



# **Enhancing Personalized E-Learning: A Novel Approach to Adaptive Learning Pathways for Individualized Knowledge Acquisition**

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## 1. Introduction

The education sector has been through key changes bearing in mind the current introduction of the technological innovations in learning. With more students out there, who do not fit to the traditional one size, one approach system of learning, it has become harder to cater for all the students hence the development of adaptive learning systems. Such systems use AI and ML technologies to adapt the content to students and their responses, and furthermore rely on the responses given by the newcomer.

Past research has pointed out that tailored instruction is essential for increases in students' performance. Research proves that when the delivery of the content is done with the help of adaptive learning platforms, the engagement, retention as well as the knowledge retention goes up significantly. However, there are several, if not many, learning systems with an adaptive version, which can be often problematic for providing timely changes of the learning paths in line with student progress and/or reviews.

For instance, the first forms of adaptive learning models including Intelligent Tutoring Systems (ITS), and Massive Open Online Courses (MOOCs) tried to integrate triune parameters of personal learning but most of them did not have the feedback mechanism that can change the learning paths constantly. Most of these models therefore incorporate pre-specified pathways or feedback cycles, which restrict the model's evolution as students advance through different stages of learning.

Adaptive learning has evolved over time and with the current research presented here a new dynamic adaptive system is added in which the learner data and the model is updated dynamically, and the learning is personalized for the initial data of the student as well as the dynamic data of an adaptive learner. The envisioned system is to incorporate dynamic learning paths and feedback loops which will then make the learning process more flexible and engaging and assist students gain improved results due to delivery of pertinent material at profitably timed intervals.

