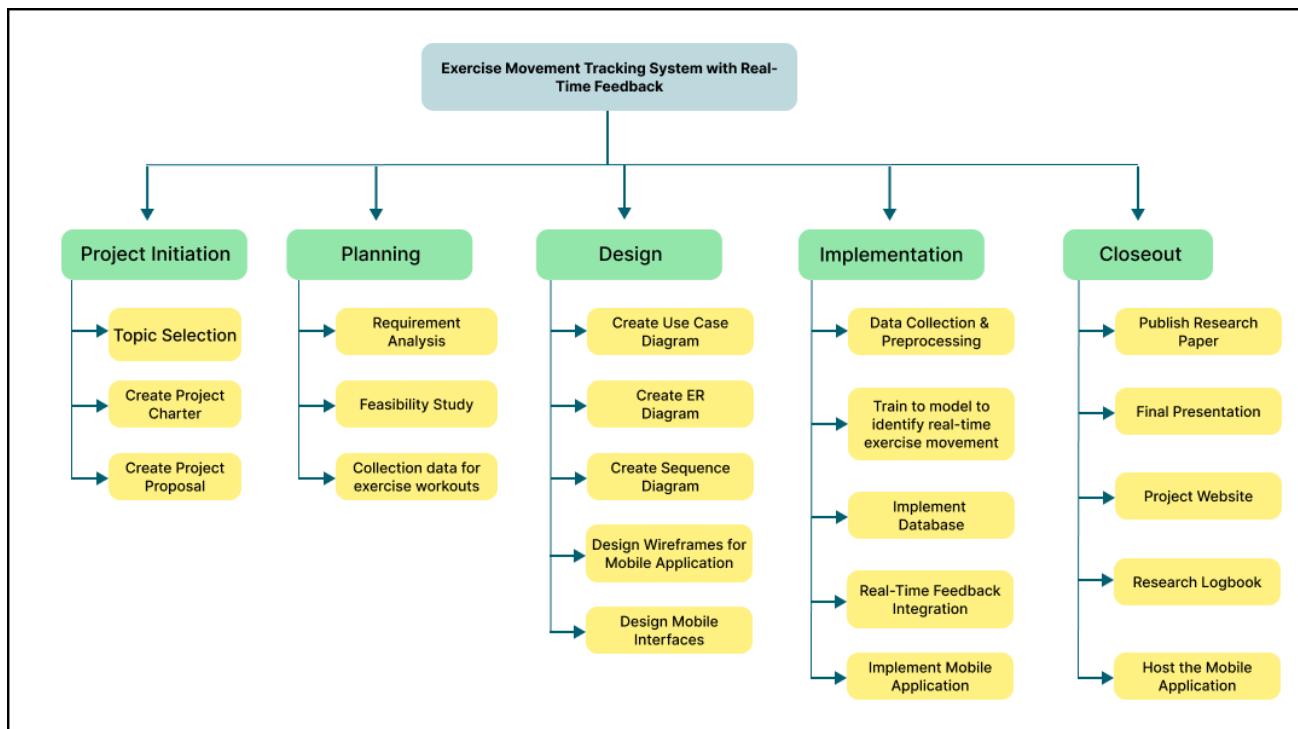


Figure 2 Work Breakdown Structure

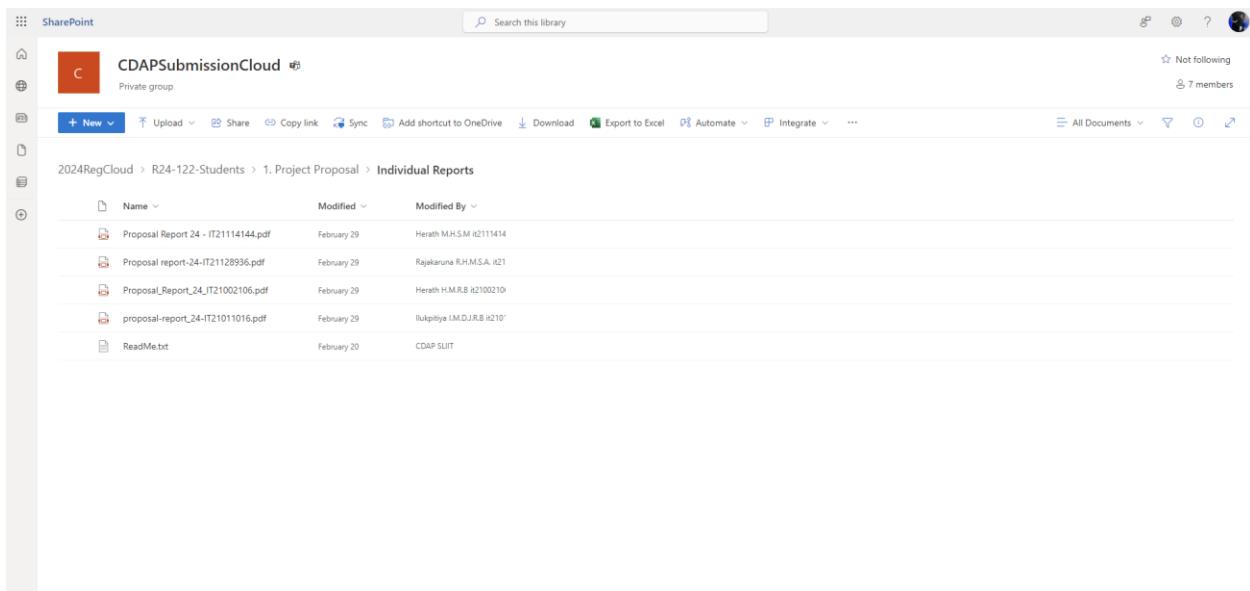
### **3. Completed Individual Component**

- Data Collection
- Develop the logic for each exercise using MediaPipe and YOLO to identify incorrect exercises
- Developed the Customized Computer Vision Algorithm to identify incorrect exercises poses
- System testing

### **4. Documentation**

- Proposal Document
- Status Document
- Logbook
- Research paper

### **5. Document Submission**



The screenshot shows a SharePoint library named 'CDAPSubmissionCloud' under the 'CDAPSubmissionCloud' group. The library contains five documents:

Name	Modified	Modified By
Proposal Report 24 - IT21114144.pdf	February 29	Herath M.H.S.M (21114144)
Proposal report-24-IT21128936.pdf	February 29	Rajakaruna R.H.M.S.A. #21
Proposal_Report_24_IT21002106.pdf	February 29	Herath H.M.R.B (21002106)
proposal-report_24_IT21011016.pdf	February 29	Ilukpitiya I.M.D.J.R.B (21011016)
ReadMe.txt	February 20	CDAP SLIIT

*Figure 3 Proposals Submissions*

The screenshot shows a SharePoint library named 'CDAPSubmissionCloud' under the 'Private group' category. The library contains several documents and folders related to 'Final Reports'. The items listed are:

Name	Modified	Modified By
Turnitin reports	February 20	CDAP SLIT
Final Group Report R24-122.pdf	August 23	Herath H.M.R.B #2100210
Final Report 24 - IT21011016.pdf	August 23	Ilukpitiya I.M.D.J.R.B #210
Final Report 24 - IT21128936.pdf	August 22	Rajakaruna R.H.M.S.A. #21
Final Report IT21114144.pdf	August 23	Herath M.H.S.M #2111414
Final Report_24_IT21002106.pdf	August 23	Herath H.M.R.B #2100210
ReadMe.txt	February 20	CDAP SLIT

Figure 4 Final reports Submissions

The screenshot shows a SharePoint library named 'CDAPSubmissionCloud' under the 'Private group' category. The library contains several documents and folders related to '4. Research Paper'. The items listed are:

Name	Modified	Modified By
Publication Details	February 20	CDAP SLIT
Turnitin report	February 20	CDAP SLIT
IEEE Research Paper Template-a4.docx	February 20	CDAP SLIT
R24-122(Progress Of research 02).pdf	June 14	Herath H.M.R.B #2100210
R24-122(Progress Of research).pdf	May 10	Herath H.M.R.B #2100210
ReadMe.txt	February 20	CDAP SLIT

Figure 5 Research paper Draft version Submissions

## 6. Research Paper Submission

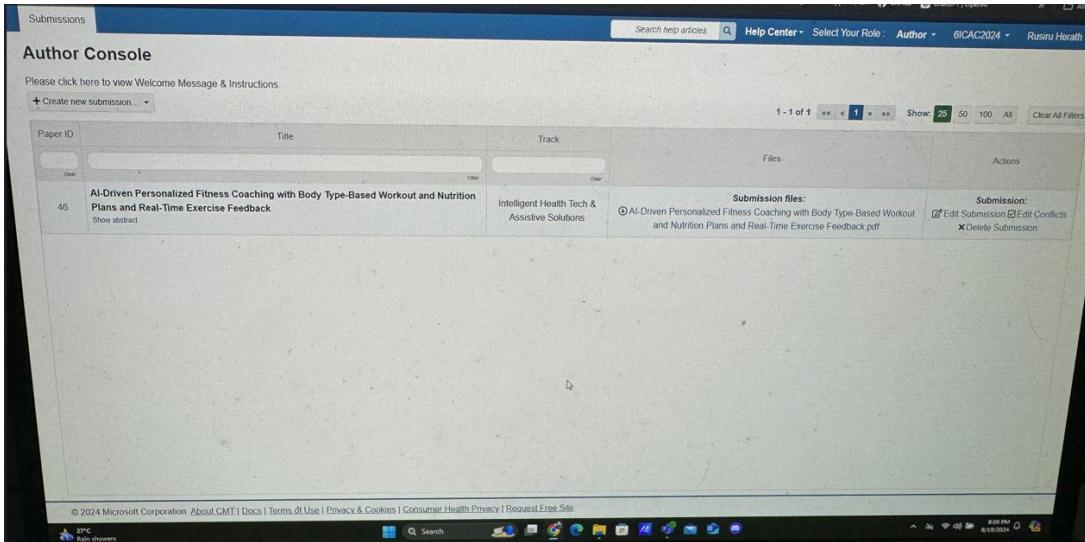


Figure 6 ICAC Research paper Submissions

## 7. Finalize work breakdown structure & allocated resources for each area

### 7.1 Teams task planner (Group)

A screenshot of a project management tool's "Project Plan" section. The interface is organized into six columns: "To do", "Project Initiation", "Final Report", "Research Paper", "Implementation", and "Closeout". Each column contains a list of tasks with their status (e.g., "Completed", "In Progress") and due dates. For example, under "Project Initiation", there are tasks like "Collect Data for Foods and Create the Dataset" and "Select the 4 Research areas", both completed on 09/11. Under "Research Paper", there are numerous tasks related to literature review, final reports, and methodology, many of which are completed by users like "Rusith Herath" and "Kalyani Sir". The "Implementation" column shows tasks such as "Improve UI &amp; UX" and "Testing and Debugging", while the "Closeout" column includes tasks like "Integrated Backend and Frontend" and "Create API". The overall dashboard provides a clear overview of the project's progress across different phases and tasks.

Figure 7 Teams task planner Dashboard

Title	Assignment	Start date	Due date	Bucket	Progress	Priority	Labels
Topic Selection			12/20/2023	Project Initiation	Completed	Important	Add label
Select the 4 Research areas			12/30/2023	Project Initiation	Completed	Important	Add label
Collect Data for exercise workouts	Bulupitiya I.M.D.J.R.	3/20/2024		Final Report	Completed	Medium	Add label
Collect Data for body-type identification			3/31/2024	Project Initiation	Completed	Important	Add label
Collect Data for Foods and Create the Dataset	Rajakaruna R.H.M.	3/22/2024		Final Report	Completed	Important	Add label
Collect Data for workout-plan and Create the Dataset	Herath M.H.S.M.I.G	3/24/2024		Research Paper	Completed	Medium	Add label
Create User-Case Diagrams for identify body-type co...	Bulupitiya I.M.D.J.R.	2/23/2024		Research Paper	Completed	Medium	Add label
Create the Case-Diagrams-for-Dine-Suggets Component	Rajakaruna R.H.M.	2/23/2024		Research Paper	Completed	Medium	Add label
Create the Case-Diagrams-for-Workout-Plan-Sugges...	Herath M.H.S.M.I.G	2/23/2024		Research Paper	Completed	Medium	Add label
Create the Case-Diagrams-for-Real-time-exercise-Com...	Herath H.M.R.B.I2	2/23/2024		Research Paper	Completed	Medium	Add label
Collect Data for Meals and Create-the-Dataset	Rajakaruna R.H.M.	3/28/2024		Final Report	Completed	Medium	Add label
Create High-Fidelity Mobile interface for-Spot-Compo...	Rajakaruna R.H.M.	2/25/2024		Research Paper	Completed	Medium	Add label
Create High-Fidelity Mobile interface for-Workout-Pa...	Herath M.H.S.M.I.G	2/25/2024		Research Paper	Completed	Medium	Add label
Create High-Fidelity Mobile interface for-body-Identif...	Bulupitiya I.M.D.J.R.	2/25/2024		Research Paper	Completed	Medium	Add label
Create High-Fidelity Mobile interface for-Real-time-ex...	Herath H.M.R.B.I2	2/25/2024		Research Paper	Completed	Medium	Add label
Create the Figma UI for each of your-interfaces-	Bulupitiya I.M.D.J.R.	4/28/2024		Research Paper	Completed	Medium	Add label
Create the Figma UI for-home-login-and-user-profile-	Bulupitiya I.M.D.J.R.	4/28/2024		Research Paper	Completed	Medium	Add label
Create-the-Figma UI for-each-of-your-interfaces-		4/28/2024		Research Paper	Completed	Medium	Add label
Create-the-Figma UI for-each-of-your-interfaces-	Rajakaruna R.H.M.	4/28/2024		Research Paper	Completed	Medium	Add label
Create-the-Figma UI for-each-of-your-interfaces-	Herath H.M.R.B.I2	4/28/2024		Research Paper	Completed	Medium	Add label
Gather-body-image-data-and-process-them-	Bulupitiya I.M.D.J.R.	3/20/2024		Implementation	Completed	Medium	Add label
Exercise-movements-data-collection-and-preprocessing-	Herath H.M.R.B.I2	3/20/2024		Implementation	Completed	Important	Add label
Collection-emph-feedback-datasets-and-preprocessing-	Herath M.H.S.M.I.G	3/20/2024		Implementation	Completed	Medium	Add label
Collecting-food-nutritious-datasets-and-preprocessing-	Rajakaruna R.H.M.	3/20/2024		Implementation	Completed	Medium	Add label
Create-Presentation-Slides-for-Methology-Evidence-	Herath M.H.S.M.I.G	4/30/2024		To do	Completed	Medium	Add label
Create-Presentation-Slides-for-Methology-Evidence-	Herath H.M.R.B.I2	4/30/2024		To do	Completed	Medium	Add label
Create-Presentation-Slides-for-Methology-Evidence-	Bulupitiya I.M.D.J.R.	4/30/2024		To do	Completed	Medium	Add label
Create-Presentation-Slides-for-Methology-Evidence-	Rajakaruna R.H.M.	4/30/2024		To do	Completed	Medium	Add label
Train-model-to-analyse-body-features-and-identify-ho...	Bulupitiya I.M.D.J.R.	4/16/2024		Implementation	Completed	Medium	Add label
Train-to-model-to-identify-real-time-exercise-movement	Herath H.M.R.B.I2	4/16/2024		Implementation	Completed	Medium	Add label
Train-to-model-to-identify-real-time-exercise-movement	Rajakaruna R.H.M.	4/16/2024		Implementation	Completed	Medium	Add label

Figure 8 Teams task planner Grid View

## 7.2 Teams task planner (Individual)

The screenshot shows the Microsoft Teams Task Planner dashboard with the following details:

- To do:**
  - + Add task
  - Create the Status 02 Doc
  - Create the Status 01 doc
  - Write the research paper Abstract
  - Create Presentation Slides for Methodology Evidence of completion Future Work Figma UI for your Component
  - Completed by Ilukpitiya I.M.D.J.R...
- Project Initiation:**
  - + Add task
  - Select the 4 Research areas
  - Completed by Rajakaruna R.H.M...
- Final Report:**
  - + Add task
  - Create the Group Final-report
  - Completed by Herath H.M.R.B.I2...
  - Create Individual Final Report
  - Completed by Herath H.M.R.B.I2...
  - Collecting Data for exercise workouts
  - Completed by Herath H.M.R.B.I2...
- Research Paper:**
  - + Add task
  - To modify the suggestions given by Koly Sir for research paper literature review
  - Completed by Herath H.M.R.B.I2...
  - Write Research Paper methodology of Exercise Movement tracking system with Real-time feedback
  - Completed by Herath H.M.R.B.I2...
  - Write Research paper Literature review
  - Completed by Ilukpitiya I.M.D.J.R...
  - Create the Figma UI for each of your interfaces
  - Completed by Herath H.M.R.B.I2...
  - Create high-Fidelity Mobile interface for Real-time exercise Component
  - Completed by Herath H.M.R.B.I2...
- Implementation:**
  - + Add task
  - Improve UI & UX
  - Integrated All the Function
  - Add more Exercises
  - Testing and Debugging
  - Integrate the audio-feedback mechanism with the WebRTC video feed
  - Completed by Herath H.M.R.B.I2...
  - Integrate WebRTC for real-time-video feed-in the mobile app
  - Completed by Herath H.M.R.B.I2...
  - Design and implement the UI for the movement tracking screen
- Closed:**
  - + Add task

