B.Sc. (Hons) Degree in Information

Technology Specializing in Information Technology

Department of Information Technology

Sri Lanka Institute of Information Technology

Sri Lanka

Enhancing Interview Preparedness: A Comprehensive Web Application

2D Interview Panel Simulation

Project Id: 24-25J-082

Project Proposal Report

PATHIRANA V.P.E.P.V (IT21175084)

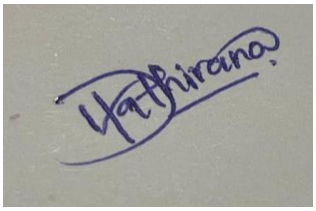
Supervisors

Mr. S.M.B Harshanath

Dr. Harinda Fernando

DECLARATION

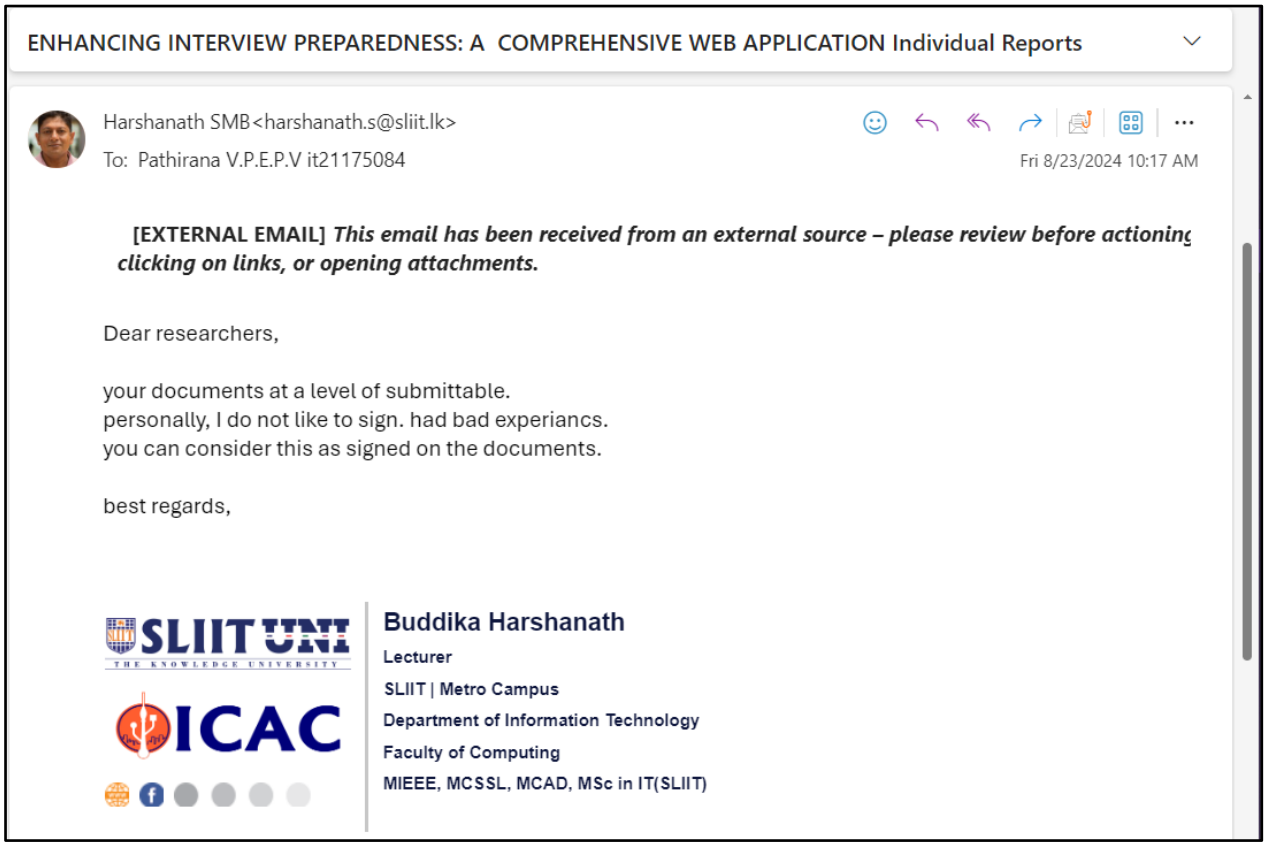
I declare that this is my own work, and this proposal does not incorporate, without acknowledgment, any material previously submitted for a degree or diploma in any other university or institute of higher learning. To the best of my knowledge and belief, it does not contain any material previously published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

Name	Student ID	Signature
PATHIRANA V.P.E.P.V.	IT21175084	

STATEMENT OF THE SUPERVISOR,

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

Signature of the supervisor:



ENHANCING INTERVIEW PREPAREDNESS: A COMPREHENSIVE WEB APPLICATION Individual Reports