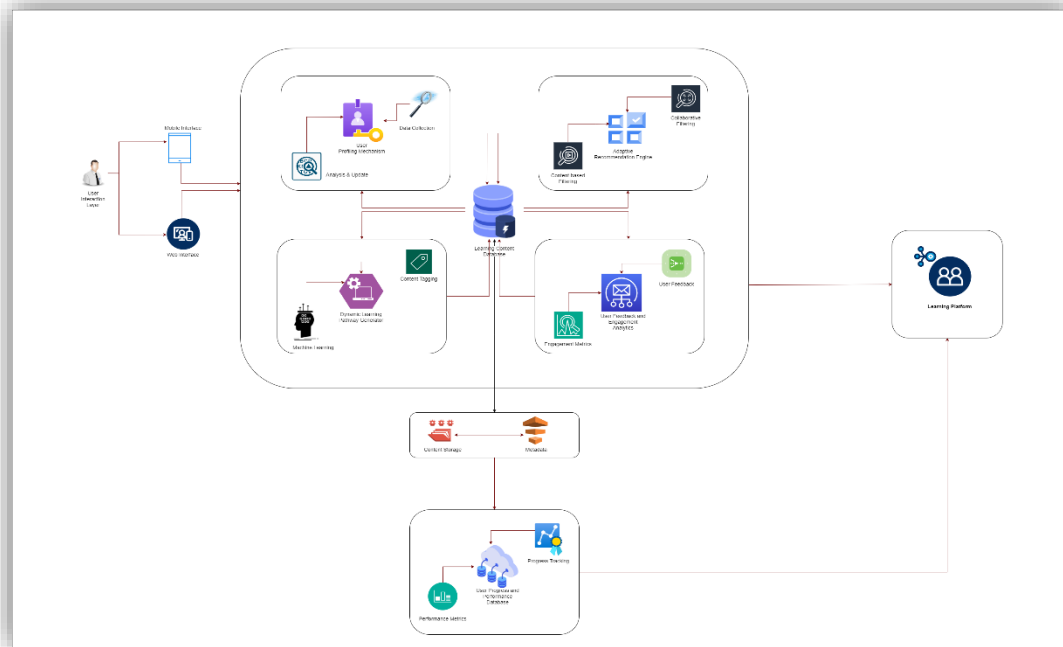


Figure 1: System Diagram

## 2. Gantt Chart

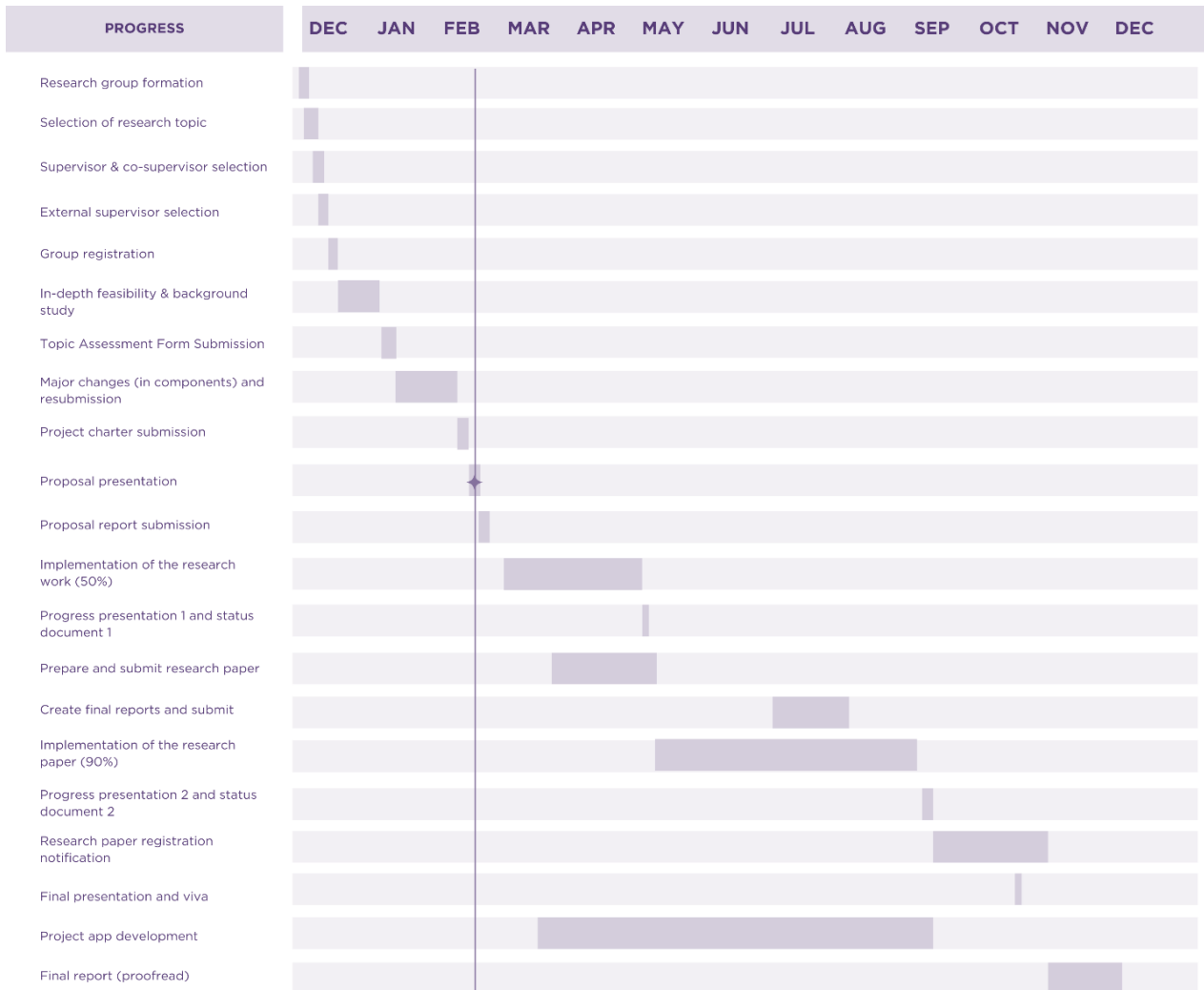
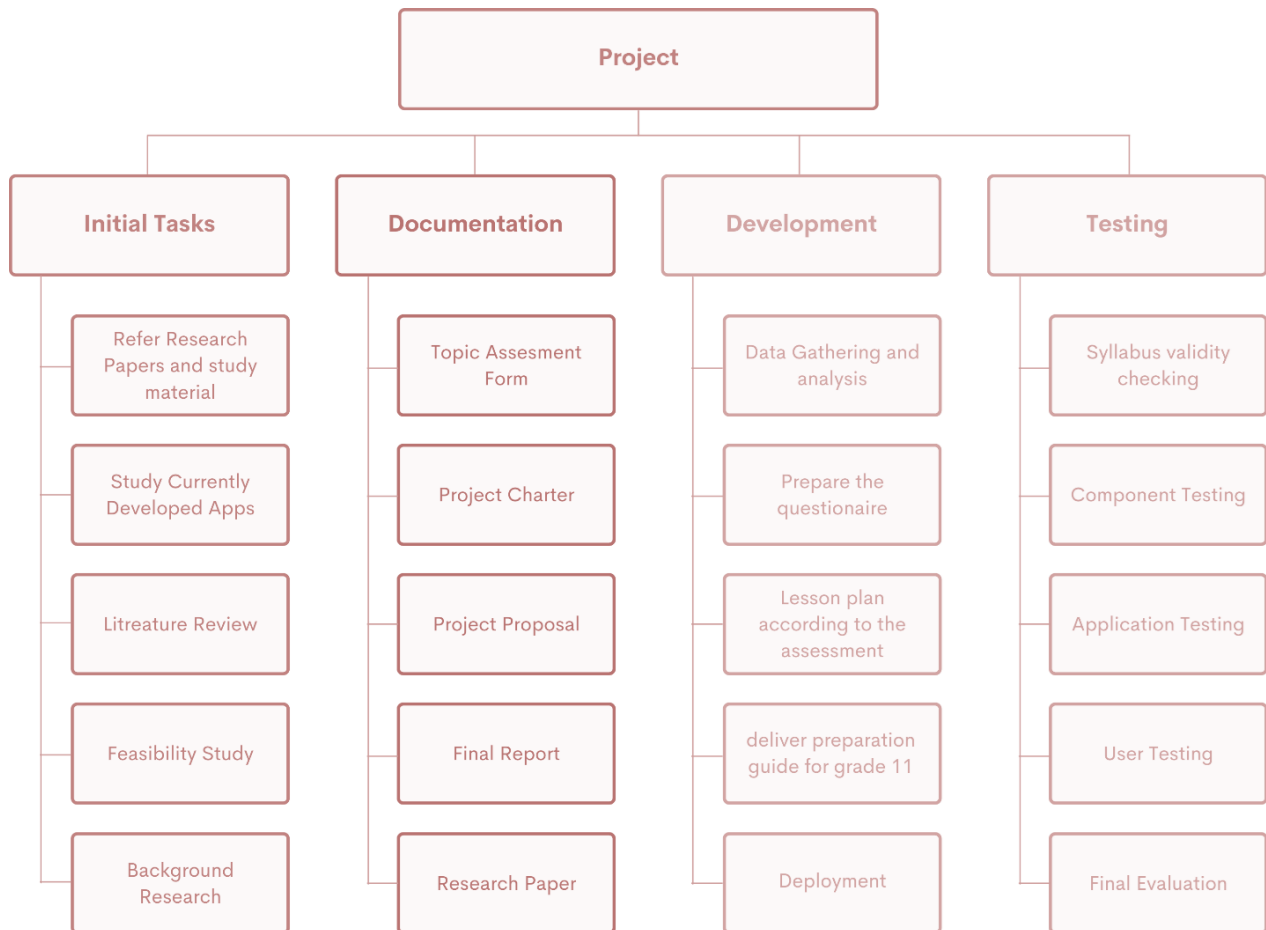


