ENHANCING INTERVIEW PREPAREDNESS: A COMPREHENSIVE WEB APPLICATION

24-25J-082

Project Proposal Report

Kavindya N.D.D. – IT21231278

B.Sc. (Hons) Degree in Information Technology Specialized in Information Technology

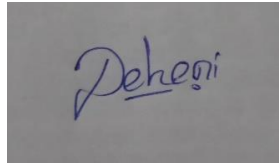Department of Computer Science and Information Technology

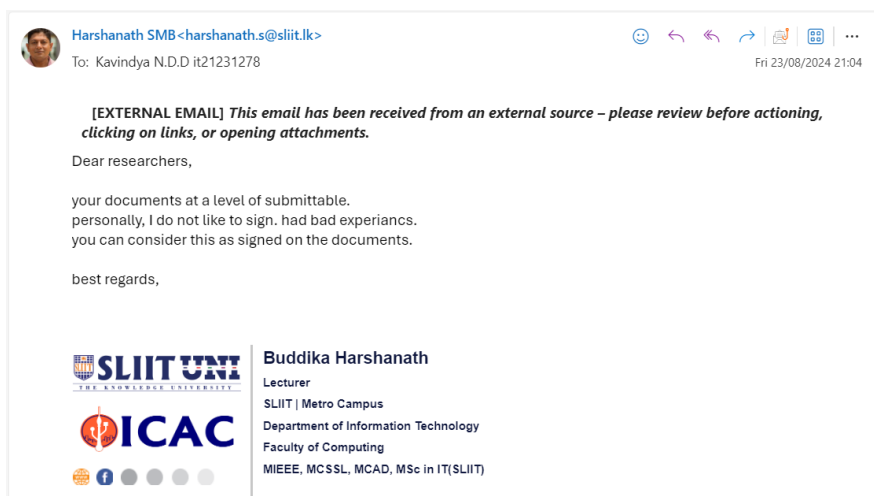Sri Lanka Institute of Information Technology

Sri Lanka

August 2024

DECLARATION

We declare that this is our own work, and this proposal does not incorporate without acknowledgement any material previously submitted for a degree or diploma in any other university or Institute of higher learning and to the best of our knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

Group Member Name	Student ID	Signature
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STATEMENT OF THE SUPERVISOR

- Signature of the supervisor:

Harshanath SMB<harshanath.s@sliit.lk>
To: Kavindya N.D.D it21231278
Fri 23/08/2024 21:04

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

Dear researchers,

your documents at a level of submittable.
personally, I do not like to sign. had bad experiancs.
you can consider this as signed on the documents.

best regards,

Buddika Harshanath
Lecturer
SLIIT | Metro Campus
Department of Information Technology
Faculty of Computing
MIEEE, MCSSL, MCAD, MSc in IT(SLIIT)

- Signature of the Co-Supervisor:

Declaration

I declare that this is my own work, and this proposal does not incorporate, without acknowledgment, any material previously submitted for a degree or diploma in any other university or institute of higher learning. To the best of my knowledge and belief, it does not contain any material previously published or written by another person, except where acknowledgment is made in the text.

Name	Student ID	Signature
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Statement of the supervisor,

The above candidate is carrying out research for the undergraduate Dissertation under my supervision.

Signature of the supervisor: Date

Signature of the co-supervisor: Date 23/8/24

ABSTRACT

The Video and Tutorial Recommendation Component is a crucial module within the broader framework of an online interview and learning platform. This component leverages AI and Machine Learning algorithms to personalize and optimize the user experience by recommending relevant video content and tutorials. Based on a user's interaction history, skill levels, and learning progress, the system intelligently curates a tailored set of videos and tutorials. It adapts to individual learning curves, ensuring users receive content that aligns with their current knowledge and goals. Additionally, the recommendation engine plays a pivotal role in guiding users through progressively challenging levels of video tutorials, ultimately leading them to paid courses. This component enhances user engagement, supports skill development, and improves overall learning outcomes by delivering content that is both timely and contextually relevant. The integration of this recommendation engine also contributes to the platform's goal of providing a seamless and intuitive user experience, making learning more efficient and effective.

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1. INTRODUCTION

In today's ever-changing world of technology, having personalized and effective learning resources is essential, especially when it comes to developing one's skills and getting ready for interviews. Many educational platforms have been built on traditional learning techniques, such as static video courses and non-interactive content. However, these approaches frequently fail to meet the various demands of distinct students. [1] Insufficient customized service, flexibility, and contextually relevant content can make it more difficult for users to learn new skills or get ready for particular jobs.

Developing general video lectures and basic recommendation systems based on user preferences or popular material have been the main goals of previous research in this field. Although these methods offer some degree of personalization, they frequently fall short of providing the level of customization needed for the best possible learning results [2]. These systems' static information distribution style ignores the diverse skill levels, learning styles, and objectives of users, resulting in a generic experience that can be inefficient and ineffective.

The latest advances in AI and machine learning have made it possible to create more advanced recommendation systems that can adjust to the requirements of each user in order to address these issues [3]. These artificial intelligence (AI) systems provide tailored video and instructional recommendations based on an analysis of a user's interaction history, learning curve, and performance indicators [4]. Many of these systems still don't have the granularity necessary to completely meet the various needs of users at various phases of their learning process, though.

By using state-of-the-art machine learning techniques, the Video and Tutorial Recommendation Component seeks to circumvent these constraints by delivering a highly customized and adaptive learning environment. This part constantly assesses the behavior and advancement of the user, suggesting material that is both pertinent to their present ability level and thoughtfully crafted to lead them through increasingly difficult learning phases. The Video and Tutorial Recommendation Component improves learning by utilizing cutting-edge AI techniques. This guarantees that users receive the most impactful and relevant content at every stage of their journey, which in turn improves engagement, skill acquisition, and interview preparation outcomes.