Harshanath SMB<harshanath.s@sliit.lk>

To: Pathirana V.P.E.P.V it21175084

Fri 8/23/2024 10:17 AM

[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,

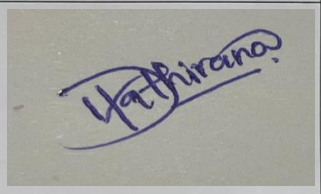
SLIIT UNI
THE KNOWLEDGE UNIVERSITY
ICAC

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:

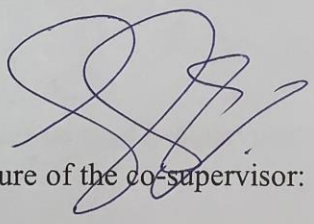
Declaration

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
PATHIRANA V.P.E.P.V.	IT21175084	

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 28/8/24

ABSTRACT

This study investigates the creation and implementation of a novel 2D Interview Panel Simulation meant to improve interview preparedness by incorporating machine learning approaches. The project's major goal is to create an engaging and realistic interview practice environment that can adjust to the user's ability level, resulting in a dynamic and individualized learning experience.

The system uses powerful machine learning methods, such as decision trees and artificial neural networks (ANNs), to build a diversified and contextually relevant question bank. These questions are then presented by 2D avatars that represent interviewers, resulting in a lifelike and dynamic interview scenario. The simulation is divided into three degrees of difficulty: beginner, intermediate, and expert, with each level gradually pushing the user and personalizing the experience to their development needs.

One of the system's primary features is its capacity to react in real time to the user's performance. As users engage with the avatars and answer questions, machine learning algorithms evaluate their responses and change the difficulty of following questions. This adaptive technique keeps the simulation demanding but helpful, allowing users to progressively gain confidence and improve their interview abilities.

The study delves into the technical aspects of generating 2D avatars, incorporating machine learning models, and creating a user-friendly interface to make the simulation accessible to a wide range of people. Furthermore, the study investigates the impact of such a system on users' interview readiness, examining aspects such as user involvement, confidence levels, and performance improvement over time.

This work advances the area by demonstrating how machine learning can be efficiently applied to interactive simulations, providing a useful tool for people looking to improve their interview abilities. The findings indicate that this technique not only provides a more engaging alternative to typical interview preparation approaches, but also results in greater improvements in user performance, particularly when dealing with difficult and high-pressure areas interview circumstances.

To summarize, the 2D Interview Panel Simulation is a significant improvement in interview training, providing a scalable and effective option for anyone seeking to

improve their readiness for real-world interview circumstances. By integrating the realism of avatar-based simulations with the adaptability of machine learning, this study lays the door for future advances in tailored learning environments.

Table of Contents

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

Abbreviation	Description
ML	Machine Learning
UI	User Interface
IOT	Internet of Things

AI	**Artificial Intelligence**
API	**Application Programming Interface**

INTRODUCTION

In an increasingly competitive job market, mastering interview skills is essential for candidates aiming to secure their desired roles. Traditional interview preparation methods, such as mock interviews or static question lists, often fail to capture the dynamic and unpredictable nature of real-life interview scenarios [1]. To bridge this gap, our project introduces a cutting-edge web-based platform designed to revolutionize interview practice by simulating realistic, interactive interview experiences.

At the heart of this platform is the "2D Interview Panel Simulation" component, which represents a novel approach to interview preparation. This component harnesses the power of machine learning to generate interview questions that adapt to the user's skill level and progress [2]. The simulation features 2D avatars, each representing a different interviewer, who engage with users by posing questions in a manner that closely mimics real-world interviews. These questions are generated using sophisticated machine learning models, including decision trees and artificial neural networks (ANNs), ensuring that the content remains relevant, challenging, and tailored to the user's development [3].

The 2D Interview Panel Simulation is structured into three progressively challenging levels—beginner, intermediate, and expert. As users advance through these levels, the difficulty of the questions increases, pushing them to think critically and respond under pressure. This adaptive learning environment not only helps users build confidence but also sharpens their ability to handle complex questions and scenarios that they may encounter in actual interviews.

Moreover, the platform provides immediate feedback and performance metrics, enabling users to identify areas for improvement and track their progress over time. This personalized and immersive approach to interview preparation sets our project apart from traditional methods, offering users a unique and effective tool to enhance their readiness for real-world interview challenges.

In summary, our project leverages state-of-the-art technology to create an innovative interview preparation platform that combines the realism of avatar-based simulations with the precision of machine learning. By providing users with a realistic, adaptive, and engaging

interview practice environment, the 2D Interview Panel Simulation component aims to empower candidates to excel in their job interviews and achieve their career goals.