Figure 2:Gantt Chart

### 3. Work Breakdown Structure



*Figure 3: Work Breakdown Structure*

#### 4. Screenshots of Supervisor Meeting

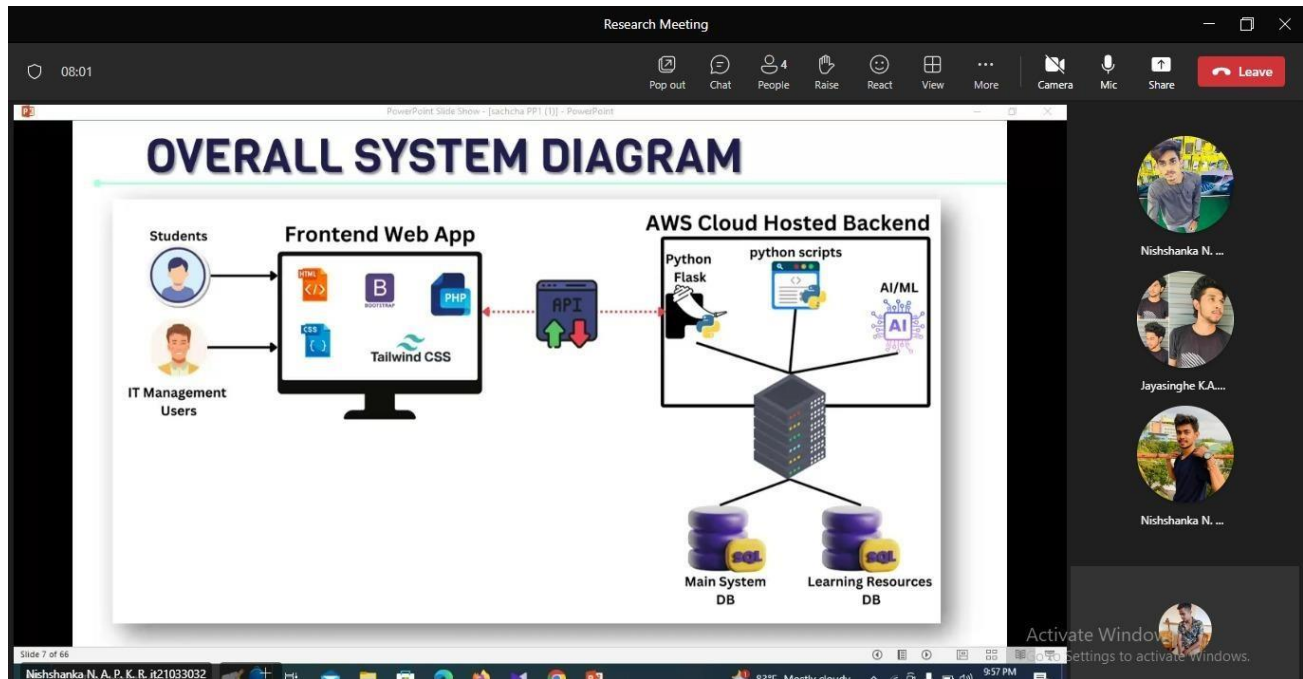


Figure 4: Personal Group Meetings

The screenshot shows a Zoom meeting window titled "Research Meeting". The main content is a PowerPoint slide titled "OVERALL RESEARCH PROBLEM". The slide lists four bullet points:

- **Lack of Personalization:** E-learning platforms struggle to tailor personalized learning experiences to individual preferences and learning styles.
- **Generic Approaches:** Current systems use content delivery methods that don't maximize user engagement or knowledge retention.
- **Limited Adaptability:** Most platforms can't dynamically adjust to diverse learner needs, creating difficulties in accessing relevant materials.
- **Gap in Literature:** There's a lack of research on developing adaptive machine learning models for customizing learning pathways in online education.

The Zoom interface shows a list of participants on the right, including Abeykoon R.M.S.P it21021602, Jayasinghe K.A.K.N it21032806, Nishshanka N. A. G. A it21032..., Nishshanka N. A. P. K. R. it21033..., and Sanji Chandrasiri (Guest) Meeting guest. The meeting is titled "Research Meeting" and the time is 01:00:28.