1.1 Background & Literature survey

The evolution of interview preparation tools has shifted from traditional, static methods to dynamic digital platforms that increasingly leverage video and tutorial recommendation systems to enhance the learning experience. Initially, interview preparation relied heavily on static multiple-choice question (MCQ) systems, which provided a structured but limited approach to assessing and improving candidate readiness. These systems often lacked the flexibility and personalization needed to cater to the diverse needs of job seekers in a competitive market. With the advent of adaptive learning technologies and machine learning, there has been a significant transformation in how interview preparation is approached.

Video and tutorial recommendation systems have emerged as critical components of modern interview preparation platforms. These systems utilize algorithms to suggest relevant content based on the learner's progress, skill level, and specific job role. [5] The integration of video content is particularly effective in delivering complex concepts and simulating real-life scenarios, which static text-based systems cannot achieve. Research indicates that video-based learning enhances user engagement, retention, and application of knowledge, making it a powerful tool in preparing candidates for job interviews [6].

The literature highlights the role of machine learning in enhancing the efficacy of these recommendation systems. Algorithms can analyze user interactions, learning patterns, and feedback to refine content recommendations, ensuring that users receive tailored resources that address their specific weaknesses and goals. Studies show that personalized video recommendations improve learning outcomes by providing targeted guidance, thereby helping users build confidence and competence in a shorter time frame.

However, despite these advancements, there is a gap in the application of video and tutorial recommendation systems specifically tailored for interview preparation. Most existing tools focus on general educational content without addressing the nuances of job-specific learning requirements. The development of specialized recommendation systems that integrate both adaptive learning technologies and real-time feedback mechanisms is crucial for bridging this gap and offering a more comprehensive and effective interview preparation experience.

Distribution of Machine Learning Techniques in Adaptive Learning Systems

40%

30%

15%

10%

5%

■ Supervised Learning ■ Reinforcement Learning ■ Unsupervised Learning ■ Deep Learning ■ Other

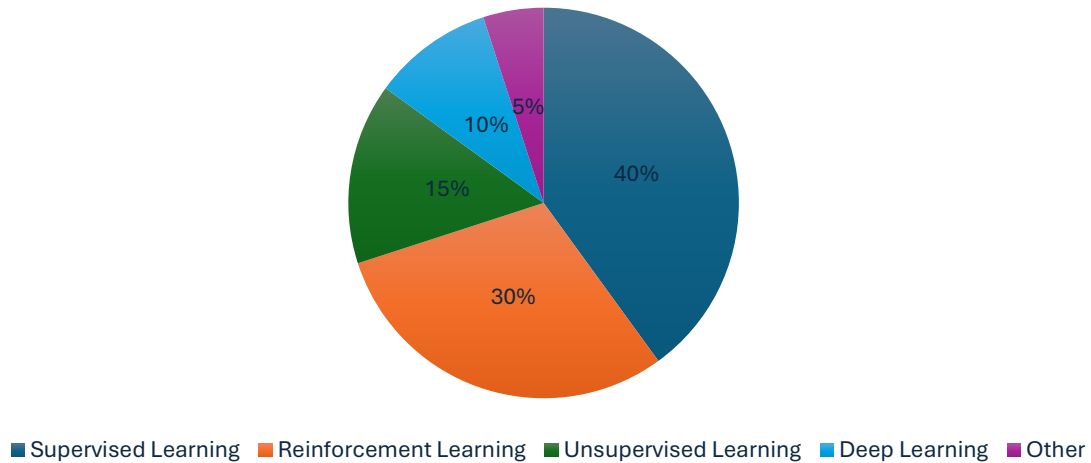*Figure 1: Distribution of Machine Learning Techniques in Adaptive Learning Systems*

Adaptive learning systems leverage various machine learning (ML) techniques to personalize educational content and optimize the learning experience for users. These techniques are distributed across different components of the system to achieve specific goals, from content recommendation to real-time feedback and performance analysis.

1.2 Research Gap

The existing research on video interviews and candidate preparation tools reveals significant gaps in how these systems are designed to support effective, equitable, and accessible evaluation processes. While some studies have successfully explored the integration of AI and machine learning to enhance candidate assessments and feedback, other crucial aspects remain unaddressed. For instance, most research does not adequately examine the impact of video interviews on evaluation consistency and fairness, particularly concerning unconscious biases and technological barriers. Additionally, there is a lack of focus on the long-term effectiveness of tutorials in preparing candidates, especially in terms of personalized learning experiences and skill retention.

The comparison of existing tools indicates that they often fail to consider the diverse needs of users, such as those with different cultural backgrounds, abilities, and device preferences. Moreover, the absence of robust AI-driven personalization and adaptability in these systems limits their effectiveness in providing a tailored and inclusive candidate preparation experience.

This research aims to fill these gaps by investigating the ethical implications of AI in candidate evaluation, exploring the role of personalized tutorials in long-term skill retention, and addressing the cultural and demographic factors that influence the usability and effectiveness of these tools. By doing so, it will contribute to the development of more equitable, effective, and accessible solutions in the hiring process.

	Research A [7]	Research B [8]	Research C [9]	Research D [10]	Proposed Solution
Impact of Video Interviews on Candidate Evaluation	✗	✓	✓	✗	✓
Effectiveness of Tutorials in Candidate Preparation	✗	✓	✗	✓	✓
User Experience and Accessibility	✗	✗	✗	✗	✓
Integration of AI and Machine Learning	✓	✓	✗	✓	✓

Table 1: Comparison of former research

1.3 Research Problem

1. **How do video interview formats and tutorial types affect the accuracy and effectiveness of online interviews?**

   - Video interview platforms often utilize standard formats that may not cater to the varying needs of different candidates or accurately reflect their abilities. Similarly, the types of tutorials offered may not be effective in preparing candidates for the specific demands of an interview. This research aims to explore how different video interview formats and tutorial types impact the accuracy and effectiveness of online interviews. The focus will be on identifying which formats and tutorials enhance candidate evaluation, ensuring a fair and comprehensive assessment process that better reflects candidate potential.