BACKGROUND & LITERATURE SURVEY

Figure 1: Online Interview Strategy

The rapid development of hiring techniques in today's competitive employment market demanded novel ways to interview preparation. Traditional approaches frequently fail to reproduce the dynamic and high-pressure environment of genuine interviews, resulting in unsatisfactory candidate performance during the hiring process. To overcome these constraints, 2D interview panel simulations have developed as an effective technique for improving interview preparedness. These simulations use machine learning techniques such as decision trees and artificial neural networks (ANNs) [4] to create a realistic, adaptive environment in which applicants can practice responding to a variety of increasingly tough questions presented by virtual interviewer avatars.

The literature on interview sims emphasizes the transformative power of these technologies in training and evaluation settings. According to research, by combining AI-driven models [5], 2D simulations can dynamically modify the complexity of questions based on the user's performance, providing a tailored and more tough experience that closely resembles real-life interviews. This adaptability is essential in helping candidates develop the abilities required to deal with the spontaneity and pressure of live interviews. Studies have also shown that computer simulations are especially good at reducing biases inherent in traditional face-to-face interviews by standardizing the interview procedure, resulting in a more impartial evaluation of candidates' responses.

Furthermore, the addition of sophisticated feedback systems to these simulations represents a considerable breakthrough. Feedback is generated by analyzing user performance against predefined criteria, and it delivers actionable insights that assist users in identifying areas for

improvement. This iterative process of practice and feedback not only improves learning but also boosts user confidence, preparing them for genuine interviews. Furthermore, due to their scalability, 2D simulations may be used in a variety of situations, from corporate recruitment to educational settings, making them a versatile tool for interview preparation across a wide range of user groups.

Despite these advantages, developing and implementing 2D interview panel simulations has a few obstacles. One key problem is to ensure that the simulations are realistic enough to represent the complexities of human interaction [6], such as nonverbal indications and emotional complexity. Current models, while good at duplicating verbal exchanges, frequently fall short of capturing the whole spectrum of interview dynamics. Furthermore, further research is needed to determine the accessibility and inclusivity of these simulations, particularly for users with varied levels of computer literacy or those with disabilities. Addressing these issues is critical to the widespread adoption and success of 2D interview simulators.

Recent research has also focused on user engagement and experience with simulation-based learning. Such platforms' success is frequently determined by their capacity to engage users through interactive aspects and an easy-to-use interface. Kim and Lee (2020) discovered that elements like avatar customization and real-time feedback improve user pleasure and the effectiveness of the learning process in virtual environments. Clark et al. (2021) reinforces this, emphasizing the necessity of intuitive design in keeping user attention and ensuring that simulation skills are effectively transferred to real-life circumstances. The suggested 2D Interview Panel Simulation seeks to combine these ideas by providing an interface that is not only simple to traverse but also rich in Interactive components that add to the realism of the interview experience.

Overall, the rising body of research indicates that 2D interview panel simulations are a promising tool for improving interview preparation. They provide a scalable, adaptive, and data-driven method that can greatly enhance candidate preparation. As technology advances, additional research and development will be required to perfect these tools, assuring an even more realistic and comprehensive simulation experience.

The literature on 2D interview panel simulations highlights their growing importance in enhancing interview preparation by replicating the dynamic and high-pressure environment of real interviews. These simulations leverage advanced machine learning techniques, such as decision trees and artificial neural networks (ANNs) [4], to create realistic and adaptive interviewer avatars. This approach allows the simulation to tailor question complexity based on user performance, making it a powerful tool for progressively challenging and refining candidates' skills. Research emphasizes the effectiveness of these simulations in reducing biases inherent in traditional interviews, offering a standardized and objective evaluation process. Additionally, integrated feedback mechanisms provide users with valuable insights, facilitating iterative learning and boosting confidence. Despite their potential, challenges remain in fully capturing the nuances of human interaction, such as non-verbal cues, and ensuring accessibility for all users. Overall, 2D interview panel simulations represent a

significant advancement in interview preparation, with ongoing research focused on enhancing their realism, inclusivity, and scalability.

Research Gap

The present body of research on interview simulation technologies, while extensive in many ways, remains substantial gaps, notably in terms of improving user experience and effectiveness through 2D simulations. One big gap is in Advanced Design Techniques for Realistic 2D Avatars. While 3D avatars have received a lot of attention in virtual worlds, the design and implementation of high-quality, realistic 2D avatars capable of mimicking human-like interactions is still in its early stages. This gap provides an opportunity to investigate creative design strategies for making 2D avatars more engaging and successful in a learning context. Another major gap is the use of decision tree and ANN models in interview simulations. Although machine learning models such as Decision Trees and Artificial Neural Networks (ANN) [4] have been widely used in educational technology, their specific application to adaptive interview simulations is still in its early stages. Current systems frequently lack the capacity to apply these models effectively to tailor interview settings based on user performance, limiting the adaptability and usefulness of the simulation experience.