Figure 9 Teams task planner Dashboard – IT21002106

Research Management Posts Files Project Plan

Project Plan Grid Board Schedule Charts Filters (1)

Title	Assignment	Start date	Due date	Bucket	Progress	Priority	Labels
Select the 4 Research areas	Herath H.M.R.B #2	12/30/2023	Project Initiation	Completed	Important		Add label
Collecting Data for exercise workouts	Herath H.M.R.B #2	3/20/2024	Final Report	Completed	Important		Add label
Create the Case Diagrams for Real-time exercise Com...	Herath H.M.R.B #2	2/23/2024	Research Paper	Completed	Medium		Add label
Create High Fidelity Mobile interface for Real time ex...	Herath H.M.R.B #2	2/25/2024	Research Paper	Completed	Medium		Add label
Create the Figma UI for each of your interfaces:	Herath H.M.R.B #2	4/28/2024	Research Paper	Completed	Medium		Add label
Exercise movements data collection and preprocessing	Herath H.M.R.B #2	3/20/2024	Implementation	Completed	Important		Add label
Create Presentation Slides for Methodology Evidence –	Herath H.M.R.B #2	4/30/2024	To do	Completed	Medium		Add label
Train to model to identify real-time exercise movement	Herath H.M.R.B #2	4/16/2024	Implementation	Completed	Medium		Add label
Write the research paper Abstract	Herath H.M.R.B #2	5/10/2024	To do	Completed	Medium		Add label
Create the Status 01 doc	Herath H.M.R.B #2	5/6/2024	To do	Completed	Medium		Add label
Create API	Herath H.M.R.B #2	5/30/2024	Implementation	Completed	Medium		Add label
Fine-Tune Exercise Identification Model and Exercise...	Herath H.M.R.B #2	6/13/2024	Implementation	Completed	Medium		Add label
Write Research paper literature review	Herath H.M.R.B #2	5/10/2024	Research Paper	Completed	Medium		Add label
Write Research Paper methodology of Exercise Move...	Herath H.M.R.B #2	6/4/2024	Research Paper	Completed	Medium		Add label
Write the Results and discussion of Exercise Moveme...	Herath H.M.R.B #2	8/1/2024	Research Paper	Completed	Medium		Add label
To modify the suggestions given by Rolyia Sir for res...	Herath H.M.R.B #2	8/8/2024	Research Paper	Completed	Medium		Add label
Integrate real-time audio feedback with the computer...	Herath H.M.R.B #2	7/31/2024	Implementation	Completed	Medium		Add label
Design and implement the UI for the movement track...	Herath H.M.R.B #2	8/10/2024	Implementation	Completed	Medium		Add label
Integrate WebRTC for real-time video feed in the mob...	Herath H.M.R.B #2	8/17/2024	Implementation	Completed	Medium		Add label
Integrate the audio feedback mechanism with the We...	Herath H.M.R.B #2	8/22/2024	Implementation	Completed	Medium		Add label
Testing and Debugging	Herath H.M.R.B #2	9/16/2024	Implementation	In progress	Medium		Add label
Add more Exercises	Herath H.M.R.B #2	9/30/2024	Implementation	In progress	Medium		Add label
Create the Status 02 Doc	Herath H.M.R.B #2	9/11/2024	To do	In progress	Medium		Add label
Create Individual Final Report	Herath H.M.R.B #2	8/20/2024	Final Report	Completed	Medium		Add label
Create the Group Final report	Herath H.M.R.B #2	8/21/2024	Final Report	Completed	Medium		Add label

Figure 10 Teams task planner Grid View – IT21002106

## 8. Teams Planner Charts

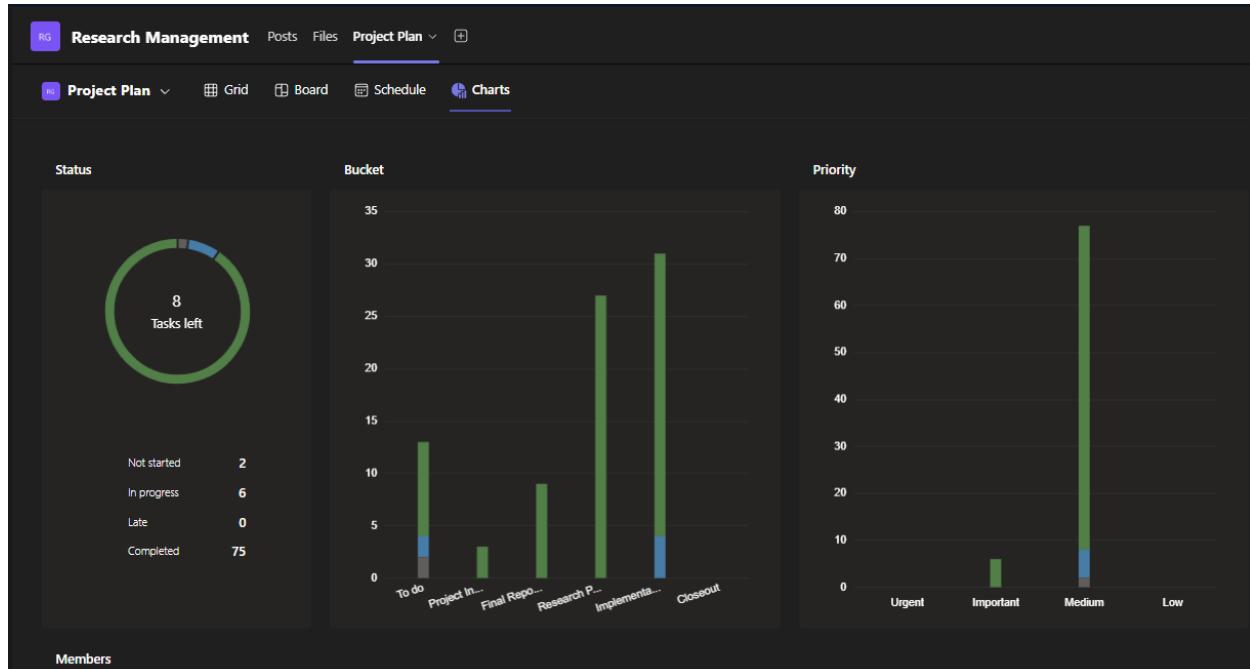


Figure 11 Teams' planner chart – IT21002106

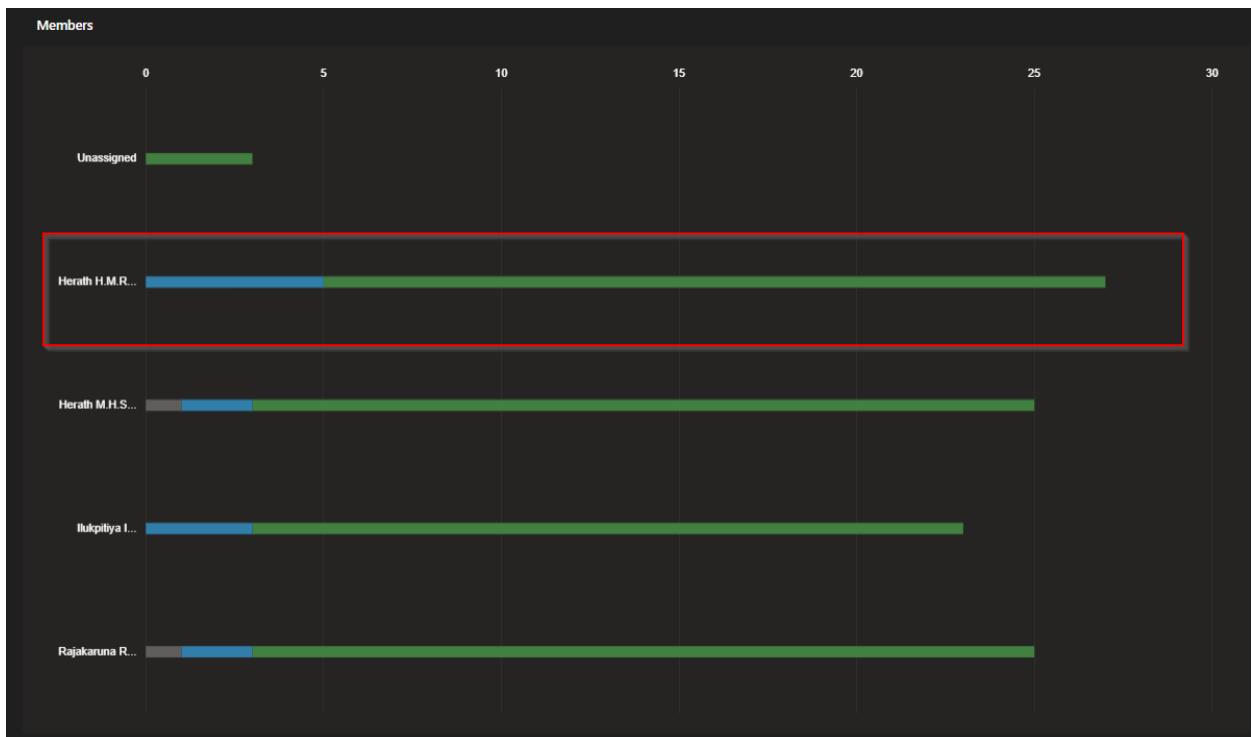


Figure 12 Teams' planner chart – IT21002106

## 9. Test Results

### 9.1 Test Cases and Results

Table 1 Test Case for Real-Time Feedback for Incorrect Exercise Movements

Test Case ID	01
Test Scenario	Ensure the system provides real-time feedback when detecting incorrect movements.
Precondition	The user performs exercises with incorrect form. The system is active and tracking the user's movements.
Input Data	Performing Jumping Jacks with incomplete arm extension and incorrect leg positioning.
Expected Outcome	The system should detect incorrect movements and provide real-time audio and visual feedback indicating the specific issues (e.g., "Need to hand up more" or "Widen legs more").

Actual Outcome	The system correctly provided instant feedback, indicating incorrect movements as expected.
Status (Pass/Fail)	Pass

*Table 2 Test case for Repetition Counting*

Test Case ID	02
Test Scenario	Verify that the system accurately counts the number of exercise repetitions.
Precondition	The system is calibrated to count repetitions based on predefined angles and movement cycles.
Input Data	Perform a set of 5 Jumping Jacks with proper form.
Expected Outcome	The system should correctly detect each complete movement cycle and count a total of 5 repetitions.

*Table 3 Test Case for Exercise Identification*

Test Case ID	03
Test Scenario	Verify that the system correctly identifies different exercises.
Precondition	The exercise identification model is trained and deployed.
Input Data	Videos of exercises such as Jumping Jacks, Squats, Dumbbell Curls
Expected Outcome	The system correctly identifies the exercise being performed with an accuracy of 85% or higher.

Actual Outcome	The system successfully identified all exercises with over 88% accuracy.
Status (Pass/Fail)	Pass

## 9.2 Results Individual (Exercise Movement Tracking System with Real-Time Feedback)

```

y_pred = clf.predict([X_test])
# Generate classification report
class_report = classification_report(y_test, y_pred)
print("Classification Report:\n", class_report)

Classification Report:
              precision    recall   f1-score   support
Bent_Overhand_Row_Dumbbell      0.85     0.90     0.87    75994
Bicep_Curl_to_Overhead_Press    0.82     0.87     0.84    77103
Body_weight_squat               0.80     0.85     0.82    33997
Dumbbell_Curls                  0.78     0.82     0.80    44373
Jumping_Jacks                   0.75     0.80     0.77    37391
accuracy                           0.88
macro avg                          0.85     0.85     0.86    268858
weighted avg                     0.85     0.88     0.86    268858

```

Figure 13 Classification report



Figure 14 Confusion matrix

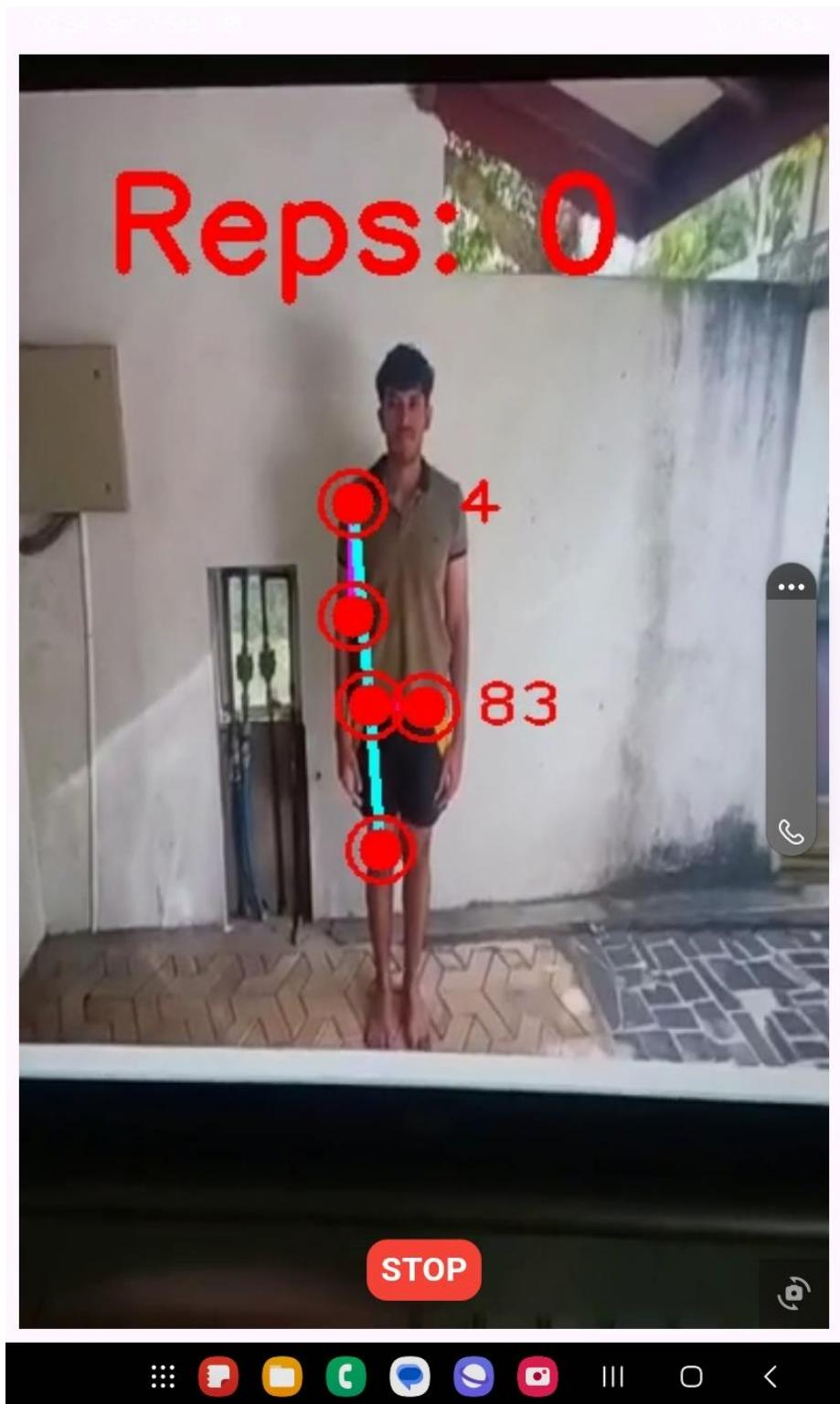


Figure 15 Results 1 of the Exercise movement tracking and real time feedback Component