2. **How can we make online interview platforms better for users, and how can AI be used to provide helpful feedback and tutorials while addressing privacy concerns?**

   - Current online interview platforms often fall short in terms of user experience and the provision of effective, personalized feedback. Moreover, the integration of AI in these platforms raises significant privacy concerns that are not fully addressed by existing systems. This research aims to investigate how online interview platforms can be improved to better meet user needs, with a particular focus on enhancing usability, accessibility, and engagement. Additionally, the study will explore how AI can be utilized to offer personalized feedback and tutorials, while also ensuring that user privacy is safeguarded, balancing innovation with ethical considerations.

3. OBJECTIVES

2.1 Main Objective

To develop and evaluate online interview platforms that enhance the accuracy, effectiveness, and user experience of candidate evaluations through the integration of advanced video interview formats, AI-driven feedback, and personalized tutorials while addressing ethical concerns such as privacy and bias.

2.2 Specific Objectives

1. **To analyze the impact of various video interview formats on the accuracy and fairness of candidate evaluations.**

- Identify which formats lead to more consistent and unbiased assessments.
- Explore how different formats affect candidate performance and interviewer perception.

2. **To assess the effectiveness of different tutorial types in improving candidate preparedness for online interviews.**

- Evaluate the long-term retention of skills and knowledge provided by various tutorial methods.
- Investigate the role of personalized learning paths in enhancing candidate readiness.

3. **To enhance user experience and accessibility in online interview platforms by applying universal design principles.**

- Develop and test features that improve usability for diverse user groups, including those with disabilities and varying device preferences.
- Measure the impact of these improvements on overall platform engagement and satisfaction.

4. **To explore the integration of AI and machine learning for providing real-time, personalized feedback during online interviews and tutorials.**

- Examine the effectiveness of AI-generated feedback in improving candidate performance.

- Address ethical concerns related to AI, including transparency, bias, and user privacy.

5. **To investigate the influence of cultural and demographic factors on the usability and effectiveness of online interview platforms.**

- Identify how cultural differences impact candidate interaction with video interviews and tutorials.

- Develop guidelines for creating more inclusive and globally relevant online interview tools.

4. METHODOLOGY

3.1 System Diagram
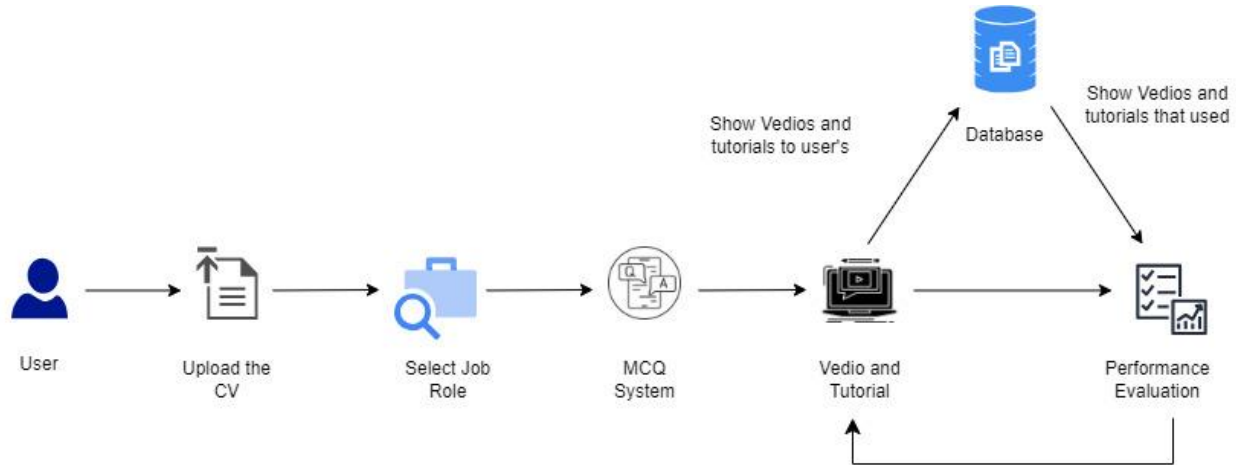
Figure 2: System Architecture Diagram

the video and tutorial recommendation component involves the systematic design and integration of various system elements to achieve personalized and effective candidate preparation. The ways in which each element supports the overall operation of the recommendation system are explained in detail below.

User Interface (UI)

- **Purpose**: To facilitate user interaction with the video and tutorial recommendation system, allowing candidates to select their job roles, access relevant content, and receive personalized tutorial suggestions.

- **Function**: Displays recommended videos and tutorials based on the user's current skill level, job role, and progress in their preparation journey. The UI also provides options for users to bookmark or rate content, further personalizing the recommendation process.

2. Adaptive Learning Algorithm

- **Purpose**: To dynamically adjust the recommended videos and tutorials based on the user's learning progress and needs.

- **Function**: Analyzes user interaction data in real-time, including video views, tutorial completion rates, and quiz performance. Based on this data, the algorithm recommends content that is aligned with the user's proficiency level and areas needing improvement.

3. Reinforcement Learning Engine

- **Purpose**: To optimize the sequence and selection of video and tutorial recommendations for each user, ensuring the most effective learning path.

- **Function**: Continuously learns from user engagement with recommended content, predicting the most beneficial next steps in the learning journey. The engine adjusts recommendations to maximize knowledge retention and skill acquisition by presenting content in a sequence that is both challenging and relevant.