Efficient integration of machine learning models with 2D simulation systems is also a big research gap. Integrating powerful machine learning algorithms into 2D simulations while maintaining system efficiency and user experience is a difficult task. Most present systems do not fully use machine learning's ability to dynamically modify the difficulty of interview questions, track user progress, and deliver individualized feedback in real time, resulting in a suboptimal learning environment. the efficient integration of ML models [7] with 2D simulation systems is also an important research gap. Integrating advanced machine learning algorithms with 2D simulations while maintaining system efficiency and user experience is a difficult task. Most present systems do not fully utilize machine learning's ability to dynamically modify the difficulty of interview questions, track user progress, and deliver individualized feedback in real-time, resulting in a suboptimal learning environment.

Finally, maintaining accuracy, reliability, and effectiveness in 2D interview simulations is a critical topic. While many systems strive for great accuracy and dependability, the efficacy of 2D simulations in preparing users for real-world interviews has not been thoroughly tested. Issues such as algorithmic bias, data privacy, and the overall usefulness of the simulated

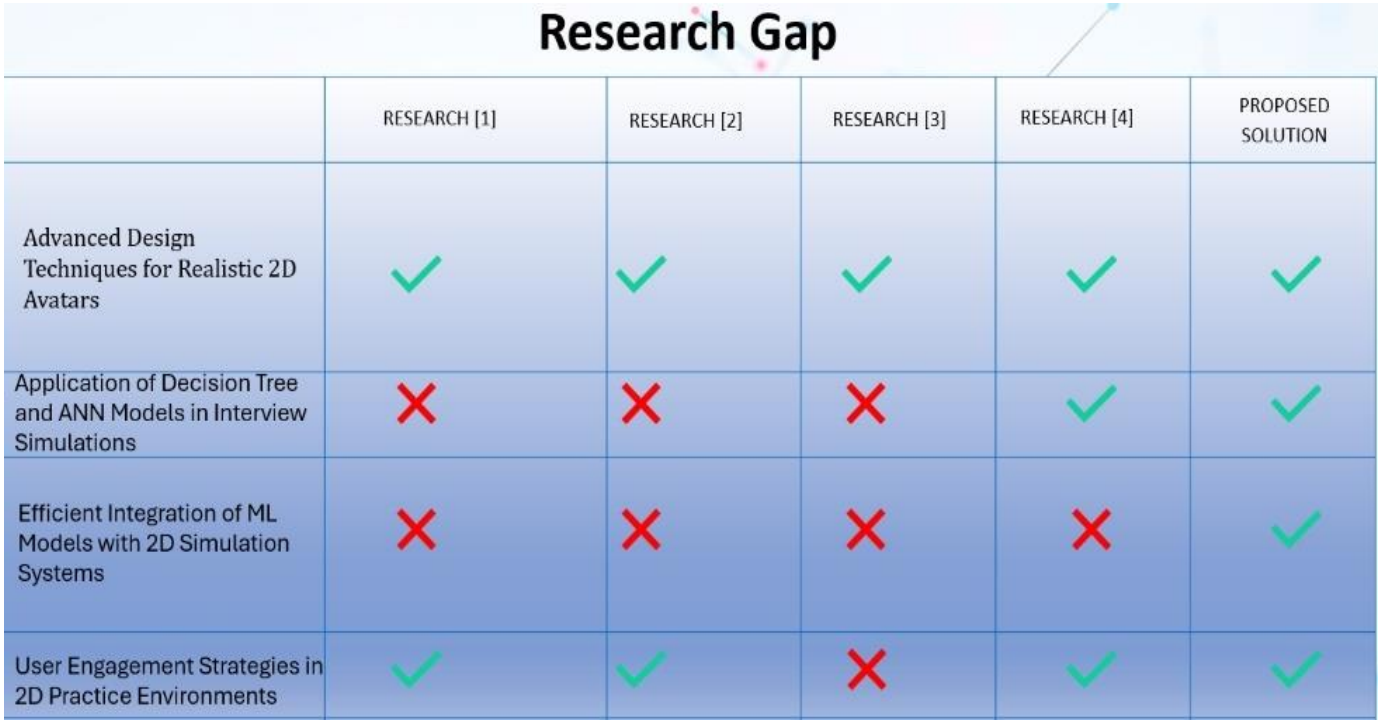


Figure 2: Research Gap

environment in simulating real interview situations are largely unexplored, highlighting the need for comprehensive testing and evaluation.

Research Problems

1.How to design 2D avatars that can realistically simulate human interviewers in terms of behavior, questioning style, and feedback?