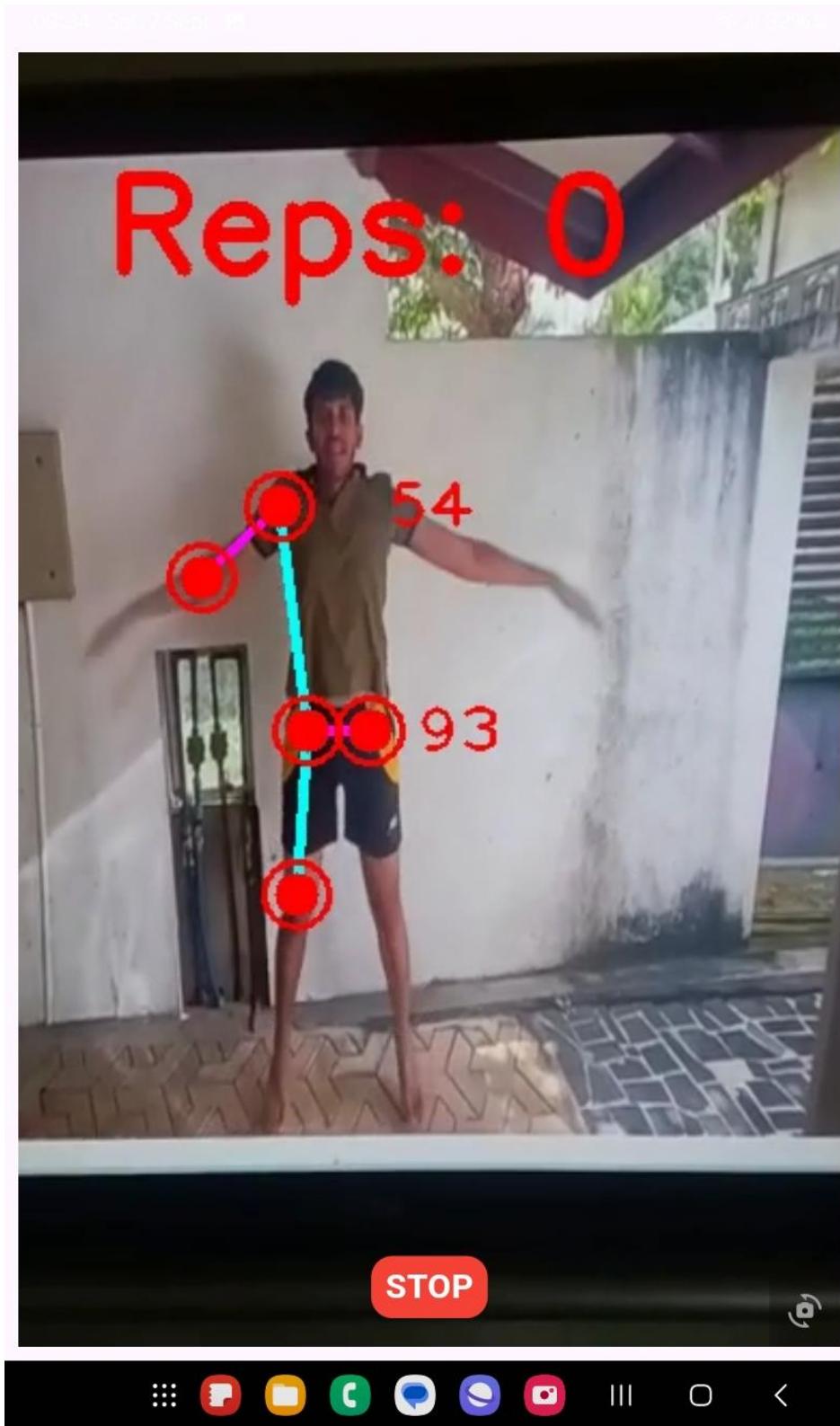


Figure 16 Results 2 of the Exercise movement tracking and real time feedback Component

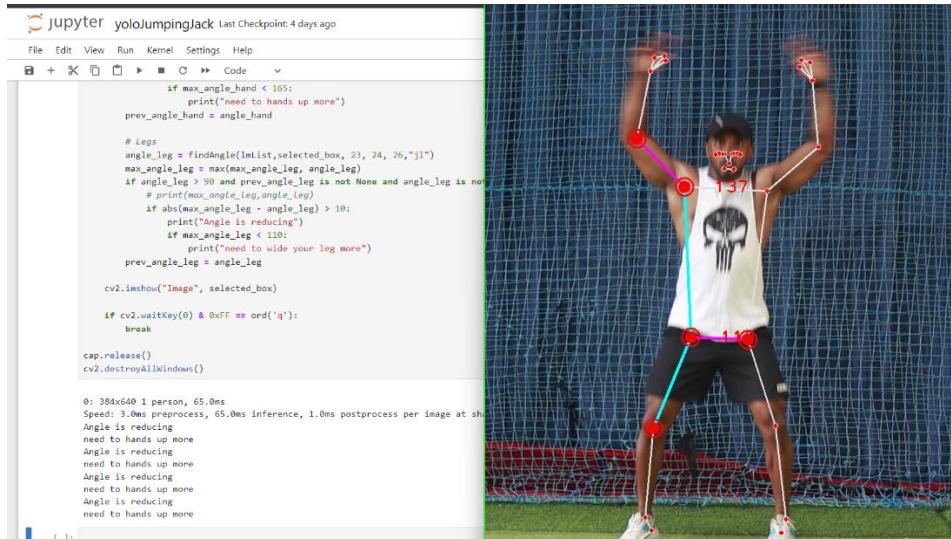


Figure 17 Jumping jack exercise with real-time feedback

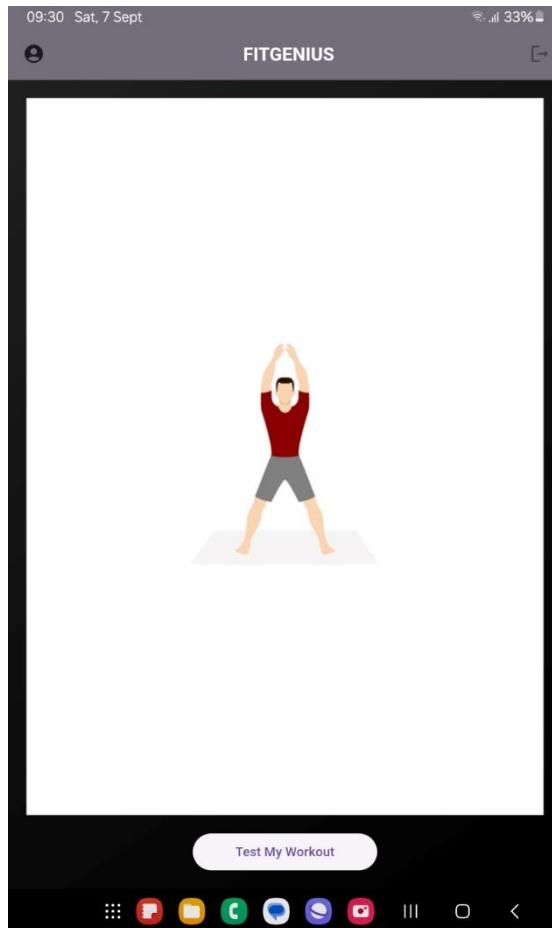


Figure 18 Results of the Exercise guide video of the Mobile Application

### 9.3 Results of the Mobile Application (Common)

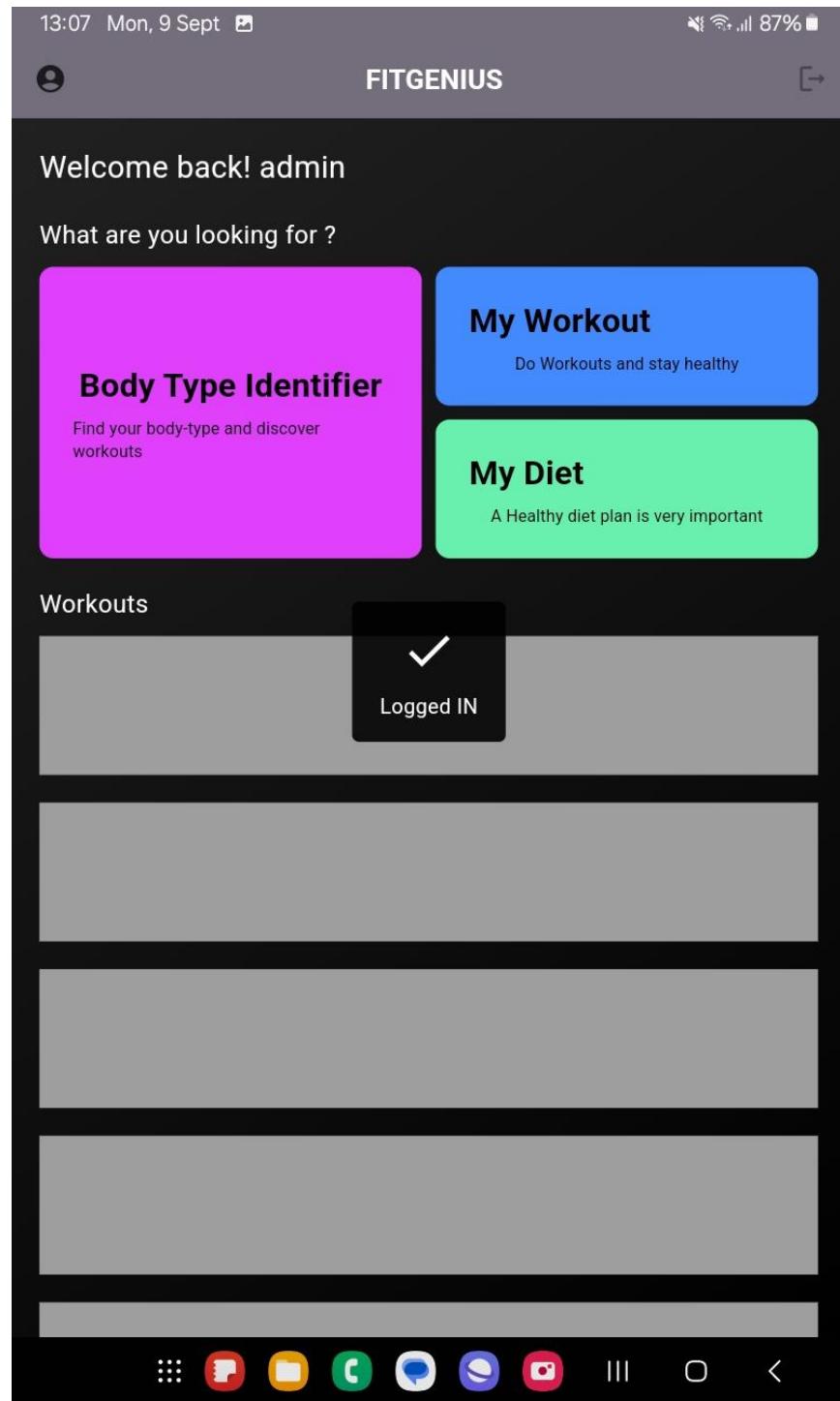


Figure 19 Home Page of the Mobile Application

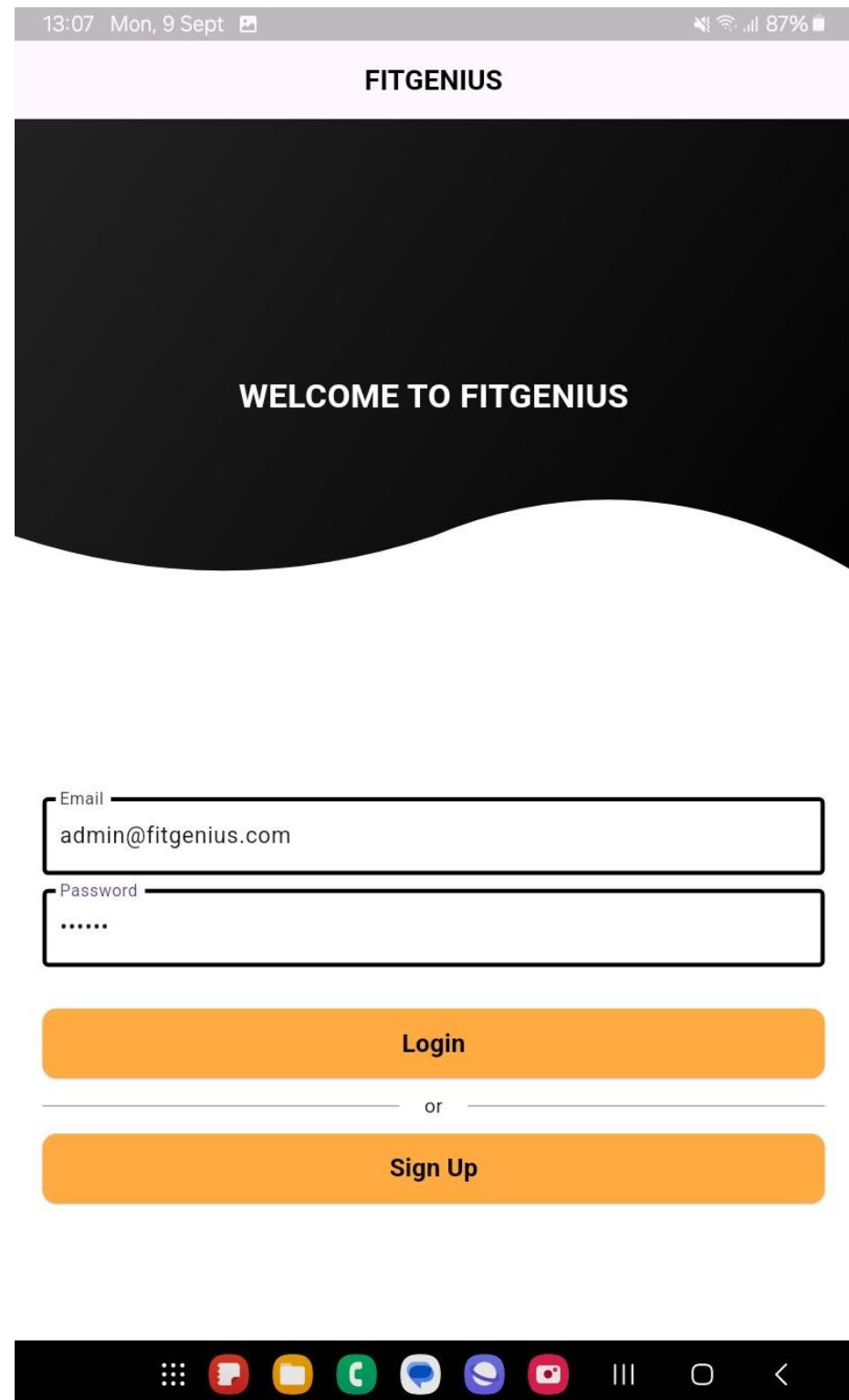


Figure 20 Login page of the Mobile Application

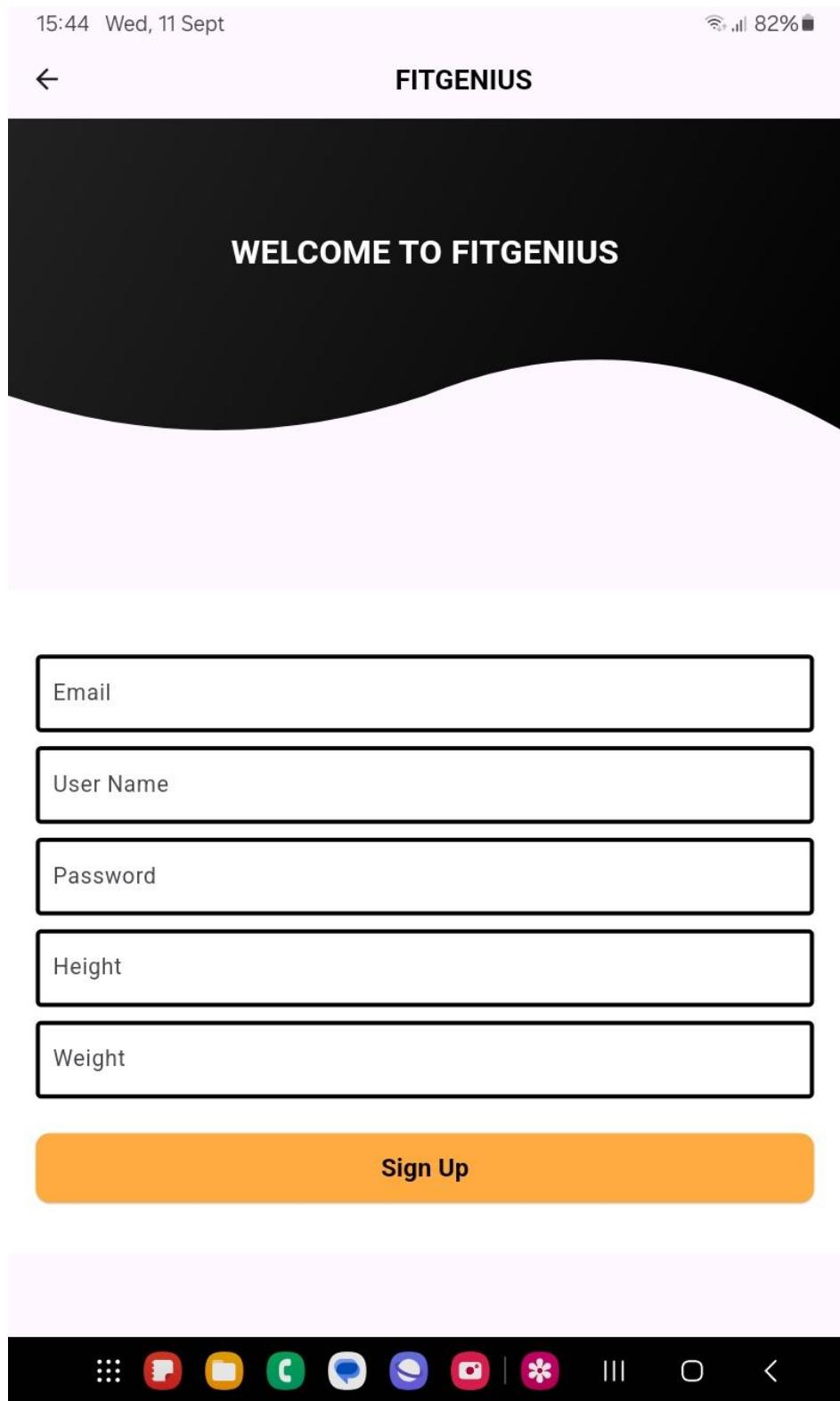


Figure 21 Sign of the Mobile Application

## 10. Emails

We reached out to a professor via email, asking them to take the position of our project co-supervisor.