Figure 5: Supervisor Meeting



## 5. Screenshots of Teams Planner

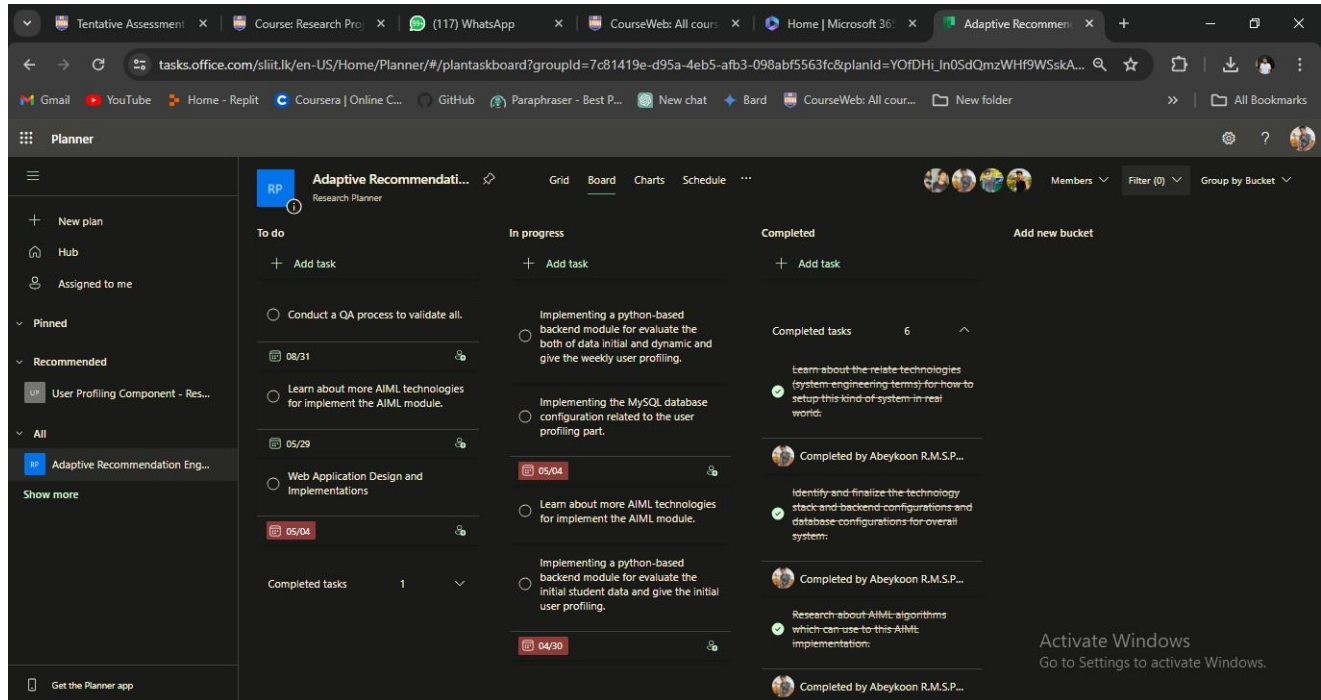


Figure 6 : Task Board

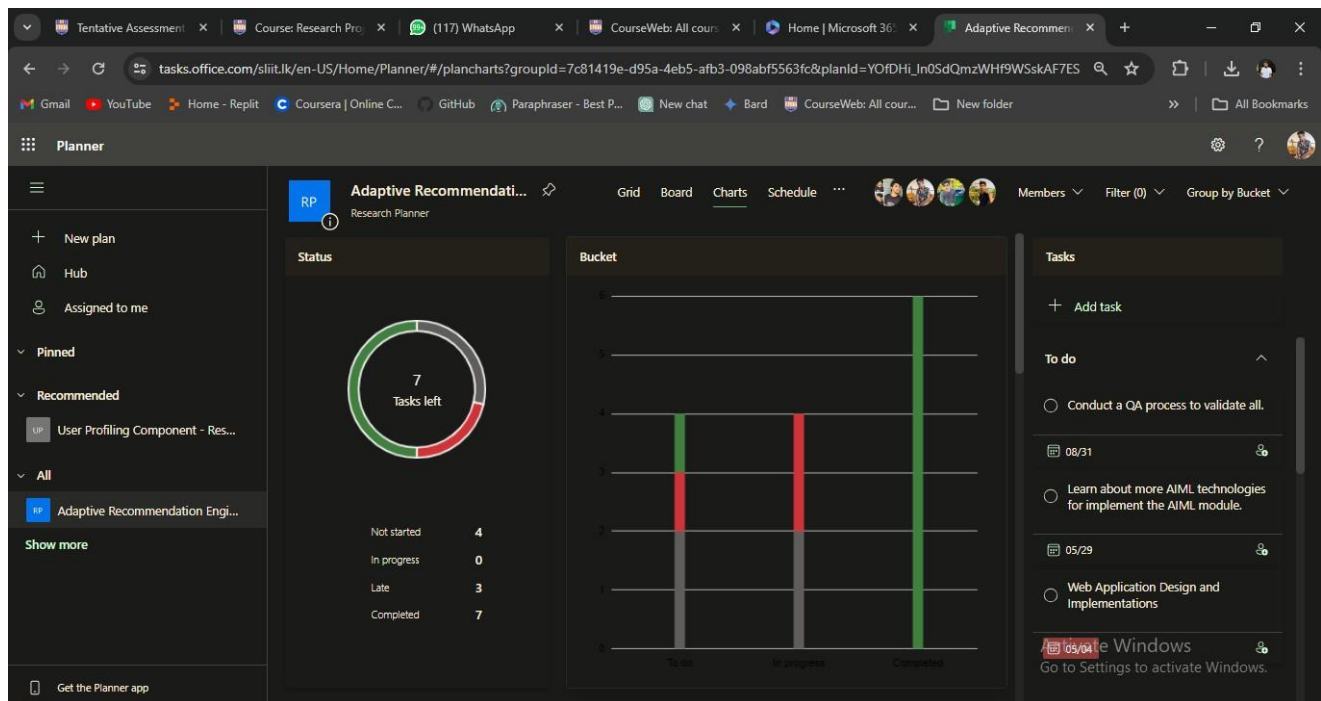


Figure 7 : Task Charts

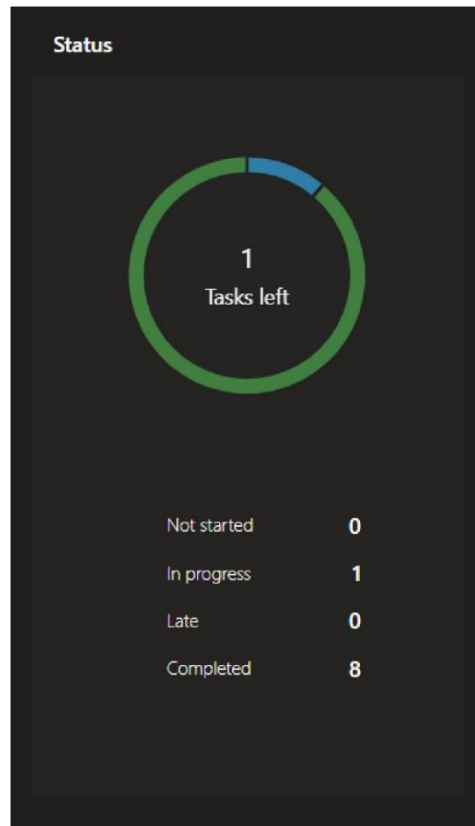


Figure 8: Project View of MS Planner