The capacity to replicate the intricacies of human behavior and communication within the confines of a 2D environment is the most difficult aspect of developing realistic 2D avatar. While current research has focused on the development of 3D avatars, there is still a lack of understanding about how to properly build 2D avatars that engage users in meaningful and interactive ways. This study intends to investigate novel design strategies that use behavioral algorithms, natural language processing, and adaptive questioning styles to produce avatars that not only replicate human-like interactions but also provide constructive feedback based on the user's performance. The goal is to design a system where 2D avatars can offer a lifelike interview experience that is both demanding and supportive, Increasing the overall effectiveness of interview preparation.

2. How to ensure that the decision tree and ANN models can accurately generate and adapt interview questions based on the user's performance and the chosen difficulty level (Beginner, Intermediate, Expert)?

The use of Decision Tree and Artificial Neural Network (ANN) [4] models in interview simulations is a novel strategy, and verifying their correctness in adapting questions to the user's performance is a substantial problem. Traditional interview preparation solutions frequently rely on static question sets, which fail to account for the dynamic character of actual interviews. This study intends to investigate how machine learning models can be trained to recognize patterns in user behavior and performance, allowing them to produce questions that are not only relevant but also appropriately hard based on the difficulty level chosen. By including these models into the simulation, the system hopes to create a personalized interview experience that changes with the user's success, resulting in a more focused and effective preparation process. The study will assess the models' capacity to keep questions relevant and tough across different levels of user skill, resulting in a consistent and realistic interview experience.

Sub problems

- **Realism in 2D Avatar Design:** What advanced design techniques can be employed to create 2D avatars that accurately replicate human-like expressions, behaviors, and interactions to enhance the realism of the interview simulation?
- **Machine Learning Model Selection and Application**: Which machine learning models, such as decision trees or artificial neural networks (ANNs) [4], are best suited for generating and adapting interview questions in real-time, and how can these models be optimized for accuracy and responsiveness in the simulation environment?
- **Efficient Integration of ML Models:** How can the selected machine learning models be efficiently integrated within the 2D simulation system to ensure seamless operation without compromising performance, accuracy, or user experience?
- **User Engagement and Retention Strategies**: What innovative strategies can be developed to maintain and enhance user engagement in the 2D interview simulation environment, particularly when users are practicing over extended periods or advancing through increasingly challenging levels?
- **Ensuring Accuracy, Reliability, and Effectiveness:** How can the simulation system be validated to ensure that it accurately reflects real-life interview scenarios, remains reliable under various conditions, and effectively prepares users for real-world interviews?
- **Adaptation to User Feedback and Learning Progression:** How can the system adapt to individual user feedback and learning progression, offering personalized interview experiences that evolve with the user's skills and needs?
- **Scalability and Accessibility of the Simulation System**: How can the 2D interview simulation system be scaled and made accessible to a wide range of

users, including those with different levels of experience, technical proficiency, and access to resources?

- **Balancing Visual Fidelity with System Performance:** What approaches can be taken to balance high-quality visual representation of avatars with the computational efficiency needed for real-time simulation, particularly on varying hardware platforms?

Proposed Solution

The solution centers on developing a sophisticated 2D interview simulation system that utilizes advanced machine learning models to deliver realistic and adaptive interview experiences. The solution is built around the following critical components

1.Advanced Designs for Realistic 2D Avatars:

- Avatar Development: Using advanced design techniques, create 2D avatars that resemble genuine human actions, expressions, and interaction patterns.

-Behavioral Mapping: Use behavioral mapping to match avatar movements and responses to the context of the interview, resulting in a natural and engaging user experience.

-Dynamic Customization: Implement avatar customization choices to cater to diverse industries and roles, making the simulation more relevant to distinct user profiles.

2. Using Decision Tree and ANN Models in Interview Simulations:

-Model Selection and Integration: Use decision tree and artificial neural network (ANN) [4]models to create adaptable interview questions based on user responses and skill levels.

-Question Personalization: Use the models to customize question difficulty and sequence, resulting in an interview experience that adapts dynamically to the user's performance.

-Continuous Learning: Include methods that allow the system to modify and adapt its question selection over time, increasing accuracy and relevance.

3. Efficient Integration of Machine Learning Models with 2D Simulation Systems:

-Model-Simulation Synchronization: Ensure that the ML models are seamlessly integrated into the 2D simulation environment, enabling for real-time interaction between avatars and users.

-Performance Optimization: Improve the models' speed and efficiency to provide smooth and responsive avatar behavior even with sophisticated decision trees or ANN computations.

-Scalability: Design the integration architecture so that it can accommodate several users at the same time without sacrificing performance or accuracy.

4. User Engagement Strategies for 2D Practice Environments:

-Gamification: Use gamification components like progress tracking, achievements, and leaderboards to boost user engagement and motivation.

-Interactive Feedback: Following each interview session, provide users with instant, actionable feedback, including areas for improvement and recommendations for future practice.

-Personalized Practice Plans: Create personalized practice plans depending on user performance, guiding them through different levels and allowing them to focus on certain skill areas.