The screenshot shows an email interface with the following details:

**From:** Rusiru Bandara <rusirubandaraherath65@gmail.com>  
**To:** jenny.k

**Date:** Sat, 25 Nov 2023, 01:42

**Subject:** Invitation to Join as Co-Supervisor for Research Group

**Email Content:**

Dear Ms. Jenny Krishara,

I hope this email finds you well. I am reaching out to you on behalf of our research group under the supervision of Prof. Koliya Pulasinghe at SLIIT. We are currently engaged in an IT specialization research project that we believe aligns closely with your expertise and research interests.

Our research group consists of dedicated students pursuing IT specialization, and we are eager to enhance our project through the valuable guidance of a co-supervisor.

The students in our research group are as follows:

1.Herath H.M.R.B - IT21002106  
2.Ilkupitiya I.M.D.J.R.B - IT21011016  
3.Herath M.H.S.M - IT21114144  
4.Rajakaruna R.H.M.S.A - IT21128936

Please let us know a time that suits you, and we will ensure to accommodate your schedule accordingly.

Thank you for considering our invitation, and we eagerly anticipate the possibility of your positive response.

**Buttons:** Reply, Forward, Print

Figure 22 Email 01

We got permission from our supervisor to submit the research paper to ICAC

The screenshot shows two emails exchanged between the student and the supervisor.

**From:** Herath H.M.R.B it21002106  
**To:** Koliya Pulasinghe  
**Cc:** Jenny Krishara; Ilukpitiya I.M.D.J.R.B it21011016; Rajakaruna R.H.M.S.A. it21128936; Herath M.H.S.M it21114144

**Date:** Fri 8/16/2024 11:51 PM

**Email Content:**

Hi Koliya Sir,

I am writing to kindly request your approval for the submission of our research paper to the ICAC organized by SLIIT.

The final version of the paper is attached for your review. I would appreciate it if you could verify the following:

1. The quality of the proposed conference (ICAC SLIIT).  
2. The quality of the paper is adequate for submission.  
3. The names and affiliations of all supervisors are correctly mentioned.  
4. The affiliation for student authors is correct.

We look forward to your feedback and approval as soon as possible. The submission deadline for ICAC is August 20th.

Thank you for your guidance and support throughout this process.

Best regards,  
Rusiru Bandara Herath

**From:** Koliya Pulasinghe <koliya.p@slilit.lk>  
**To:** Herath H.M.R.B it21002106  
**Cc:** Jenny Krishara; Ilukpitiya I.M.D.J.R.B it21011016; Rajakaruna R.H.M.S.A. it21128936; Herath M.H.S.M it21114144

**Date:** Sun 8/18/2024 9:35 PM

**Email Content:**

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

Dear Students,

This has resolved the issues I raised and is ready for submission. I can approve this for the ICAC, but please continuously improve this research work until you get the acceptance.

Kind Regards,  
Koliya

Figure 23 Email 02

## 11. Physical Meeting



Figure 24 physical meeting with the supervisor – 23.02.2024

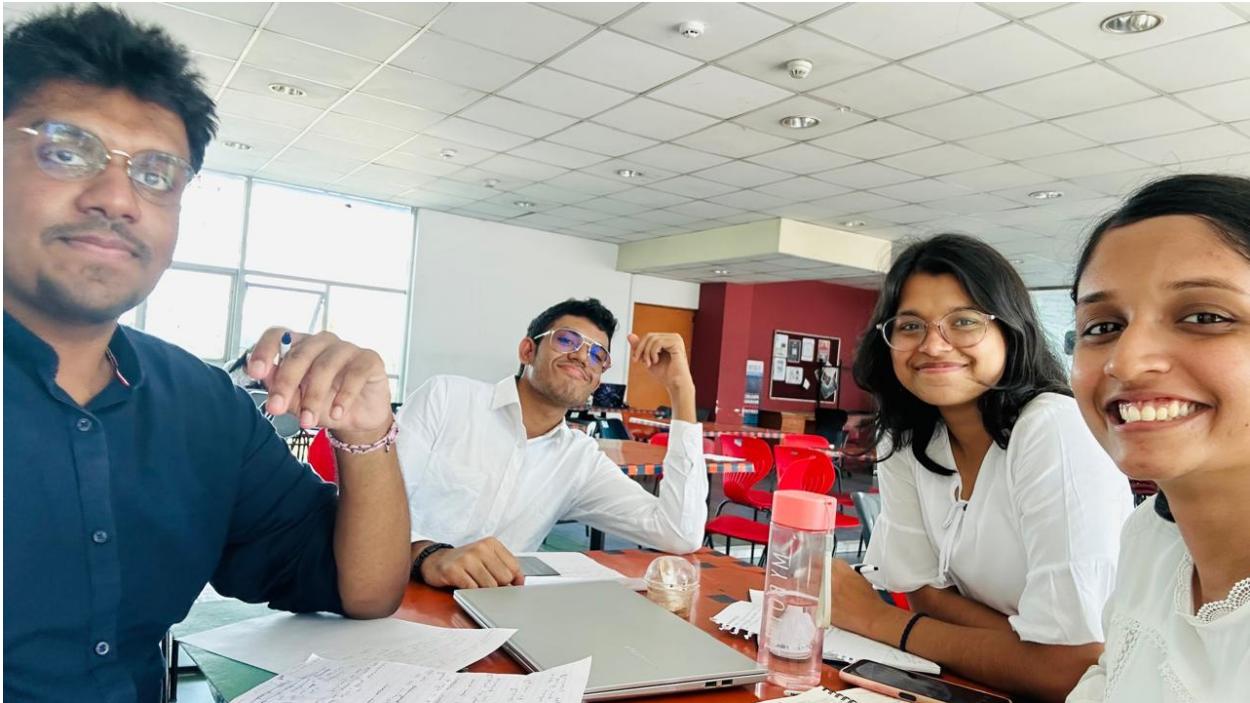
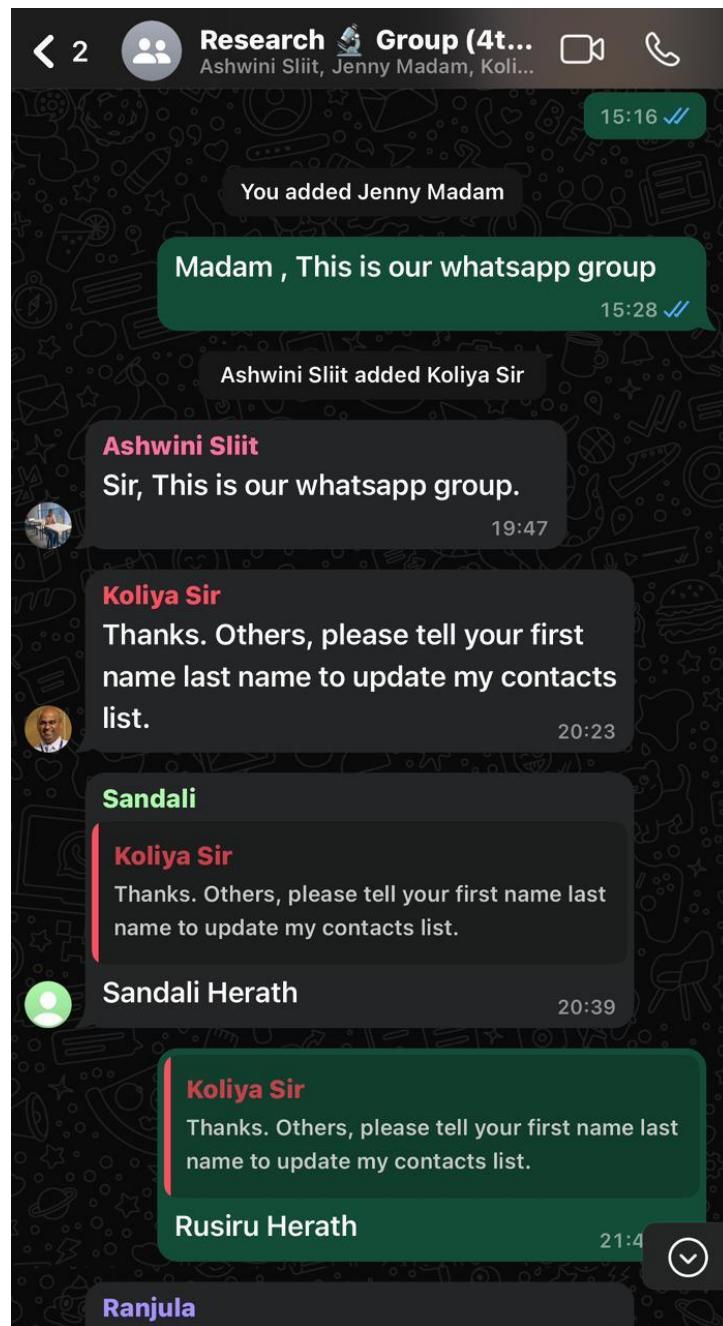


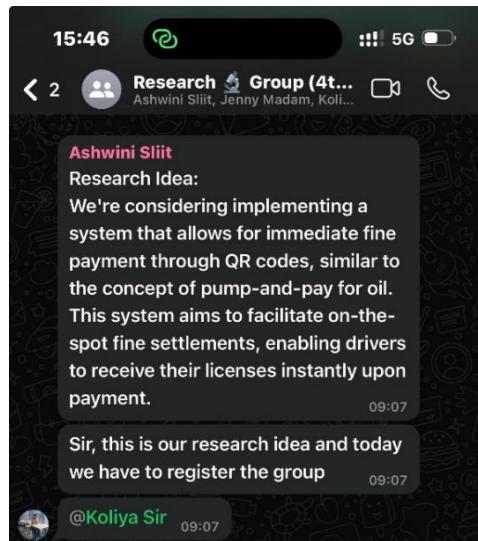
Figure 25 Physical Meeting with group members for progressing the research work

## 12. WhatsApp chats discussing research details

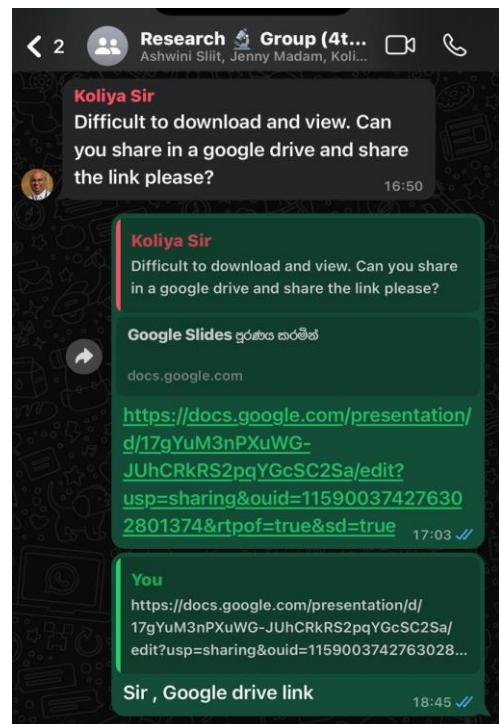
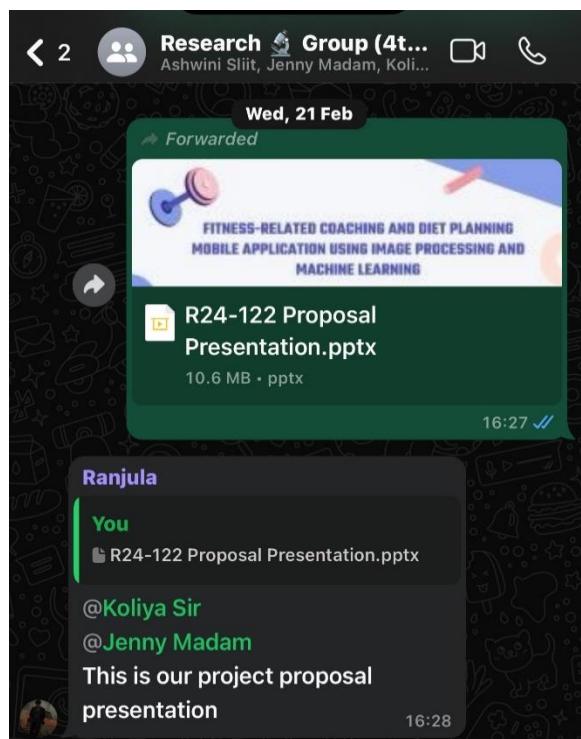
### 12.1 Proof of acknowledgment from both the supervisor and co-supervisor



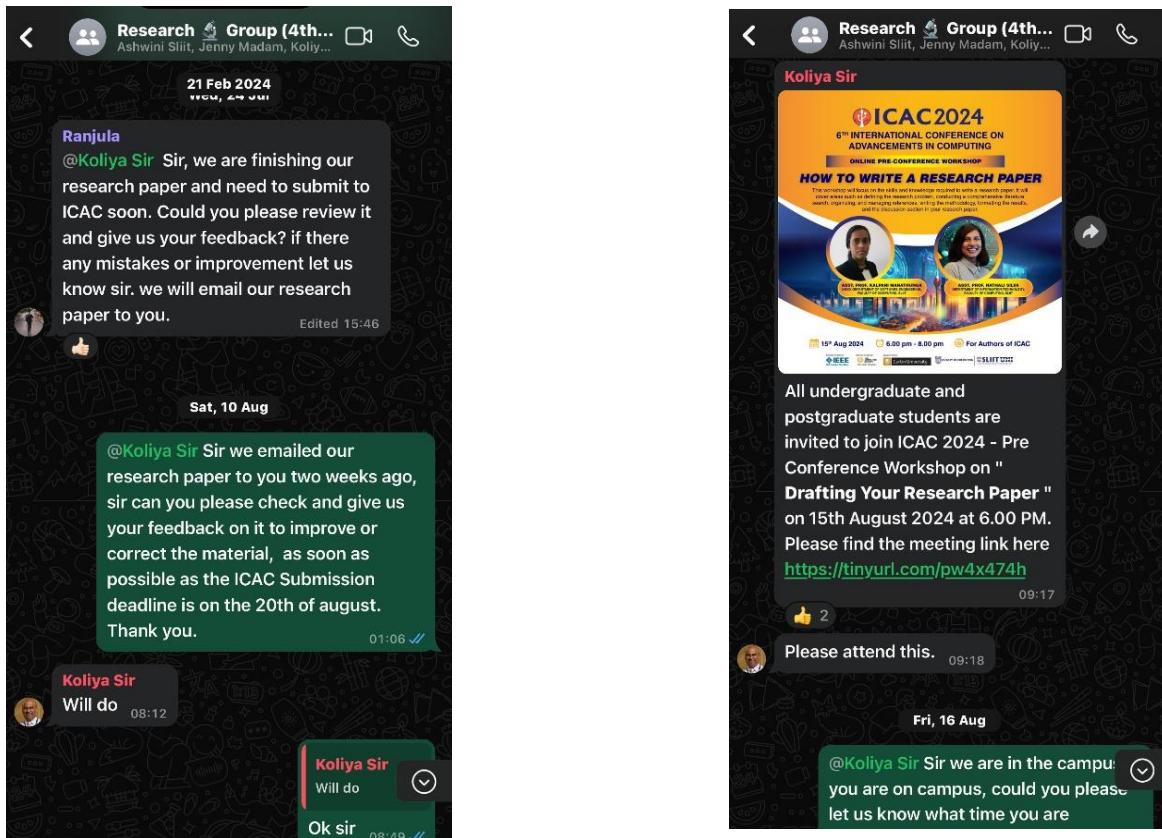
## 12.2 Confirmation of one of our conceptual hypotheses