## 6. Teams Chat

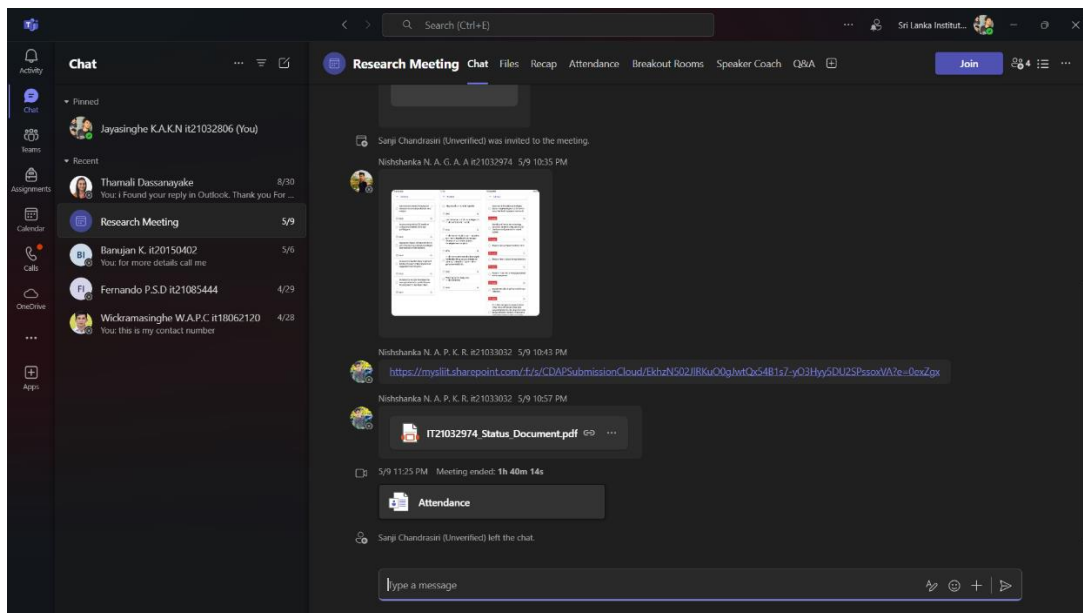


Figure 9 : Teams Chat

## 7. WhatsApp Chat

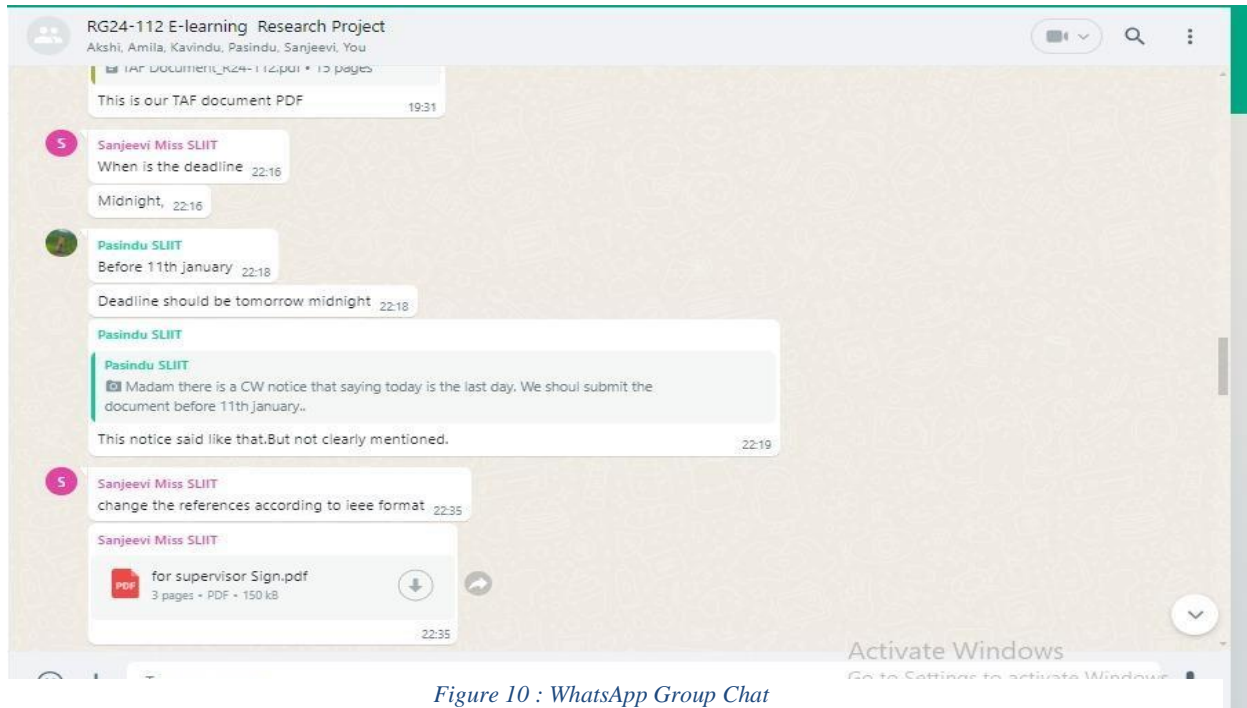


Figure 10 : WhatsApp Group Chat

## 8. Outlook Mails

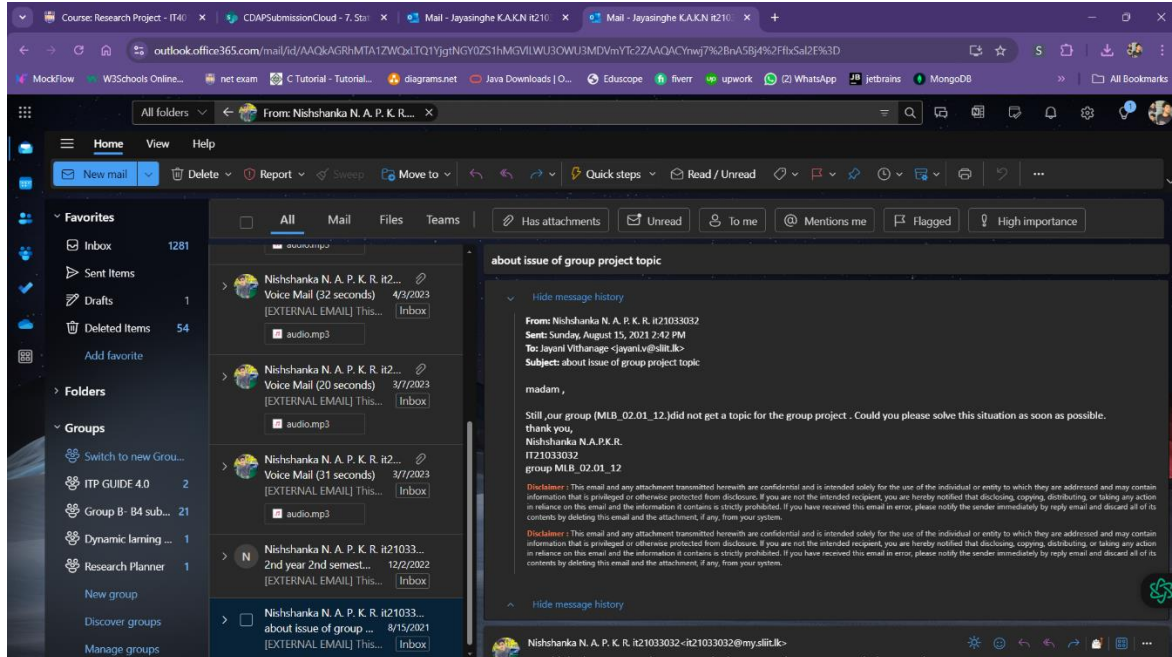


Figure 11 : Outlook Mails