5. Ensure Accuracy, Reliability, and Effectiveness in 2D Interview Simulations:

-Validation & Testing: Test the system's effectiveness on a regular basis against a variety of real-world interview settings to ensure the correctness and dependability of avatar interactions and question generation.

-User Feedback Integration: Continuously gather user feedback on the simulation experience and iteratively improve the tool's realism and efficacy.

-Long-Term Monitoring: Track the long-term influence of the simulations on user performance in actual interviews, and utilize this information to improve the system and increase its efficacy.

Research Objectives

Main objective

The main objective of this research is to develop an interactive 2D interview panel simulation that mimics real interview scenarios, providing users with a realistic and engaging platform to enhance their interview preparedness. The project also aims to deliver a user-friendly interface and experience, ensuring that users can easily navigate

the simulation, interact with the 2D avatars, and receive constructive feedback. By focusing on both realism and usability, this research seeks to create a powerful tool for improving interview skills in a practical and accessible manner.

Specific objectives

1.Create Lifelike 2D Avatars

-Design and Animation: Create 2D avatars that are visually accurate and can express themselves and move naturally, much like humans. Use innovative animation techniques to ensure that these avatars accurately reflect real-life interview circumstances.

-Customization and Diversity: Use a range of avatars to represent different interview panelists, each having their own unique attributes such as gender, age, and professional experience. This will give users a diverse and inclusive interview experience.

2. **Develop Beginner, Intermediate, and Expert Interview Levels**

-Level Structuring: Design the simulation to offer three distinct levels of difficulty. Each level should gradually challenge the user with more complex and speedy interview questions.

-Content Differentiation: Ensure that the questions and scenarios offered at each level are appropriate for the desired skill level. The beginning level should concentrate on basic, often asked topics, while the intermediate and expert levels should include more complex and industry-specific questions.

3. **Train Models to Generate Questions for Each Level**

-Question Database Creation: Develop a comprehensive database of interview questions categorized by difficulty and subject matter. These questions should be based on real-world interview settings to ensure relevance.

-Model Training: Use this question library to train machine learning models that can dynamically generate and adapt questions based on user performance. The model should be able to select questions that are appropriate for the level of difficulty and properly challenge the user.

4. Integrate Machine Learning Models into the System

-System Integration: Easily integrate machine learning models into the simulation framework. Make sure these models are responsive and can generate and analyze questions in real time.

-Adaptive Learning: Set up systems that allow machine learning models to learn from

user interactions and continuously enhance the quality and relevance of the questions generated.

5. **Test and Validate the Simulation for Realism and Effectiveness**

-Simulation Testing: Thoroughly test the interview panel simulation to ensure that it accurately mimics real-world interview settings. This involves evaluating the realism of the 2D avatars, the relevance of the interview questions, and the entire user experience.