## 12.3 Reviewing our proposal report with both the supervisor and co supervisor for feedback.



## 12.4 Research paper writing and review with supervisors' guidance



## 13. Screenshots of the chats in MS Teams

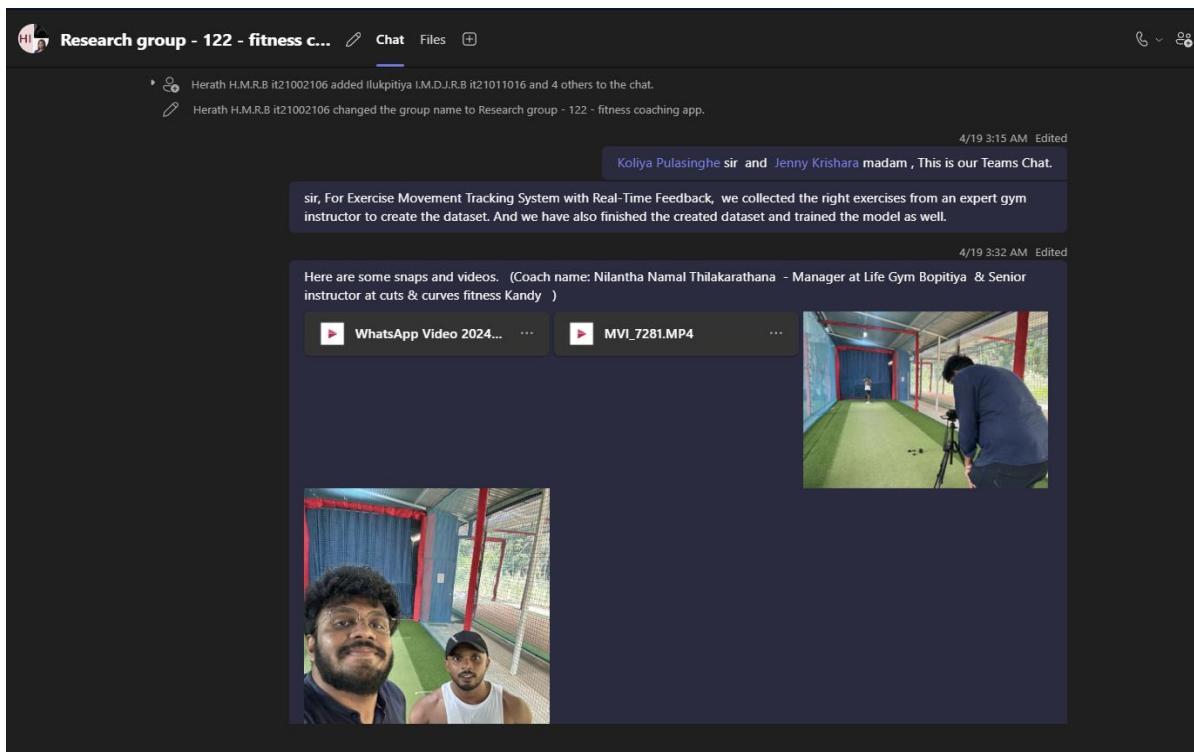


Figure 26 Informing the supervisor about collection data.