## 9. Flow Chart

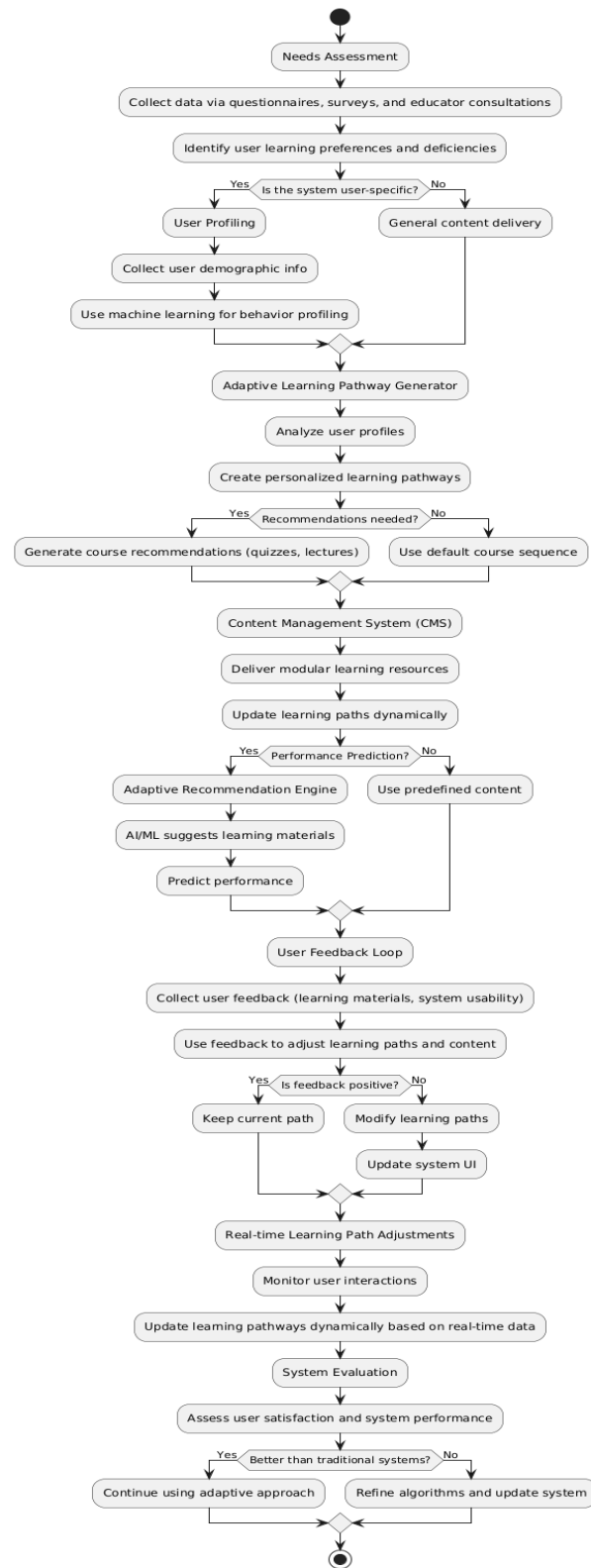


Figure 12 : Flow Chart

## 10.Completed UIs

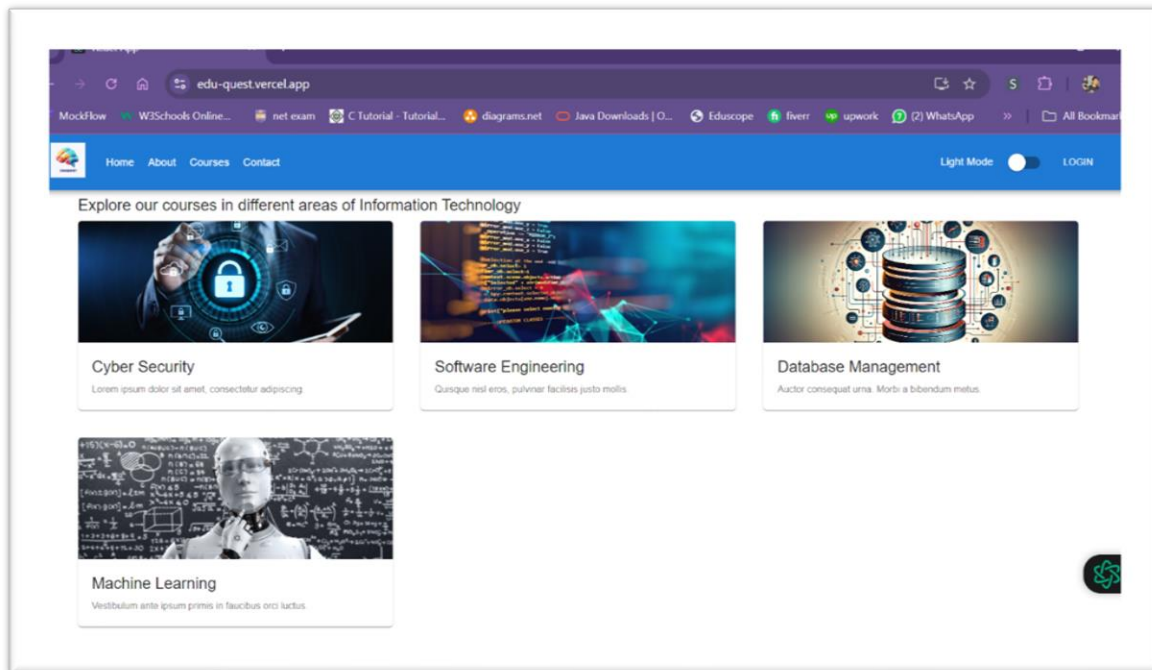


Figure 13: Sample Front-end - Dashboard

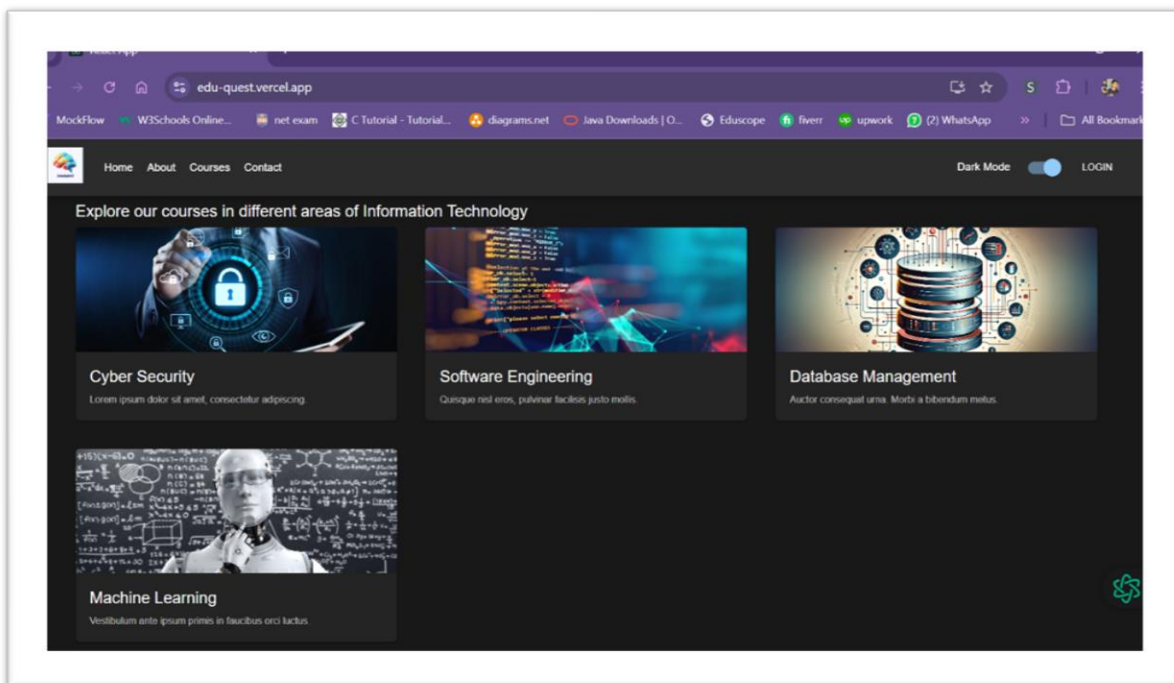


Figure 14: Front-End Dark Mode Active (UX)