METHODOLOGY

Overall system diagram – 2D Interview panel simulation

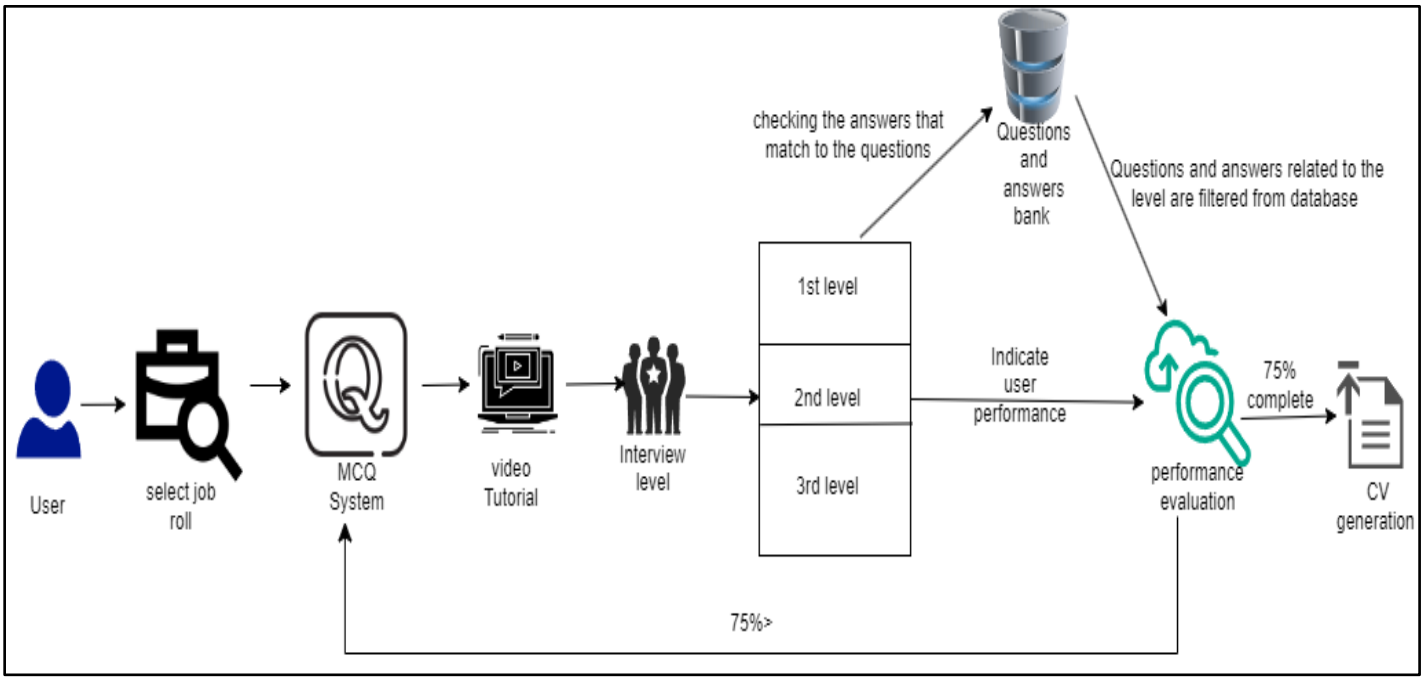


Figure 3: Overall System Diagram

Avatar Creation
The first stage is mastering advanced 2D design techniques to create lifelike avatars that resemble human expressions and actions. These avatars are precisely designed to provide lifelike interactions during simulated interviews. Furthermore, the Customization Options allow for changes in appearance, temperament, and attire to reflect the different interview panelists. This strategy ensures that users are exposed to a variety of interview settings, which improves their preparedness.

Simulation Platform
At the Simulation Platform, the generated avatars and interview scenarios are smoothly integrated into a single system. The platform's architecture offers Dynamic Interaction, which allows avatars to interact with users in real time while modifying queries and responses based on their performance. A strong Machine Learning Integration guarantees that the avatars ask contextually relevant questions that are appropriate for the set interview level. This platform not only provides users with a realistic and difficult environment, but it also securely stores their progress and responses for ongoing improvement and analysis.

Individual Component: 2D Interview Panel Simulation

This component hopes to provide an immersive 2D interview simulation that will improve user preparedness through realistic practice. The focus is on creating an interactive platform where advanced machine learning models control the behavior of lifelike avatars, providing users with a dynamic and demanding interview experience. By including changing levels of difficulty and real-time user engagement, the system aims to imitate real-world interview circumstances, assisting users in developing confidence and improving their performance.

1. **Develop Interactive 2D Interview Simulation:**

- **Objective:** Create a realistic and dynamic 2D interview simulation platform.
- **Activities:**
    - Design and develop lifelike 2D avatars to simulate interviewers.
    - Implement varying levels of interview difficulty (Beginner, Intermediate, Expert) to cater to different user proficiency levels.
    - Integrate AI-driven avatars that simulate realistic interview behavior and responses based on the interview level.

2. **Implement Machine Learning for Question Generation:**

- **Objective:** Develop an AI-driven system for generating interview questions tailored to different difficulty levels.
- **Activities:**
    - Apply machine learning algorithms (e.g., Decision Trees, Neural Networks) to generate and categorize questions based on difficulty.

- Train the models with a diverse dataset of interview questions and scenarios to ensure a wide range of topics and complexities.
- Validate and refine the model to ensure questions are relevant, challenging, and representative of real-world interview situations.

3. **User-Friendly Interface and Experience:**

- **Objective:** Provide an intuitive and accessible interface for users interacting with the simulation.
- **Activities:**
  - Design a clean, user-friendly interface that guides users through the interview process with minimal friction.
  - Implement features such as progress tracking, feedback mechanisms, and customizable avatar interactions.
  - Ensure the interface is responsive and accessible across different devices, making the simulation easy to use for a broad audience.

4. **Model Integration and System Scalability:**

- **Objective:** Ensure seamless integration of machine learning models into the simulation system and allow for future scalability.
- **Activities:**
  - Integrate the machine learning models into the simulation engine to drive avatar behavior and question generation.
  - Design the system architecture to be scalable, allowing for the addition of new interview scenarios, questions, and difficulty levels as needed.
  - Conduct rigorous testing to ensure the system can handle multiple users and complex simulations without performance degradation.

5. **Testing and Validation of the Simulation:**

- **Objective:** Ensure the 2D interview simulation is realistic, effective, and beneficial for users.
- **Activities:**
  - Perform extensive testing with real users to assess the simulation's realism and effectiveness in preparing users for actual interviews.
  - Collect user feedback and use it to make iterative improvements to the avatars, questions, and overall simulation experience.
  - Validate the system's ability to provide accurate, meaningful feedback to users based on their performance during the simulation.