4. Content Database

- **Purpose**: To store and manage a comprehensive collection of videos and tutorials categorized by job role, difficulty level, and topic relevance.

- **Function**: Supplies the recommendation system with a rich array of content options, ensuring that users receive targeted suggestions that are both challenging and pertinent to their preparation needs.

5. Feedback System

- **Purpose**: To provide real-time, actionable feedback on the effectiveness of the recommended videos and tutorials.

- **Function**: After a user engages with a video or tutorial, the system offers feedback based on performance in subsequent assessments. This feedback loop helps the system refine future recommendations and offers users insights into areas requiring further study.

6. Performance Analytics Module

- **Purpose**: To monitor and evaluate the effectiveness of the video and tutorial recommendations, providing insights into user progress and learning outcomes.

- **Function**: Analyzes data on user engagement with recommended content, tracking metrics such as completion rates, improvement in assessment scores, and overall readiness for interviews. These insights are used to continuously refine the recommendation algorithm and improve the system's effectiveness.

Data Collection and Analysis

Data Requirements:

- **User Interaction Data**: To inform the adaptive learning algorithm and reinforcement learning engine by tracking which videos and tutorials are accessed, duration of engagement, and user ratings.

- **Performance Data**: To optimize the recommendation system by analyzing how content engagement correlates with improvements in quiz scores and overall readiness.

- **Feedback Data**: To continuously refine the recommendation system by gathering user feedback on the relevance and effectiveness of recommended content.

Data Collection Methods:

- **Surveys**: Collect feedback from users on the relevance and helpfulness of recommended videos and tutorials.

- **System Logs**: Track detailed user interactions, including video viewing patterns, tutorial completions, and engagement duration.

- **Interviews**: Conduct interviews with subject matter experts and users to validate the accuracy, relevance, and quality of the recommended content.

Data Analysis Techniques:

- **Statistical Analysis**: To evaluate the effectiveness of the recommendation system, including user satisfaction and improvement in interview readiness.

- **Machine Learning Techniques**: To refine the adaptive learning and reinforcement learning algorithms, ensuring more accurate and personalized recommendations.

- **Qualitative Analysis**: To analyze user feedback and identify areas for improvement, leading to iterative enhancements in the recommendation system.

3.2 Software Solution
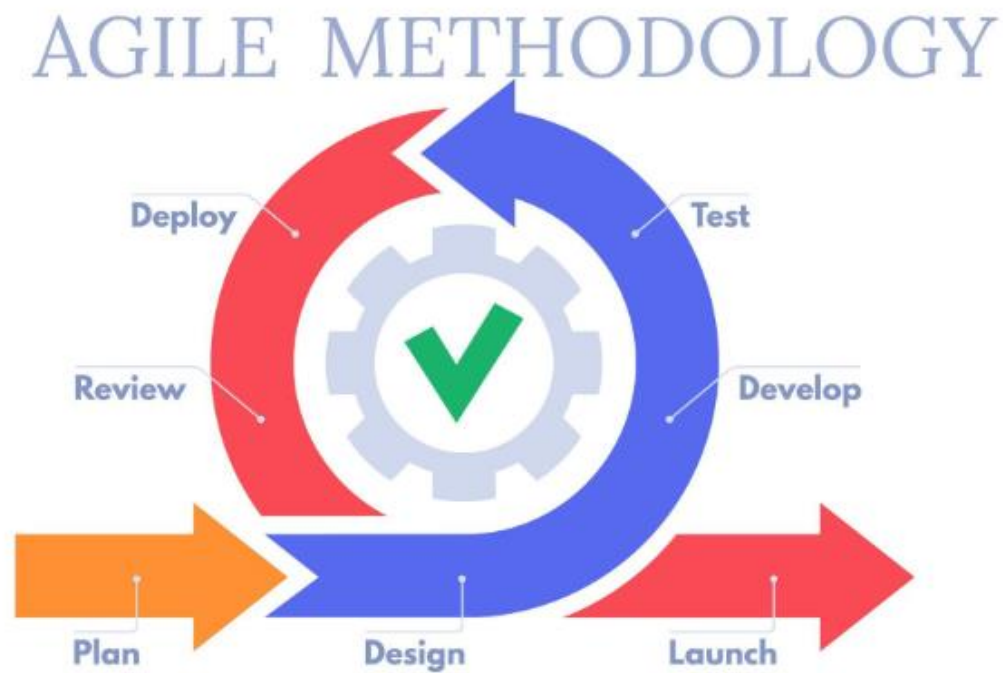
Figure 3: Agile Methodology

The Software Development Life Cycle (SDLC) refers to the systematic stages involved in developing quality software, from initial planning and requirements gathering to deployment and maintenance. The SDLC provides structure and best practices for producing robust, reliable software. Typically, SDLC models like waterfall follow a sequential approach, moving through clearly defined phases. However, as seen in the attached agile model diagram (Figure 4), agile methods take an iterative approach, emphasizing adaptation, collaboration, and rapid prototyping throughout the development process. Both sequential and agile SDLC methodologies comprise essential processes for guiding the creation of complex software products. Choosing the right approach depends on the project goals, team culture, and production environment.