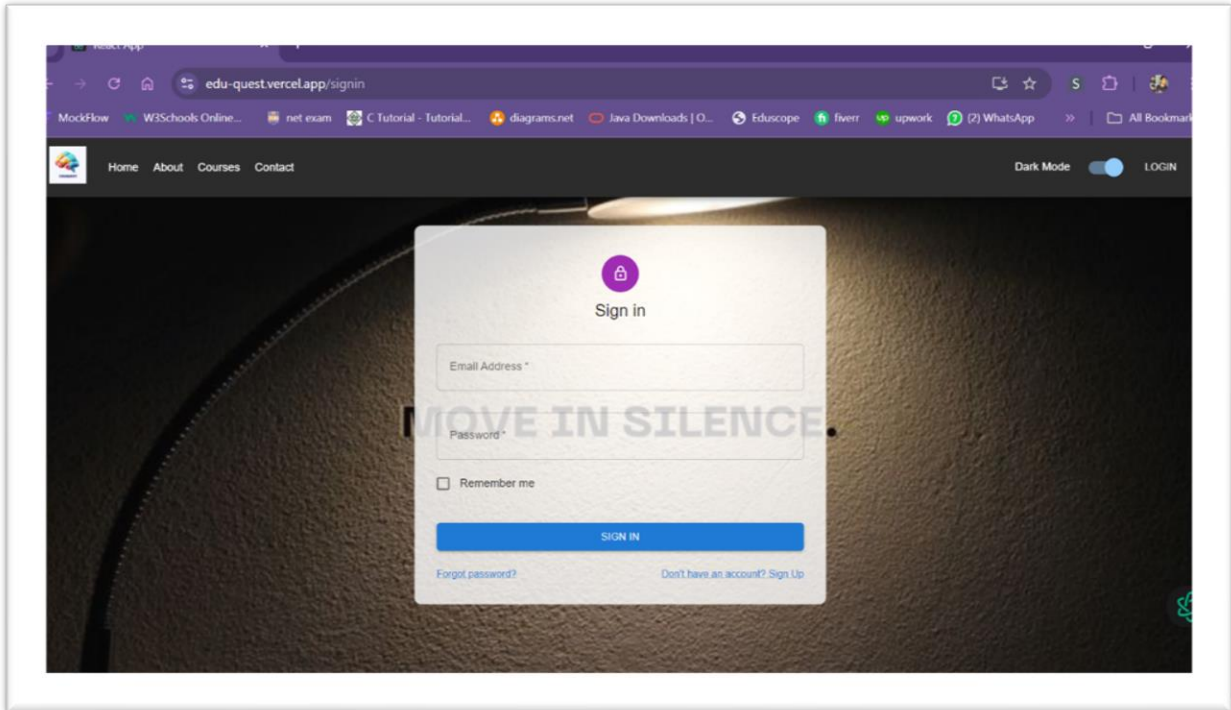


Figure 15: Sign In Interface

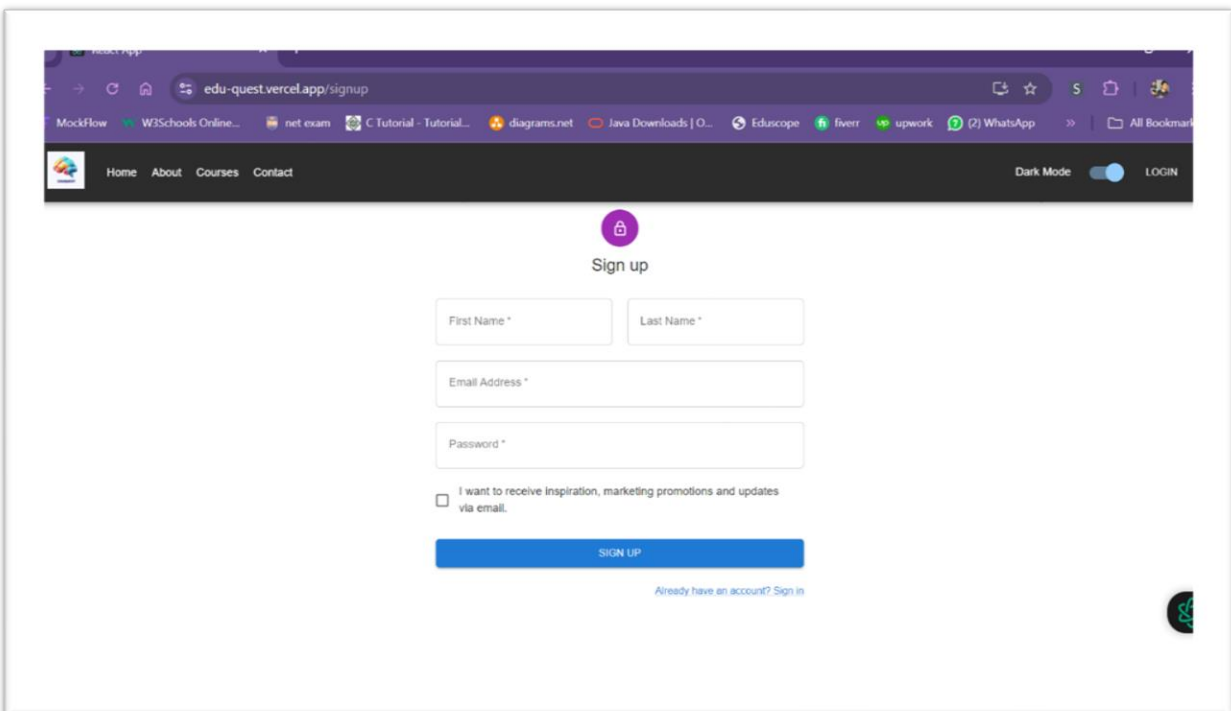


Figure 16: Sign Up Interface





Figure 17: Mobile Responsive Frontend

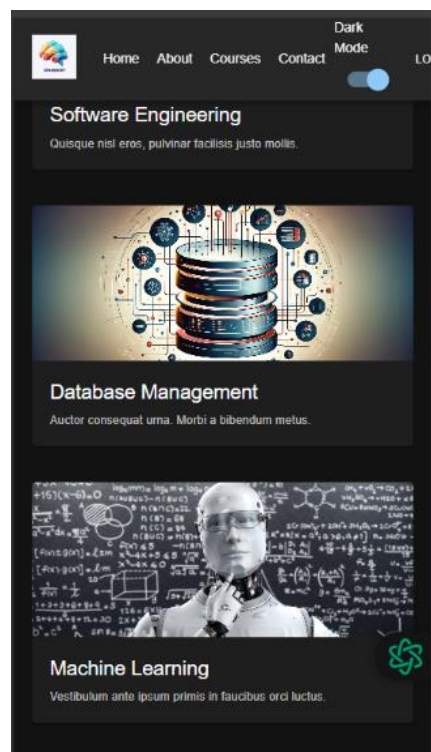


Figure 18: Mobile Responsive Frontend- Sample 2

### Focus

Subject

Artificial Intelligence and Machine Learning

Course Score

85

Learning Score

78

Quiz Score

90

PREDICT

Predicted Complexity: Advanced

Predicted Learning Content: Assignment

Figure 19: Results Were Checked from Frontend and Got the Outputs ( SLPM)