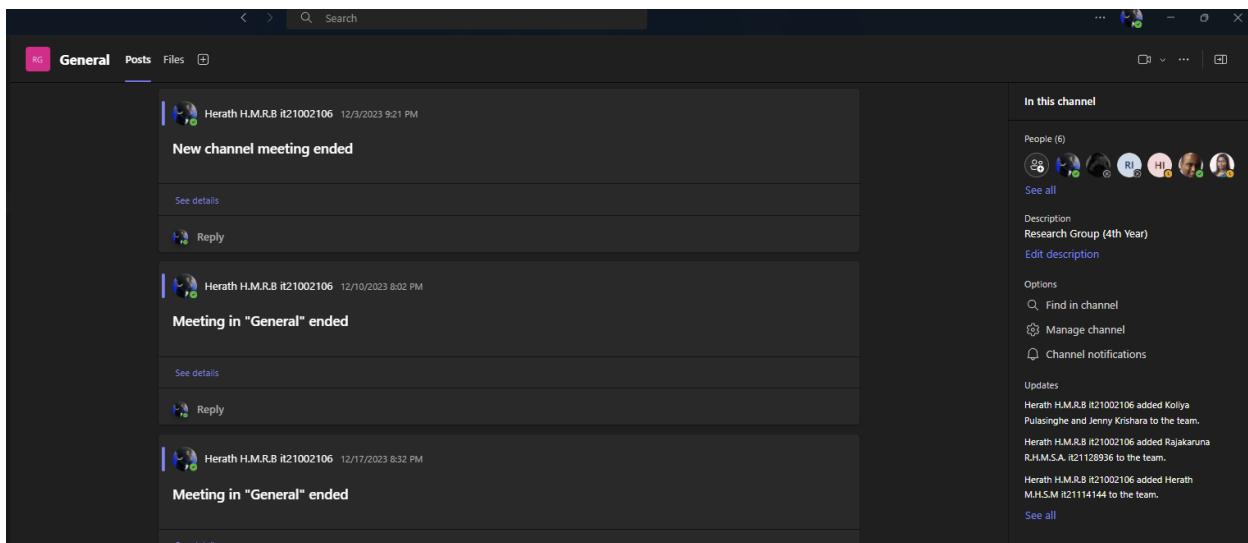


Figure 27 Team Channel in the MS Team

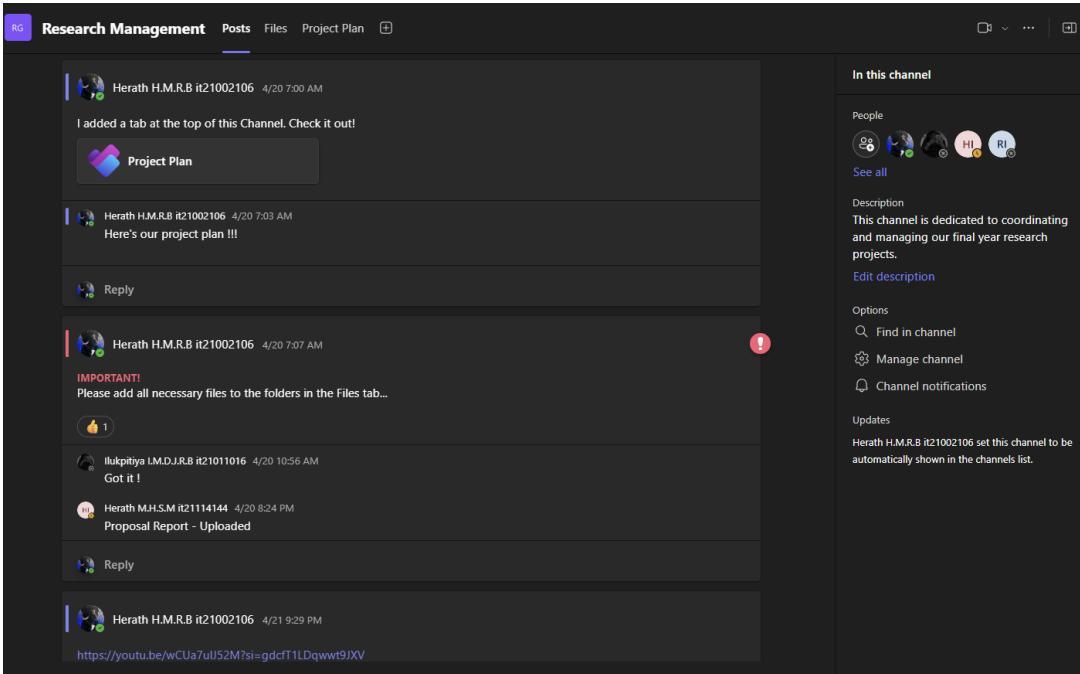


Figure 28 Chats in the MS Teams

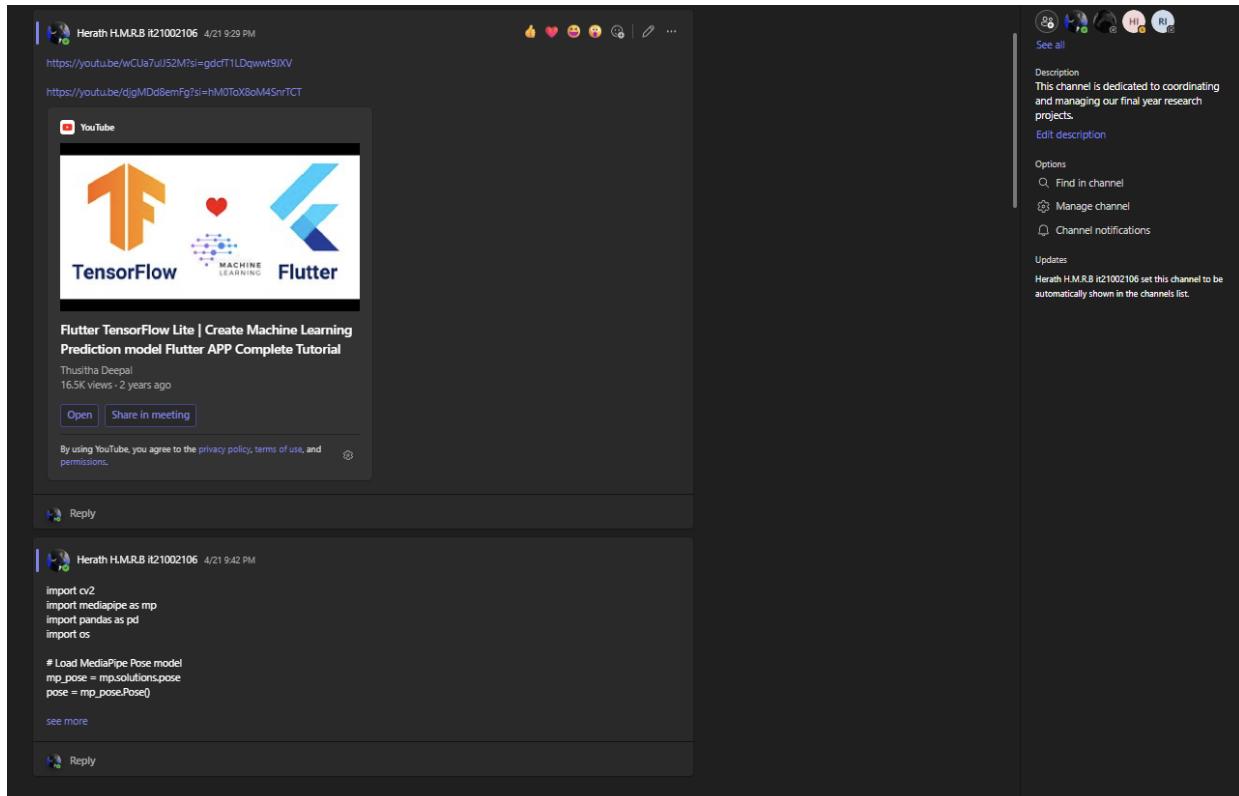


Figure 29 Chats in the MS Teams

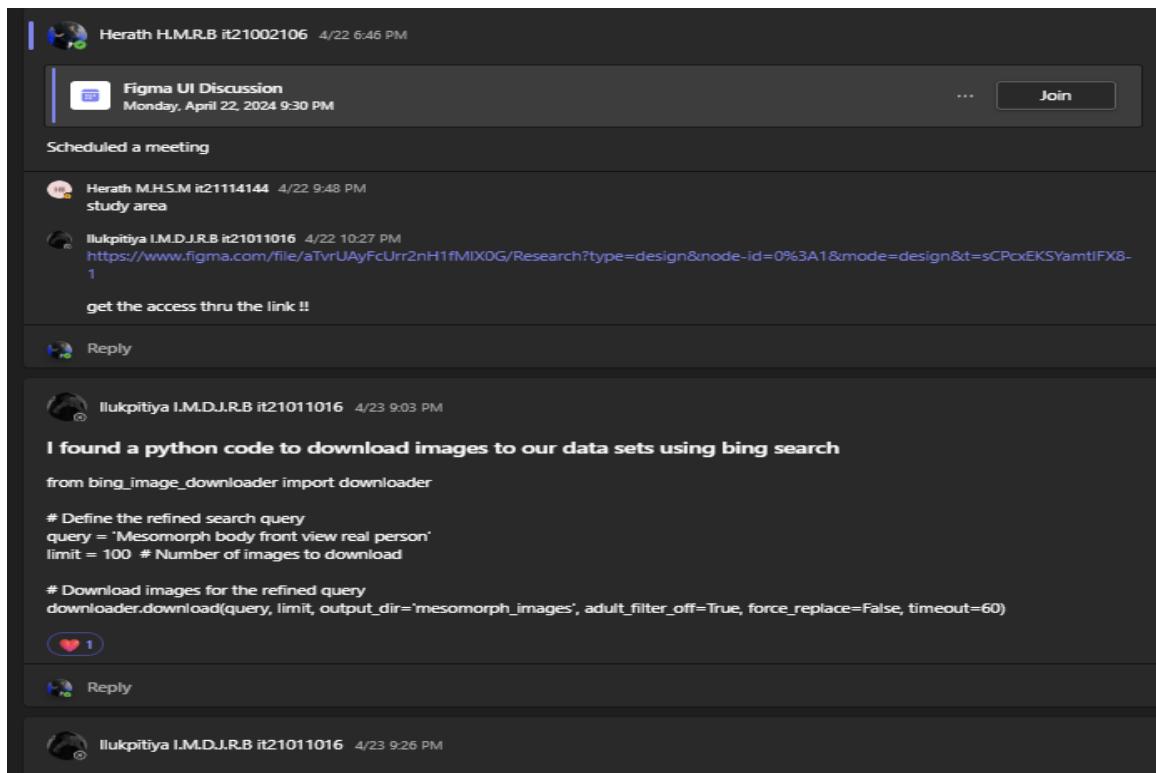


Figure 30 Chats in the MS Teams

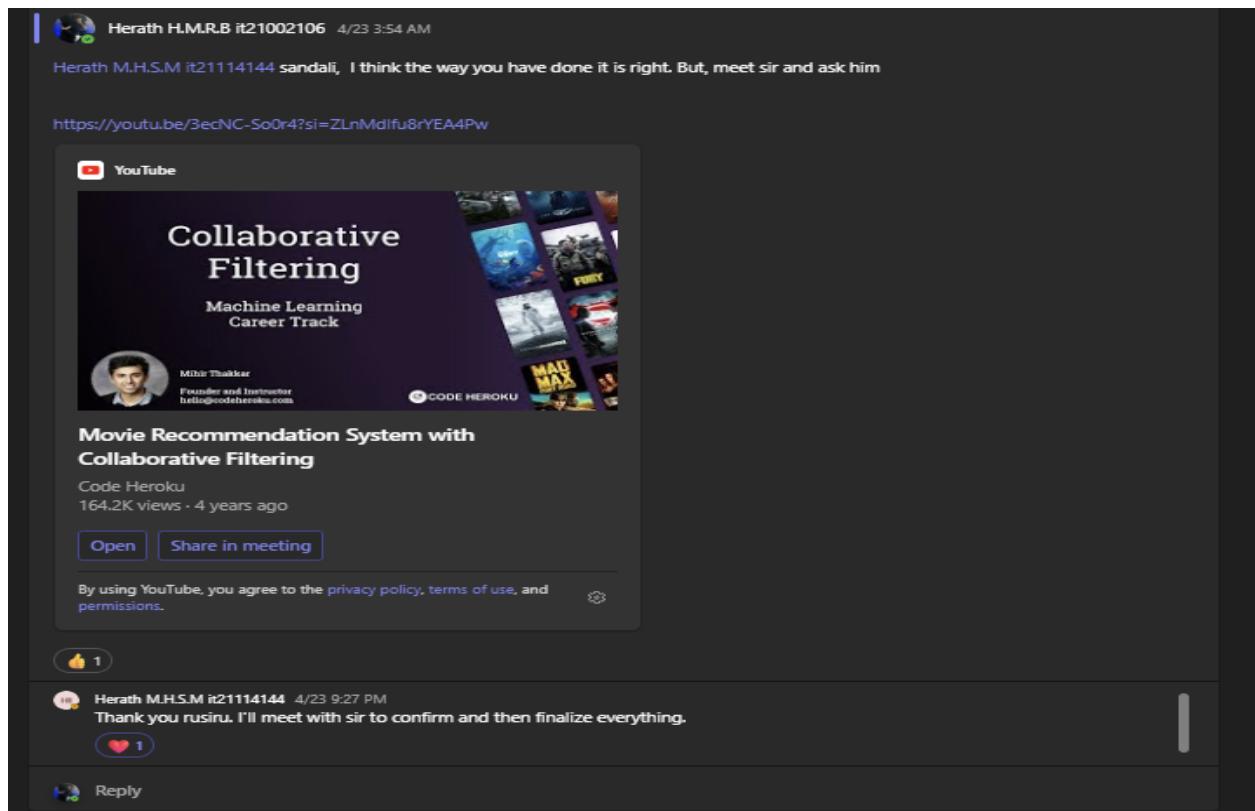


Figure 31 Chats in the MS Teams

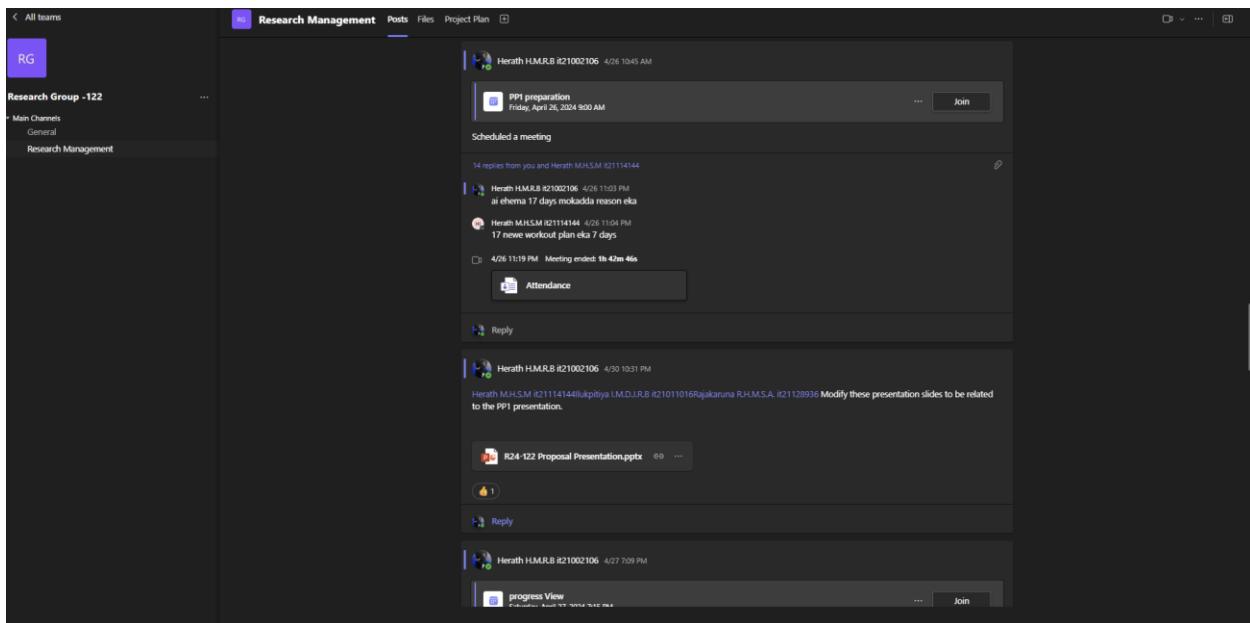


Figure 32 Chats in the MS Teams

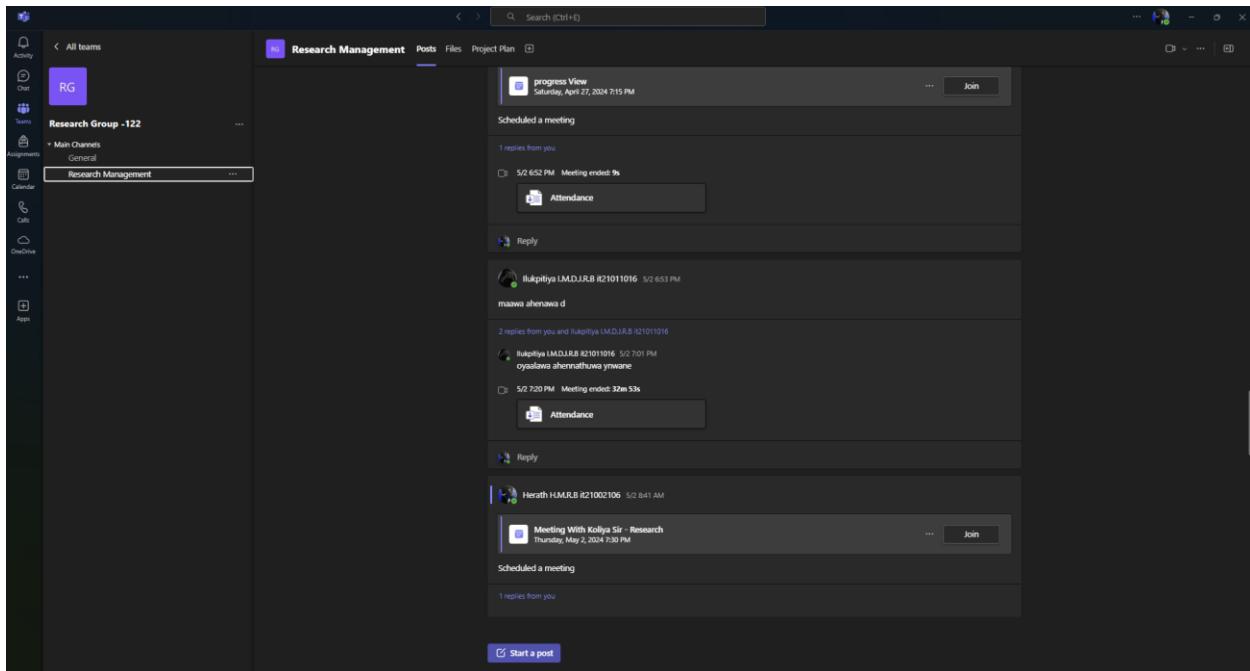


Figure 33 Chats in the MS Teams

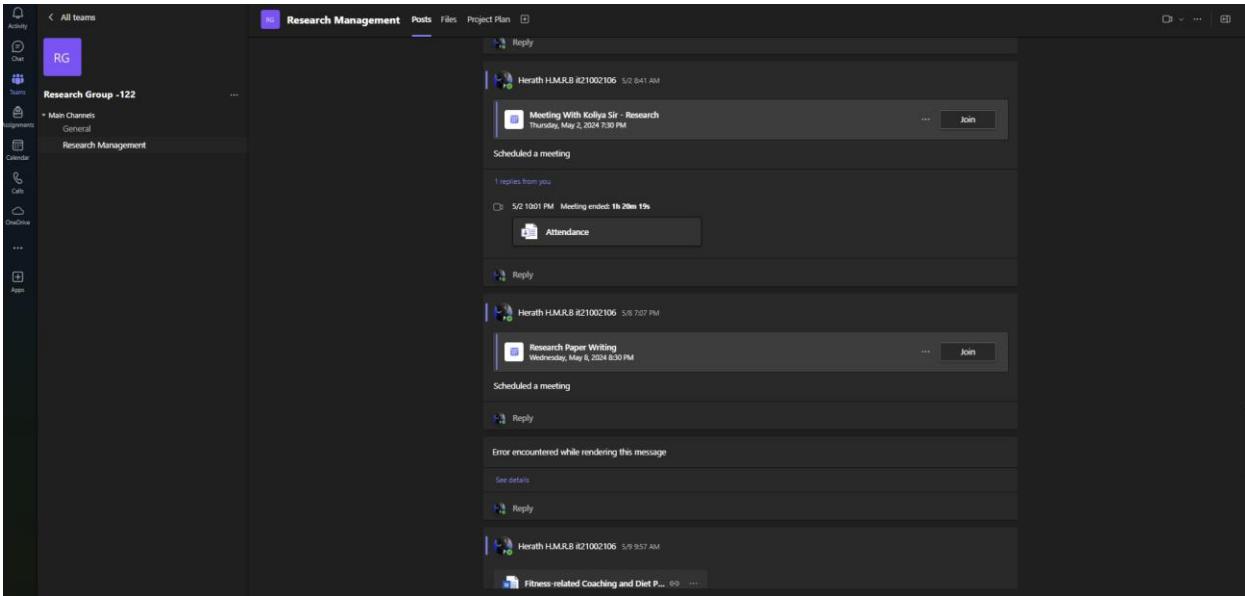


Figure 34 Chats in the MS Teams

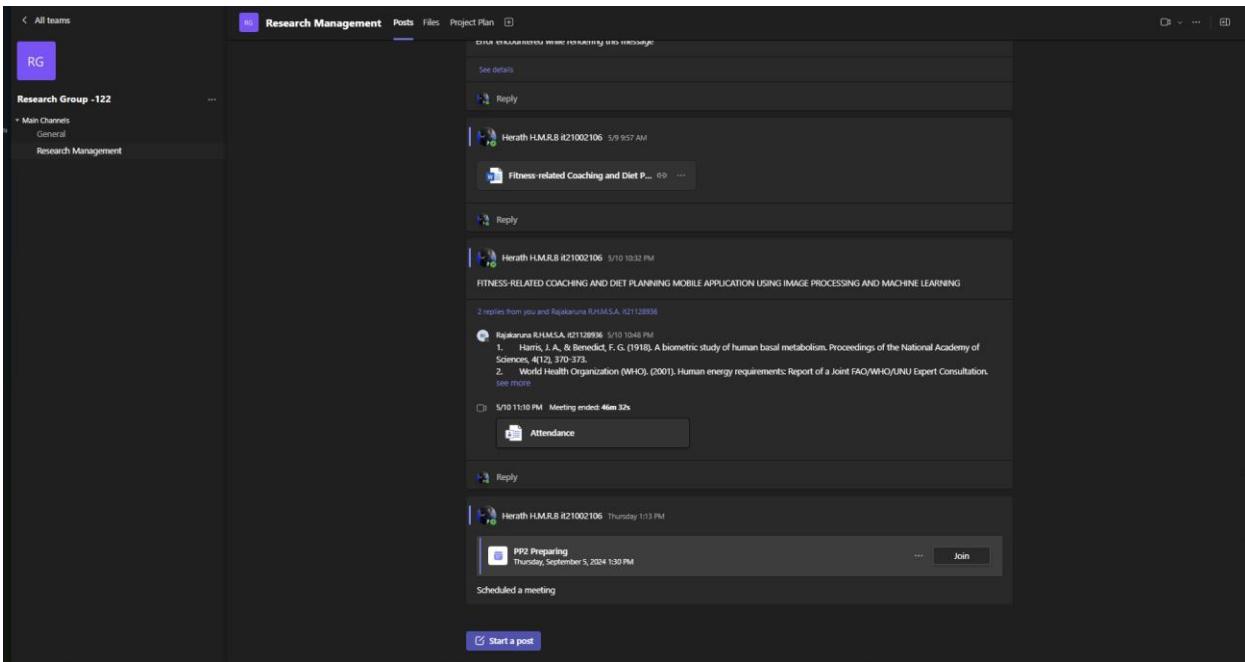


Figure 35 Chats in the MS Teams

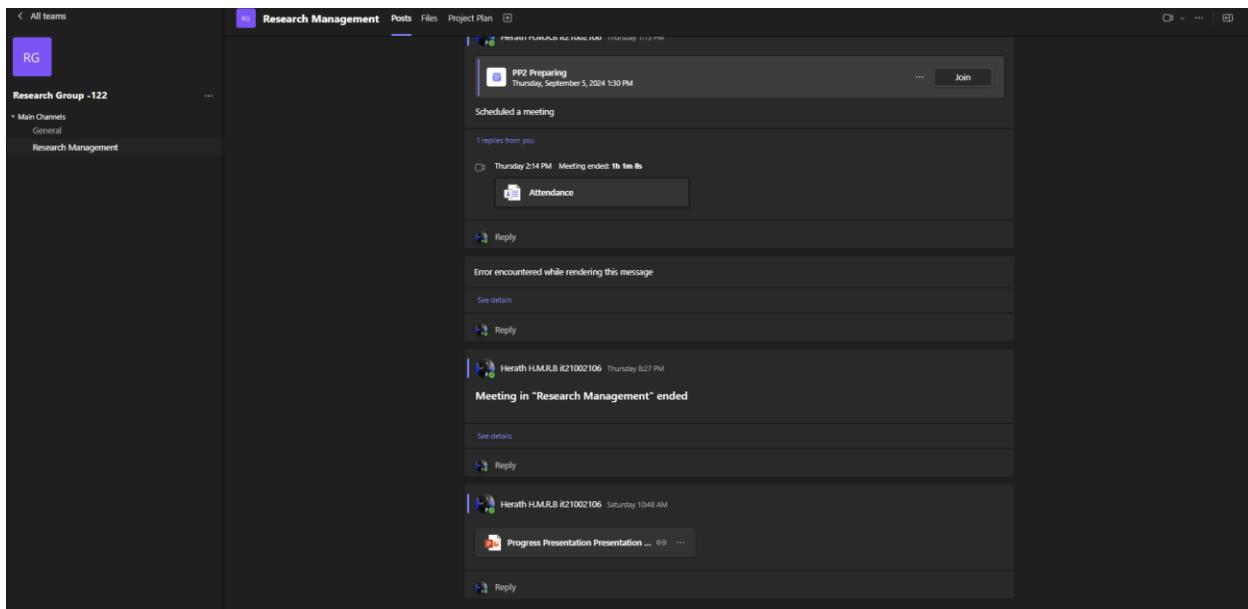


Figure 36 Chats in the MS Teams

## 14. Screenshots of the calls in MS Teams & WhatsApp

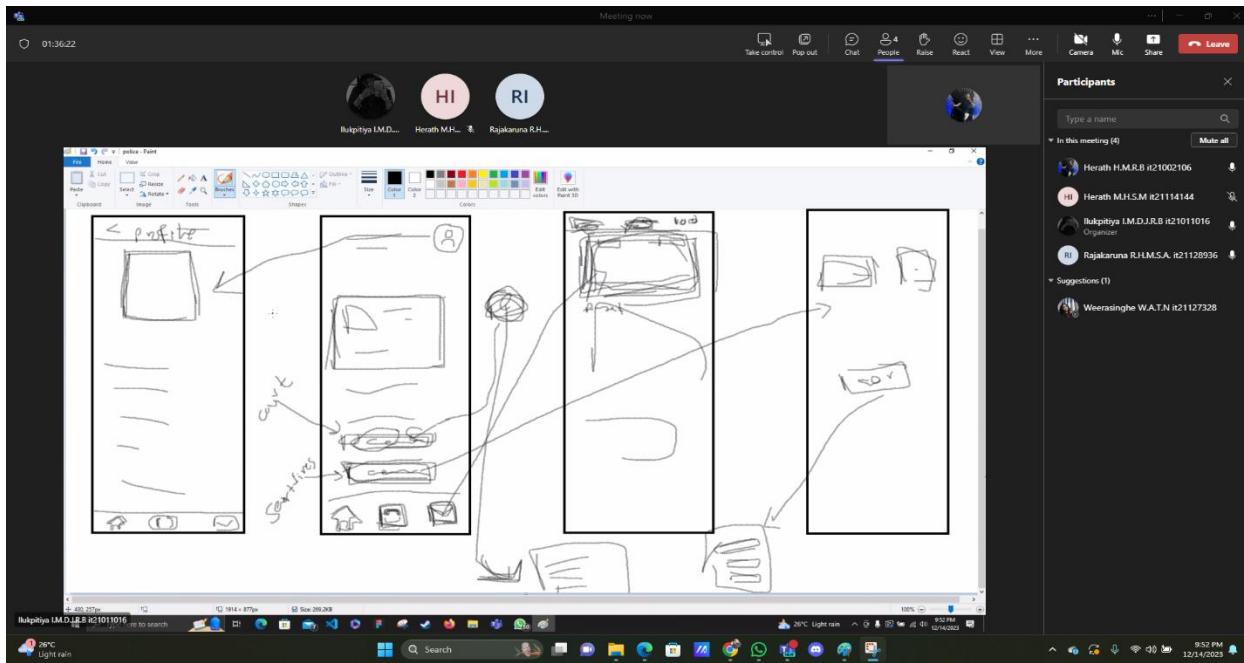


Figure 37 Online Meeting with team members through Microsoft Teams - 14.12.2023.