3.3 Design Diagrams

3.3.1 Use Case Diagram
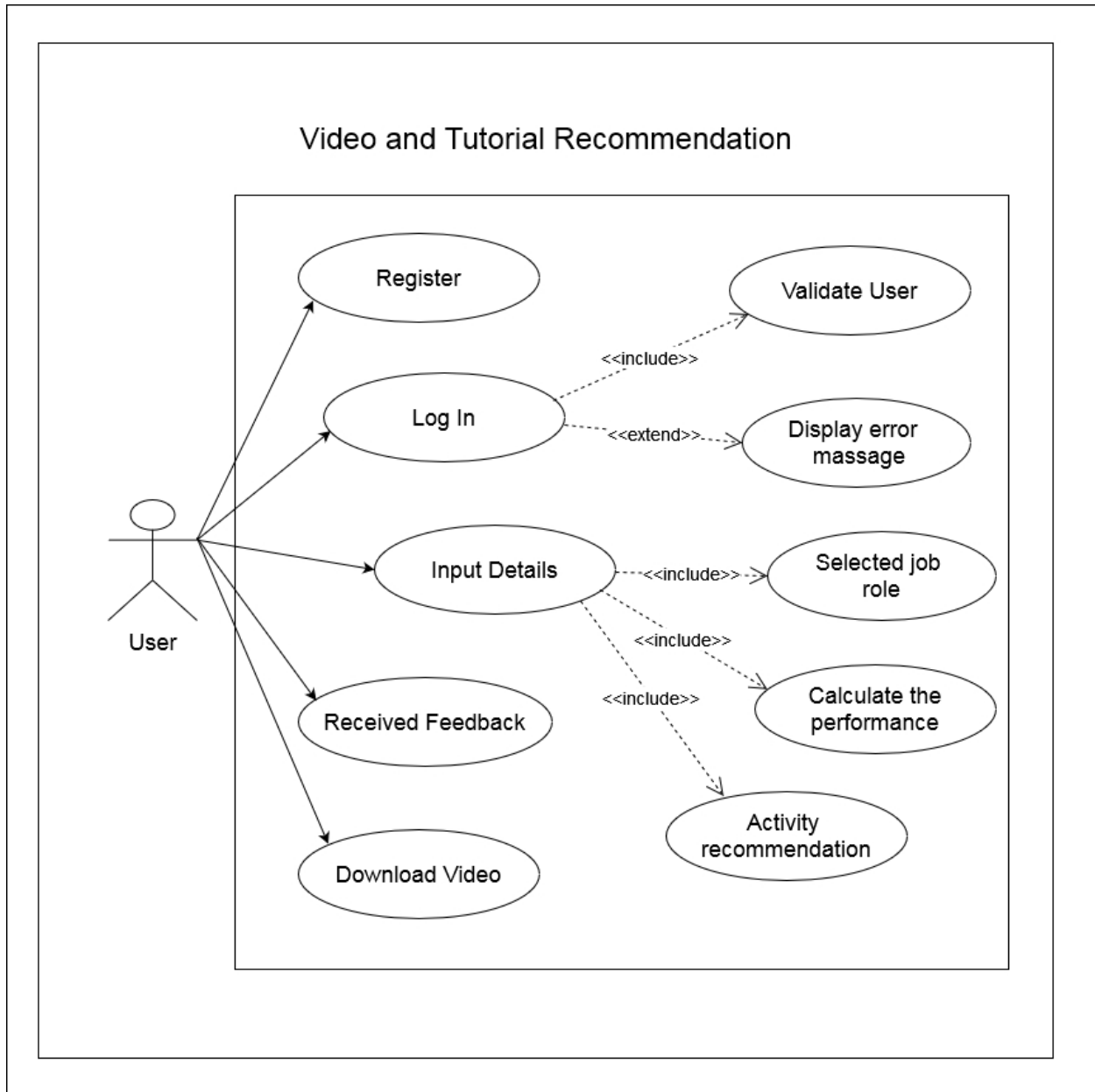
Figure 4: Use case Diagram

3.3.2 Sequence Diagram
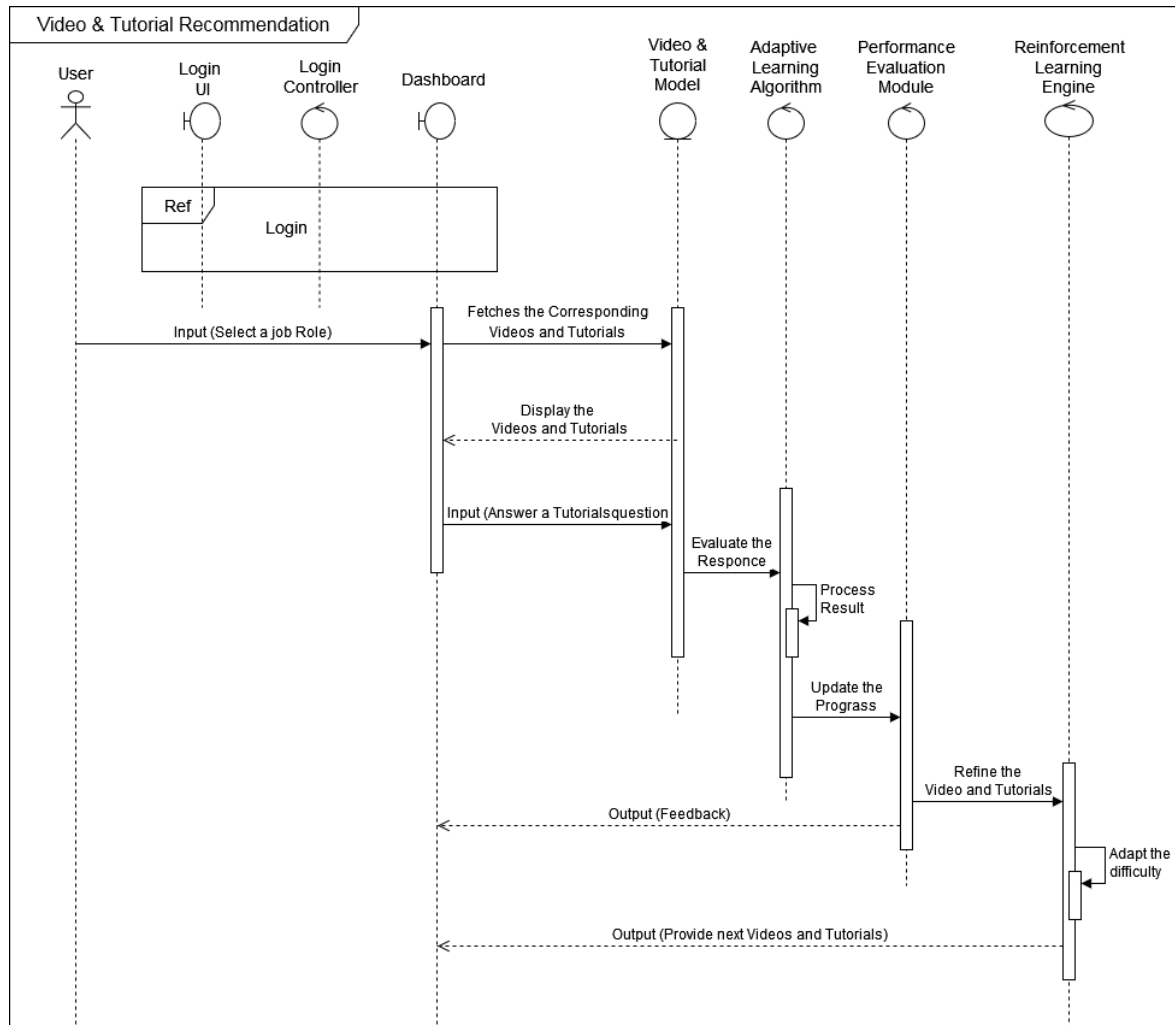
Figure 5: Sequence Diagram

4.PROJECT REQUIREMENTS

4.1 Functional Requirement

1. **User Profile Analysis:**

   - The system shall analyze user profiles, including skills, job roles, and previously completed tutorials, to tailor recommendations.

2. **Content Recommendation Engine:**

   - The system shall utilize an algorithm that considers user behavior (e.g., completed tutorials, time spent, and ratings) to recommend relevant video interviews and tutorials.

3. **Integration with Video Interview Functionality:**

   - The component shall integrate seamlessly with the video interview functionality to suggest relevant interview preparation videos based on the user's scheduled interviews or selected job roles.

4. **Tutorial Functionality Integration:**

   - The component shall recommend tutorials that complement the video content, such as specific skills or topics that enhance the user's understanding of the video interview process.

5. **Real-Time Feedback:**

   - The system shall provide real-time feedback on user interactions with recommended content, enabling adjustments to recommendations based on user engagement and feedback.

6. **Security:**

   - The system shall ensure that user data is securely stored and processed, complying with data protection regulations. User preferences and interactions must be accessible only to authorized personnel.

7. **User Management:**

- The system shall allow users to manage their recommendation preferences, including the ability to provide feedback on the relevance of recommendations, which will be used to improve the algorithm.

8. **Integration and Compatibility:**

- The component shall be compatible with existing user management and tutorial functionalities, ensuring a seamless experience across the platform.

4.2 User Requirements

1. **Personalized Recommendations:**

   o The system shall provide me with tailored video interview and tutorial recommendations based on my profile, including my job role, skills, and completed tutorials.

2. **User-Friendly Interface:**

   o The recommendations should be presented in a clear and accessible manner on my dashboard, allowing me to easily navigate and select content.

3. **Feedback Mechanism:**