### Performance

subject

Artificial Intelligence and Machine Learning

course\_score

75

learning\_score

80

quiz\_score

85

PREDICT

Predicted Recommendation: IT Project Management

Figure 20: Inputs were passed to the URL and the outputs were received (ARE)



Progress

Proficiency level  
Medium

Preferred subjects  
Software

Preferred study times  
Morning

Goals  
Short-term

Curriculum structure  
Exam

Available content  
Lectures

External factors  
Time Constraints

Figure 21: testing frontend (DLPG)

Available content  
Lectures

External factors  
Time Constraints

Time spent on different types of content  
10

Completion rates  
7

Quiz scores  
80

PREDICT

Predicted Class: Visual

Figure 22: results were retrieved successfully (DLPG)

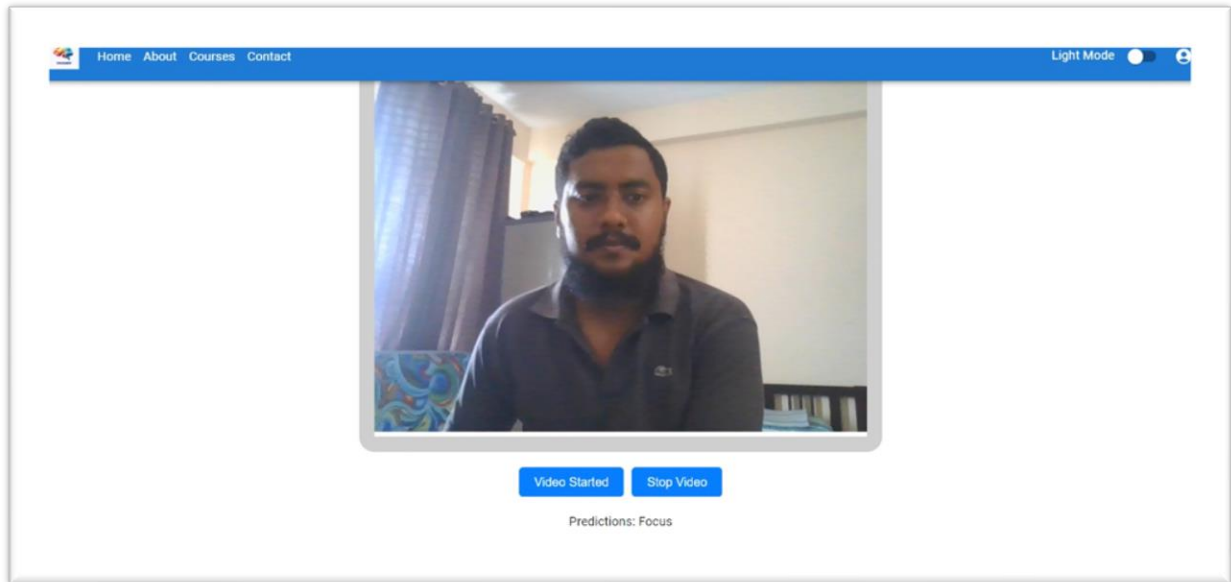


Figure 23: flask app connected to frontend and the checked with Realtime video (CUIFL)

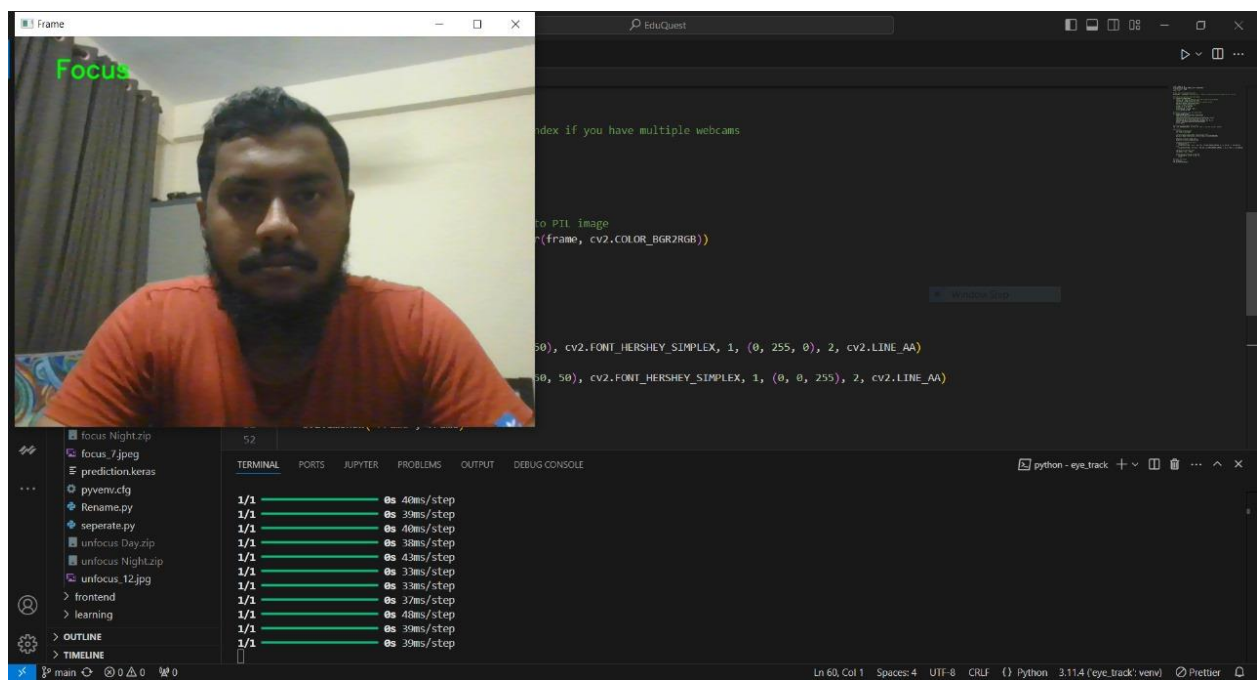


Figure 24: Realtime testing with camera (CUIFL)