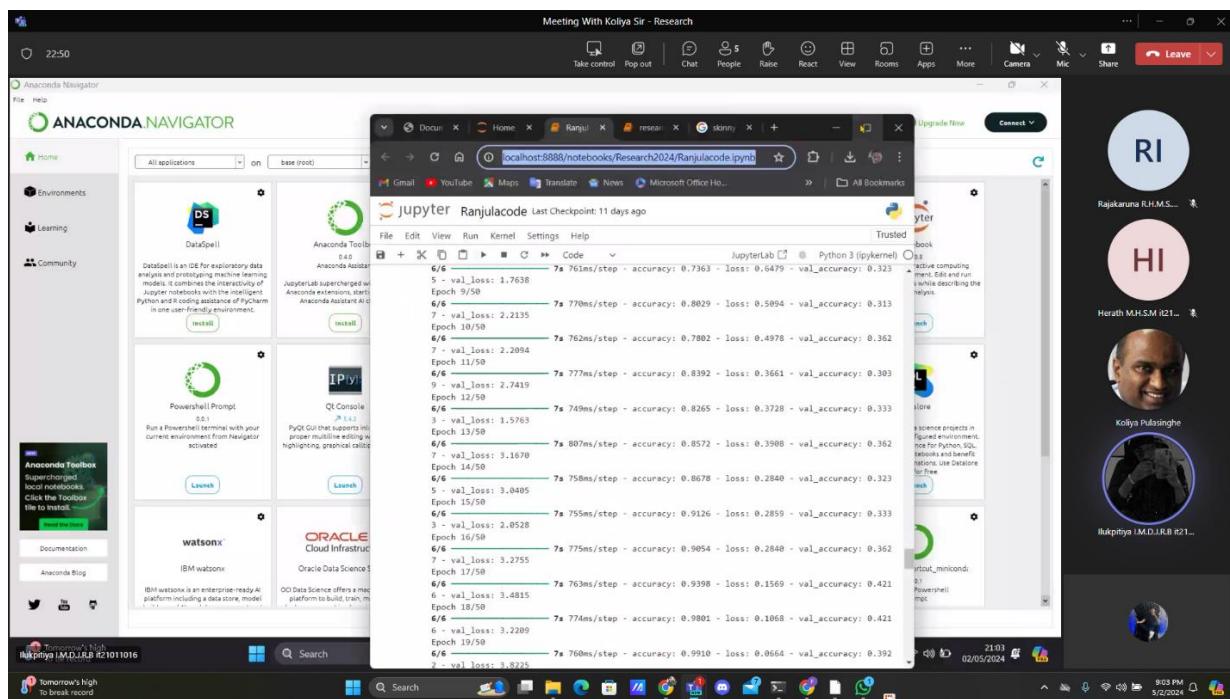


Figure 38 Online Meeting with the Supervisor

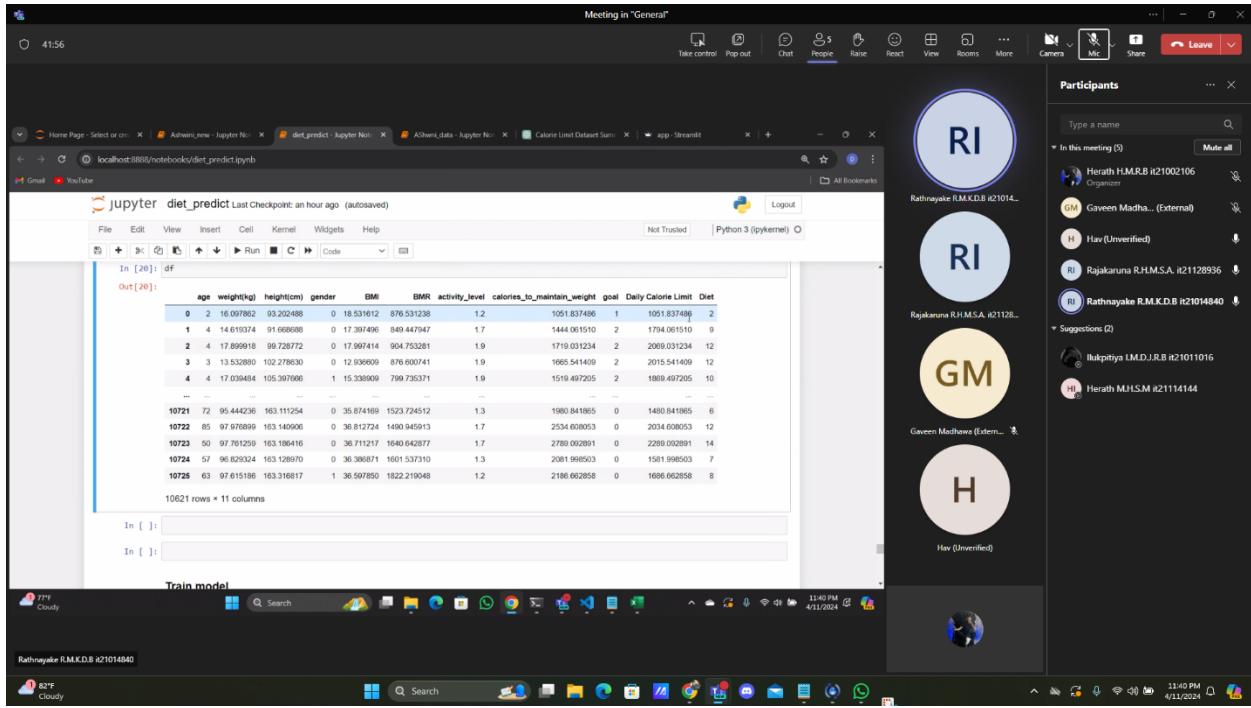


Figure 39 Meeting with a senior graduate - 11.04.2024.

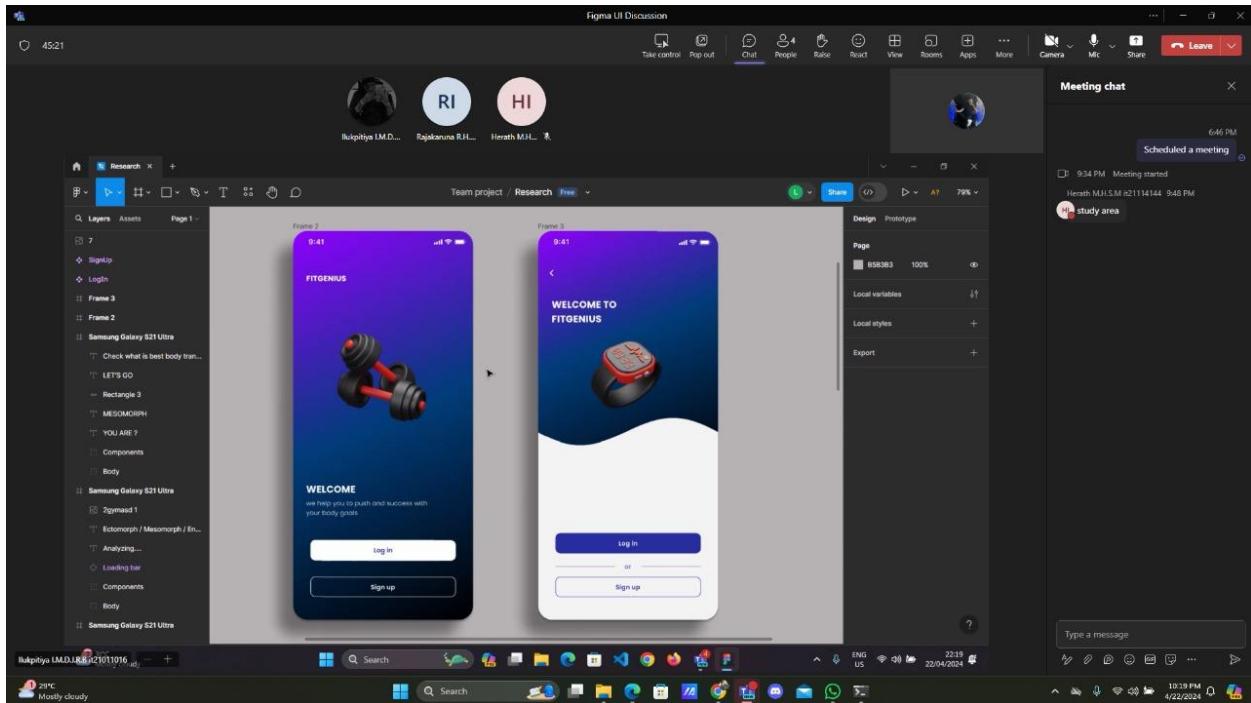


Figure 40 Online Meating with team members through Microsoft Teams 22.04.2022.

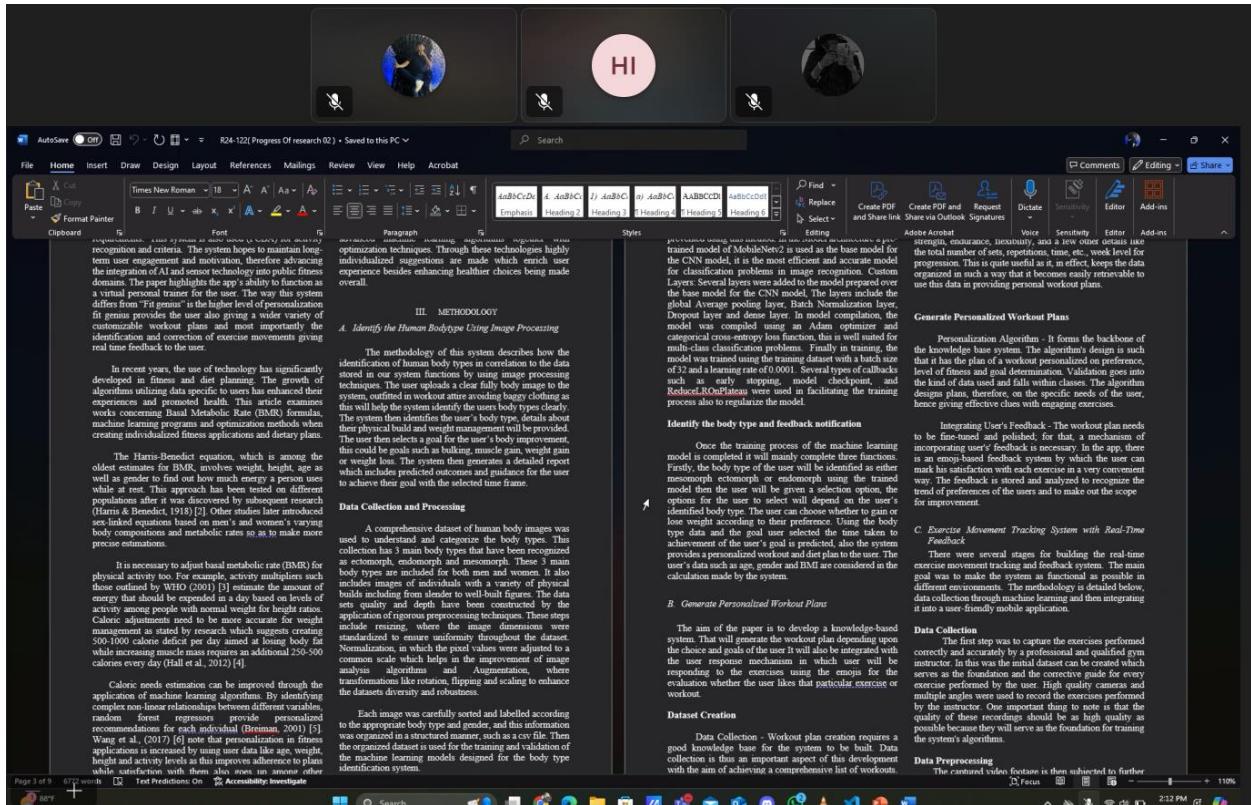


Figure 41 Meeting to write and edit the research paper with group members

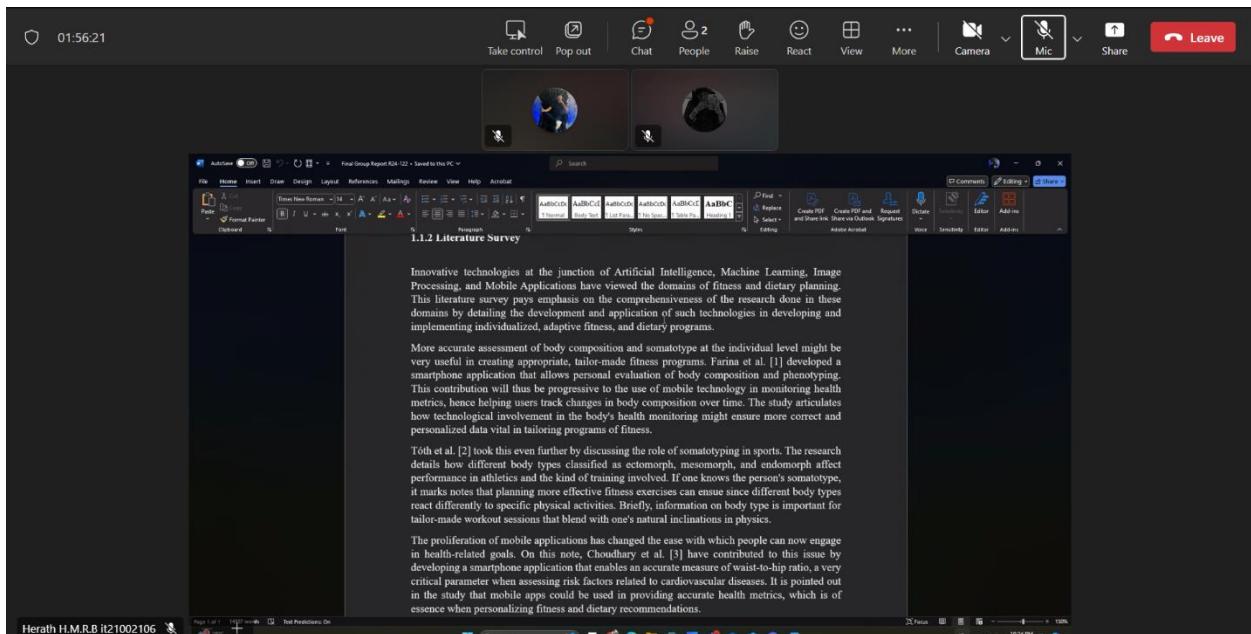


Figure 42 Meeting to write and edit the research paper with group members – 16.08.2024