   o I want the ability to rate the relevance of recommended videos and tutorials, enabling the system to refine future recommendations based on my feedback.

4. **Integration with Upcoming Interviews:**

   o The recommendations should consider my scheduled interviews, suggesting relevant content that helps me prepare effectively for each specific interview.

5. **Skill Development Focus:**

   o The system should also recommend tutorials that build on my existing skills and knowledge, helping me to further develop areas related to my career aspirations.

6. **Data Privacy:**

   o I want assurance that my data, including my profile information and interaction history, is securely stored and only used for improving my recommendations.

7. **Notification System:**

   o I would like to receive notifications about new recommendations, including updates to the video and tutorial library that may align with my interests.

4.3 System Requirements

4.3.1 Software Requirements:

- **Backend:** Spring Boot (Java), Flask (Python for machine learning model serving)

- **Frontend:** React.js

- **Database:** MySQL

- **Development Tools:** PyCharm, IntelliJ IDEA, VS Code

- **Version Control:** GitLab

4.3.2 Hardware Requirements:

- A server with sufficient CPU, RAM, and storage to host the application, database, and model training processes.

- User devices should support modern web browsers for accessing the system.

4.4 Non-Functional Requirements

1. **Performance:**

   - The system shall respond to user inputs within 2 seconds.
   - The server shall handle at least 100 concurrent users without performance degradation.

2. **Scalability:**

   - The system shall be able to scale horizontally to accommodate an increasing number of users.
   - The question bank and user data shall be stored in a scalable database.

3. **Reliability:**

   - The system shall have an uptime of 99.9% or higher.
   - Regular backups shall be scheduled to prevent data loss.

4. **Usability:**

   - The user interface shall be intuitive and easy to navigate.
   - Instructions and helpful documentation shall be readily available to assist users.

5. **Maintainability:**

   - The system codebase shall follow best practices for readability and modularity.
   - Regular updates and patches shall be applied to keep the system secure and up to date.

6. **Compatibility:**
   - The system shall be compatible with all major web browsers.
   - The mobile version of the platform shall be accessible on both Android and iOS devices.

4.5 Test Cases

Test Case ID	Test Case Description	Test Steps	Input Data	Expected Output	Actual Output	Pass/ Fail
001	Test video recommendation based on skill level	1. User logs in. 2. User selects skill level. 3. System generates video recommendations.	User skill level: Beginner	Recommended videos suitable for a beginner skill level.	Recommended videos displayed.	Pass
002	Test tutorial recommendation based on previous completions	1. User logs in. 2. User views completed tutorials. 3. System recommends new tutorials.	Completed tutorials: "HTML Basics"	Recommended tutorials that build on HTML knowledge.	Recommended tutorials displayed.	Pass
003	Test user feedback influence on recommendations	1. User rates a tutorial. 2. System updates recommendations.	Tutorial rated: 4 stars	Recommendations reflect user feedback preferences.	Recommendations updated.	Pass
004	Test real-time tutorial suggestions during video	1. User starts a video. 2. System suggests tutorials related to video content.	Current video topic: "JavaScript Basics"	Suggested tutorials on advanced JavaScript concepts.	Suggestions provided.	Pass
005	Test performance tracking in tutorial completion	1. User completes multiple tutorials. 2. View performance summary.	Completed tutorials: 5	Summary shows completion rate and areas for improvement.	Performance summary displayed.	Pass

006	Test personalized tutorial paths	1. User logs in. 2. System generates a personalized tutorial path.	User profile data: Intermediate knowledge	Personalized tutorial path based on user profile.	Personalize d path displayed.	Pass
007	Test tracking of user engagement with videos	1. User watches videos. 2. System tracks watch time and interactions.	Watch history: 3 videos, average watch time: 10 min	Engagement metrics updated based on user activity.	Engagemen t metrics updated.	Pass
008	Test review feature for tutorial feedback	1. User completes a tutorial. 2. User reviews tutorial content.	Tutorial feedback: "Helpful, but too fast."	User can submit feedback and review tutorial.	Review option available.	Pass
009	Test recommendat ion accuracy based on user behavior	1. User frequently watches tutorials on a specific topic. 2. System adjusts recommendations.	User behavior: 10 tutorials on "React"	Recommendations favor more advanced React tutorials.	Recommen dations updated.	Pass
010	Test notifications for new tutorials	1. User subscribes to tutorial notifications. 2. System sends notifications for new tutorials.	Subscribed topics: "Python, Data Science"	Notifications received for new tutorials in subscribed topics.	Notificatio ns received.	Pass

Table 2: Test Case

5.BUDGET

Estimated Budget Per Month	Amount (LKR)
Power Bill Charges	1500.00
Internet Charges (The development and technical information learning)	3500.00
Extra Charges	1000.00
Total	6000.00