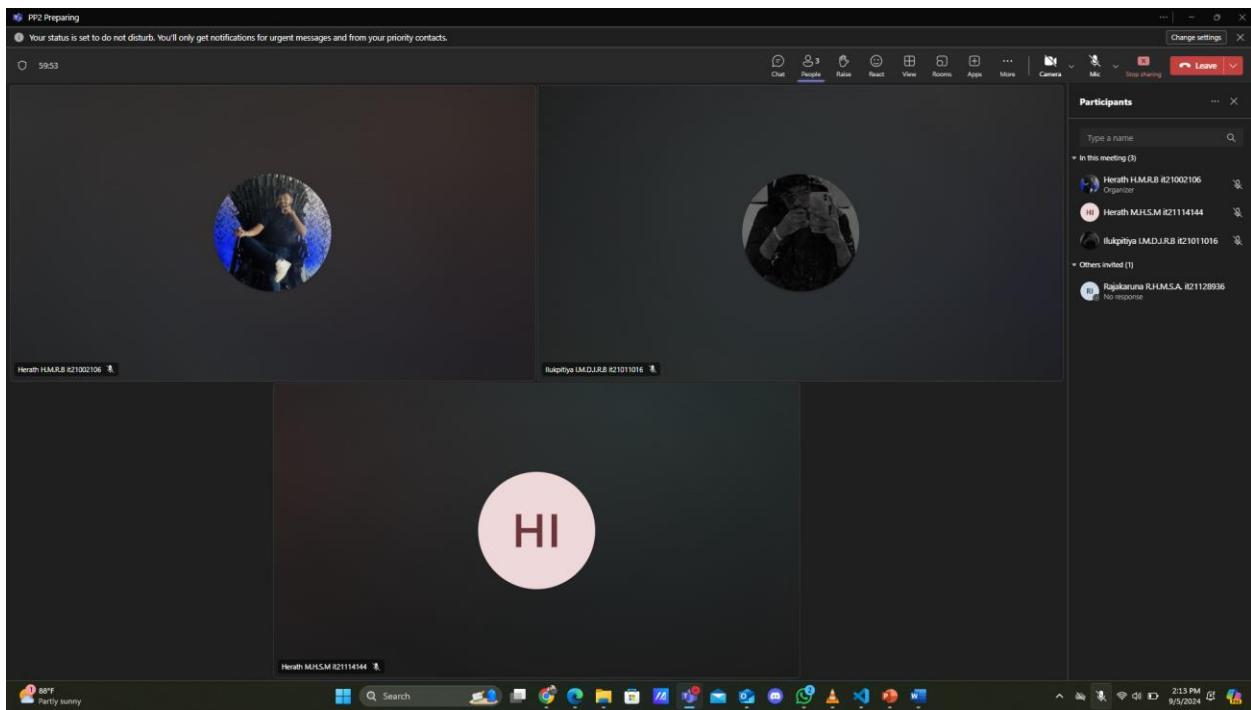


Figure 43 Meeting with the Group members to prepare PP2

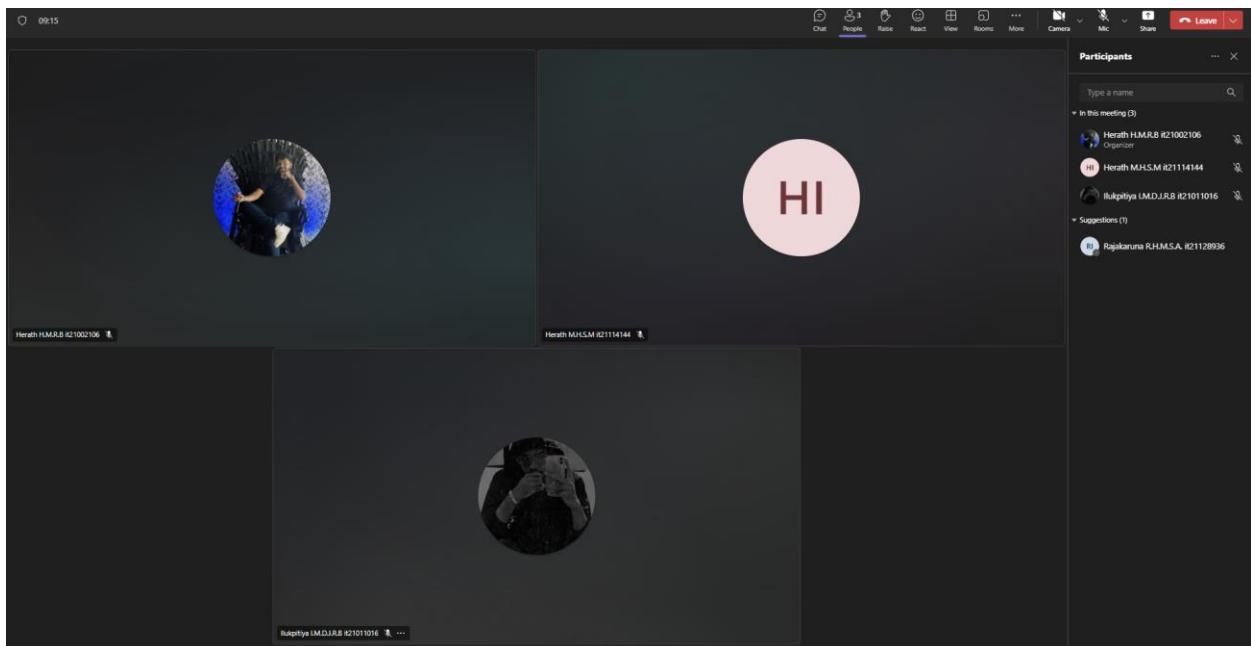


Figure 44 Meeting with the Group members to prepare PP2

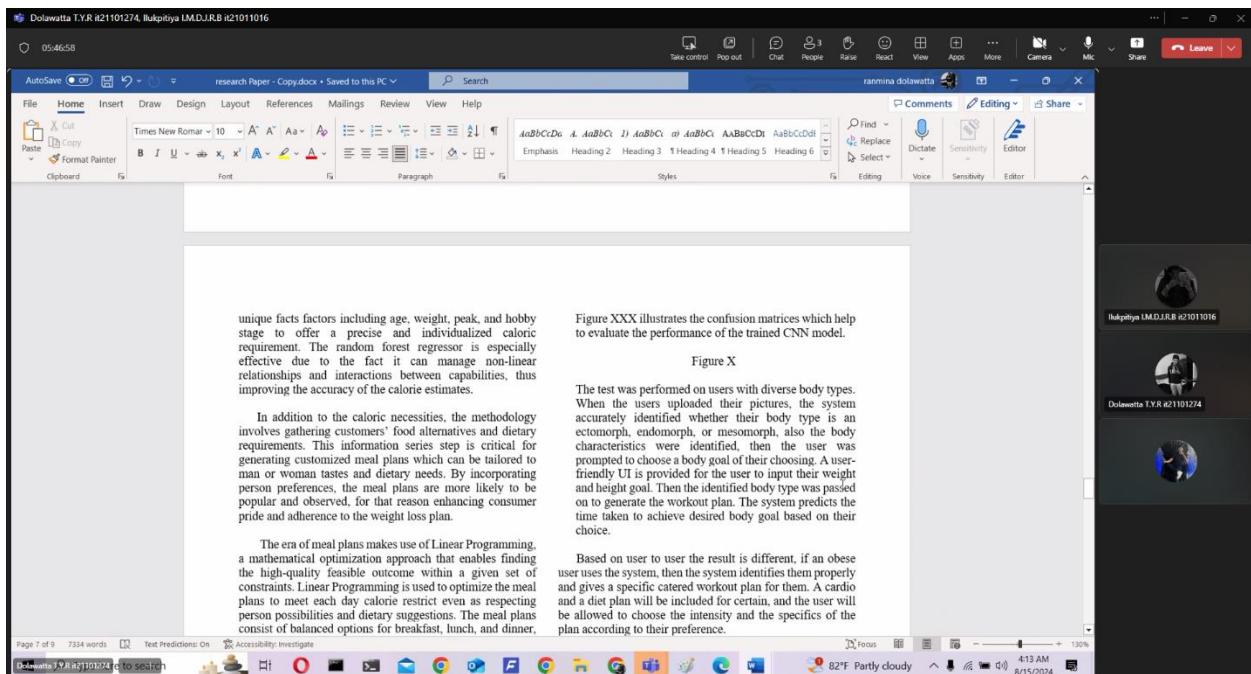


Figure 45 English proof reading with an external editor

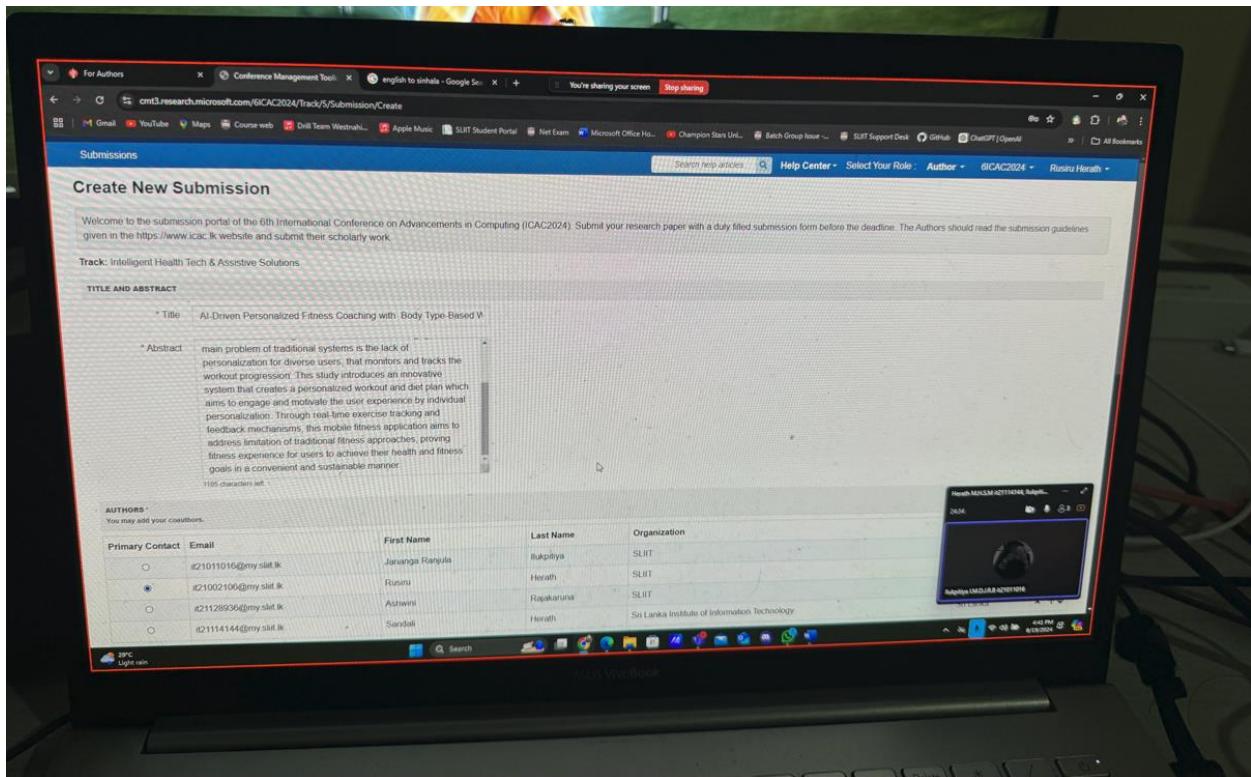


Figure 46 Meeting taken prior to the ICAC research paper submission

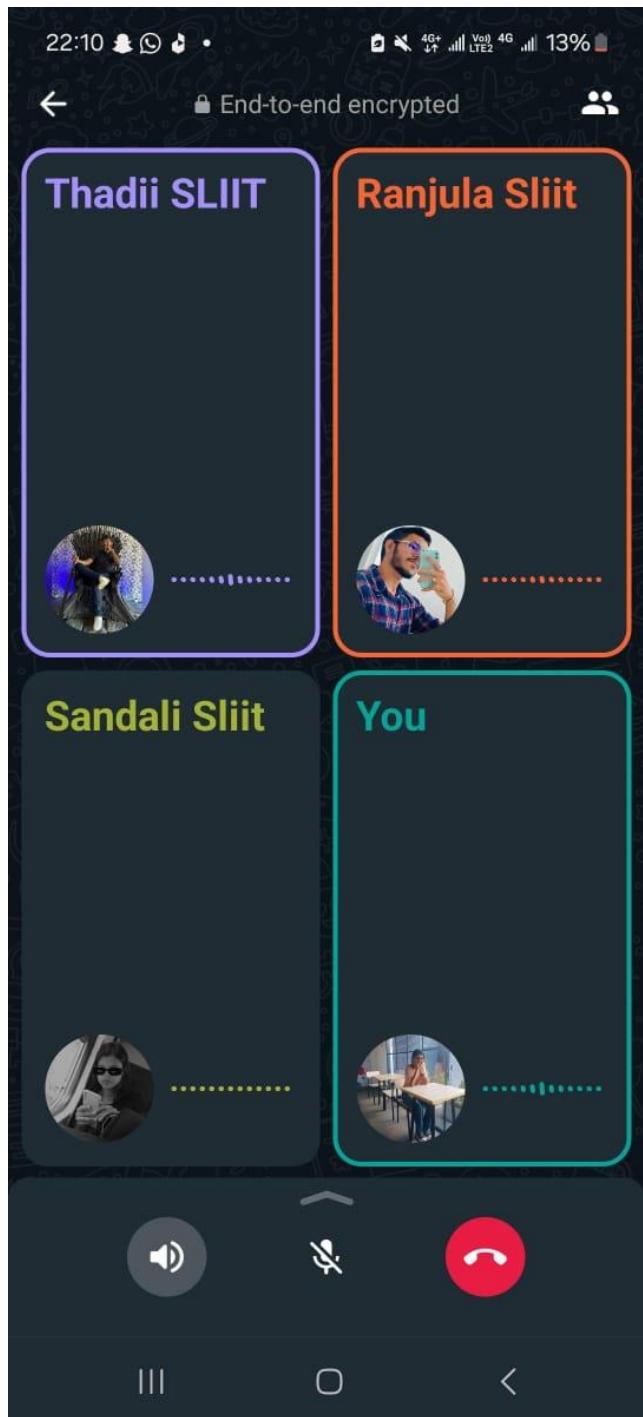


Figure 48 WhatsApp call 1 with group member

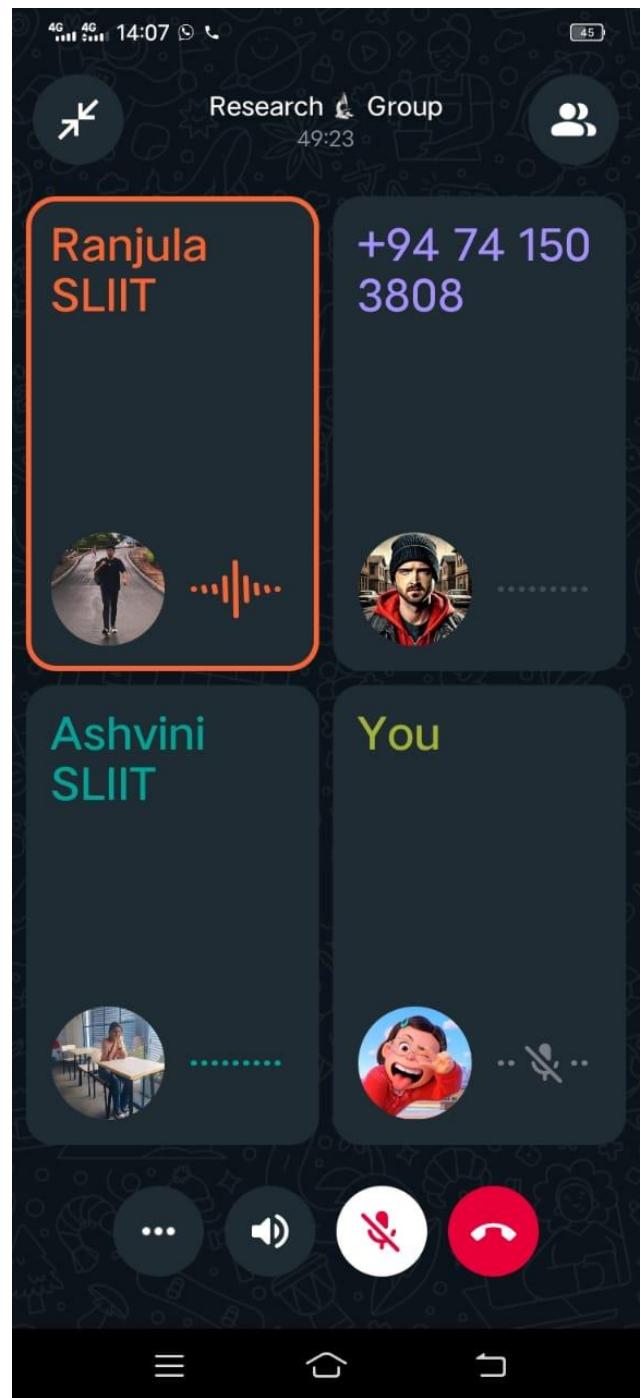


Figure 47  
WhatsApp call 2 with group member

## 15. Field visit for data collection

With Nilantha Namal Thilakarathana - Manager at Life Gym Bopitiya & Senior instructor at cuts & curves fitness Kandy



Collected the right exercises from an expert gym instructor to create the dataset,



## **16. Project Completion Criteria**

- 1. Proposal Presentation**

Date: 21st February 2024

- 2. Proposal Report**

Date: 29th February 2024

- 3. Progress Presentation I**

Date: 6th May 2024

- 4. Status Document I**

Date: 6th May 2024

- 5. Final Report**

Date: 23rd August 2024

- 6. Research Paper**

Date: 31st August 2024

- 7. Progress Presentation II**

Date: 9th September 2024

- 8. Status Document II**

Date: 11th September 2024

- 9. Project Website**

Date: 21st October 2024

- 10. Final Presentation & Viva**

Date: 28th October 2024

- 11. Research Logbook Submission**

Date: 20th November 2024