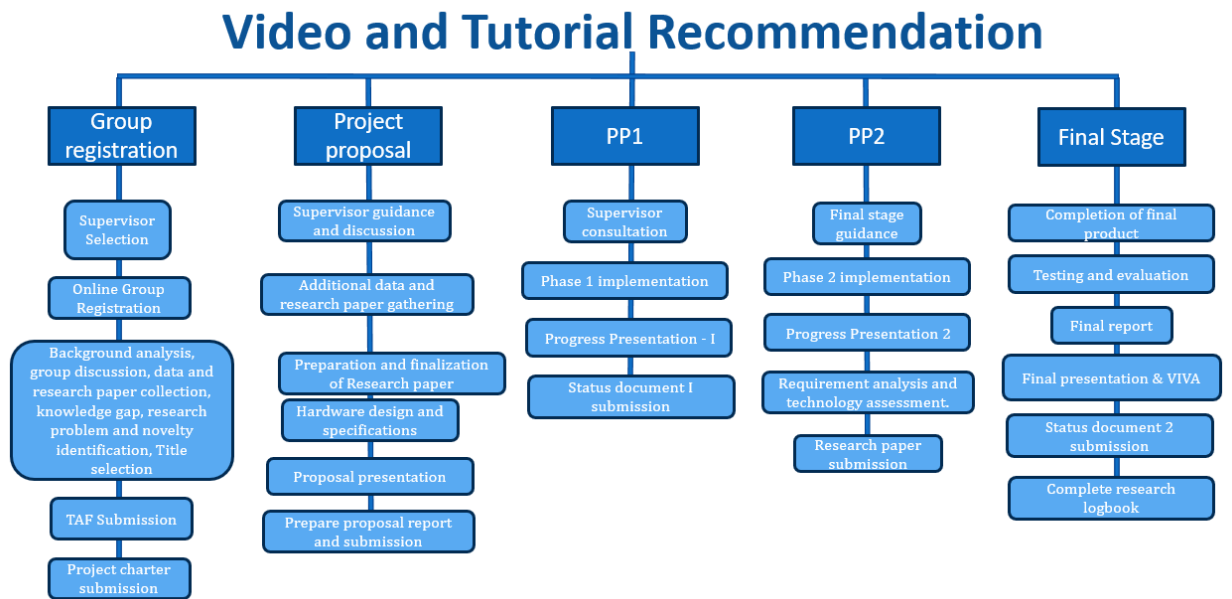*Table3: Estimated Budget*

5. WORK BREAKDOWN STRUCTURE

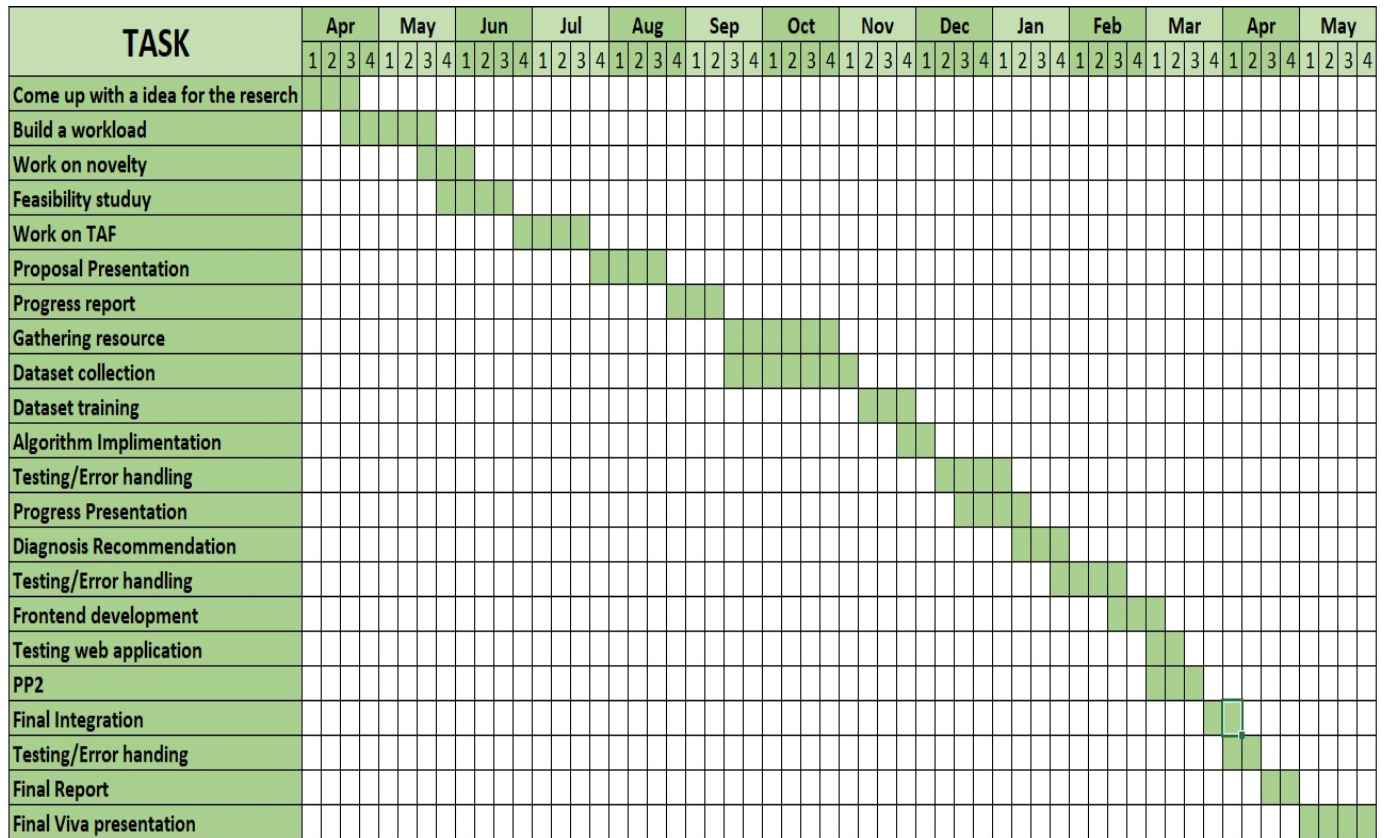
Figure 6: Work Breakdown Structure

7.GANTT CHART

TASK	Apr 1	Apr 2	Apr 3	Apr 4	May 1	May 2	May 3	May 4	Jun 1	Jun 2	Jun 3	Jun 4	Jul 1	Jul 2	Jul 3	Jul 4	Aug 1	Aug 2	Aug 3	Aug 4	Sep 1	Sep 2	Sep 3	Sep 4	Oct 1	Oct 2	Oct 3	Oct 4	Nov 1	Nov 2	Nov 3	Nov 4	Dec 1	Dec 2	Dec 3	Dec 4	Jan 1	Jan 2	Jan 3	Jan 4	Feb 1	Feb 2	Feb 3	Feb 4	Mar 1	Mar 2	Mar 3	Mar 4	Apr 1	Apr 2	Apr 3	Apr 4	May 1	May 2	May 3	May 4
Come up with a idea for the reserch		▓	▓																																																					
Build a workload			▓	▓	▓																																																			
Work on novelty						▓	▓																																																	
Feasibility studuy									▓	▓	▓																																													
Work on TAF													▓	▓	▓																																									
Proposal Presentation																	▓	▓																																						
Progress report																				▓	▓																																			
Gathering resource																					▓	▓	▓																																	
Dataset collection																							▓	▓	▓																															
Dataset training																											▓	▓																												
Algorithm Implimentation																													▓	▓																										
Testing/Error handling																															▓	▓																								
Progress Presentation																																	▓	▓																						
Diagnosis Recommendation																																			▓	▓																				
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Frontend development																																							▓	▓																
Testing web application																																									▓	▓														
PP2																																													▓	▓										
Final Integration																																															▓									
Testing/Error handing																																																	▓							
Final Report																																																			▓					
Final Viva presentation																																																					▓	▓		

Figure 7: Gantt Chart

8.COMMERCIALIZATION

Level	Description	Revenue Model	Market Strategy
Level 1: Beginner	Basic video and tutorial recommendations based on user interests and skill levels. Free access to a limited selection of content.	Freemium: Free access to basic recommendations with ads.	- Leverage SEO and social media marketing to attract users. - Use content marketing and educational blogs to drive traffic.
Level 2: Intermediate	Enhanced recommendations that adapt based on user feedback and engagement. Offers additional tutorials and videos for a limited time.	Freemium with Paid Extension: Free for a limited time; payment required for extended features and exclusive content.	- Offer limited-time promotions to encourage users to upgrade. - Partner with online education platforms and influencers for co-marketing.
Level 3: Expert	Comprehensive and personalized recommendations, including premium tutorials and videos. Focused on professional development and advanced topics.	Subscription & Pay-per-Use: Users can subscribe for access to exclusive content or pay per tutorial/video.	- Target corporate training programs and educational institutions for bulk subscriptions. - Implement targeted ads on professional networks and forums.

Table 4: Commercialization Strategy

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