Expected Outcomes

- **Realistic Interview Experience:** The 2D interview simulation offers customers a highly realistic and immersive interview experience that closely resembles real-world interview settings of varying difficulty levels.
- **Adaptive Learning Environment:** The system adjusts to the user's skill level, providing appropriate challenges at the beginner, intermediate, and expert interview levels, improving the user's readiness for actual interviews.
- **Effective Question Generation**: The machine learning models produce a broad set of relevant and hard interview questions, ensuring that users are prepared for a wide range of interview subjects and situations.
- **stronger Interview Preparedness:** As a result of the simulation's complete preparation, users display increased confidence and performance in real-world interviews, as evidenced by their better ability to manage complicated questions and scenarios.

This component is intended to generate an interactive 2D interview panel simulation that improves user preparedness via realistic practice scenarios. This simulation uses complex machine learning models to provide various levels of difficulty, allowing users to gradually improve their skills. The emphasis on user-friendly interface design guarantees that the experience is easy and entertaining, resulting in a powerful tool for users to practice and improve their interview skills.

PROJECT REQUIREMENTS

1.Functional Requirements

1. User Authentication and Profile Management

The system shall allow users to create and manage their profiles, ensuring secure access to personalized interview simulations.

Users shall have the ability to update their personal details, track their progress, and manage their account settings

2. Interview Simulation Level

The system shall offer simulations across three difficulty levels: Beginner, Intermediate, and Expert

Users shall be able to select the desired difficulty level before starting a simulation, with each level designed to progressively challenge the user's skills.

3. Question Generation and Feedback

The system shall dynamically generate interview questions based on the selected difficulty level and job role, providing real-time feedback after each response.

Users shall receive explanations for both correct and incorrect answers to reinforce learning.

4.Progress Tracking and Analytics

The system shall track user performance across multiple simulations, offering detailed analytics to help users understand their strengths and areas for improvement.

Users shall be able to view their progress over time, with visual representations of their performance metrics.

5. Interactive 2D Avatars

The system shall include 2D avatars representing interviewers, with each avatar delivering questions in a manner consistent with the selected difficulty level.

Avatars shall provide a realistic and engaging simulation experience, with varying levels of intensity based on user progress.

6. Security and Privacy

The system shall implement encryption for all user data, both in transit and at rest, to ensure privacy and security.

Role-based access control (RBAC) shall be used to restrict access to sensitive information, with audit logs maintained for security monitoring.

2. User Requirements

Users:

- Need a seamless and intuitive interface to participate in interview simulations that align with their job roles and desired difficulty levels.
- Expect real-time feedback on their responses, including detailed explanations and suggestions for improvement.
- Require progress tracking features to monitor their development over time, with access to performance metrics and history.
- Desire an engaging simulation experience with interactive 2D avatars that mimic real-world interview scenarios.
- Need assurance of data security and privacy throughout their interaction with the platform.

Admins:

- Need robust tools for managing users, including the ability to add, remove, and modify user accounts, as well as oversee user progress and performance.
- Require the capability to manage and update the question bank, ensuring that the content remains relevant and challenging.
- Expect comprehensive analytics and reporting features to evaluate system usage, user engagement, and the overall effectiveness of the simulations.
- Need controls for configuring system settings, managing the security protocols, and ensuring compliance with data privacy regulations.
- Require the ability to monitor the performance and behavior of the 2D avatars to ensure they are providing a realistic and effective interview experience.

3. System requirements

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

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. Non-functional Requirements

1. Performance:

- The system shall load interview simulations and related features within 2 seconds of user interaction.
- The platform shall support smooth operation for at least 100 simultaneous users without noticeable performance issues.
- Response time for real-time feedback shall not exceed 1 second after a user submits an answer.

2. Scalability:

- The system shall be designed to scale horizontally, allowing the addition of resources to handle an increasing number of users and data without degrading performance.
- The interview simulations, user data, and progress tracking information shall be stored in a highly scalable database, ensuring efficient handling of large datasets.
- The architecture shall support the deployment of additional instances to balance load effectively.

3. Reliability and Availability:

- The system shall maintain an uptime of 99.9% or higher, ensuring consistent availability to users.
- Automated backups shall be conducted regularly to prevent data loss, with recovery mechanisms in place to minimize downtime in case of failures.
- The platform shall include redundancy measures to prevent single points of failure, ensuring continuous operation.

4. Usability and User Experience:

- The user interface shall be designed to be intuitive, allowing users to easily navigate through the platform with minimal guidance.
- The system shall provide clear and concise instructions throughout the user journey, with accessible help documentation and tutorials available at all times.

- The interface shall be responsive and optimized for both desktop and mobile devices, ensuring a seamless experience across different screen sizes.

5. Maintainability and Extensibility:

- The codebase shall adhere to best practices for modularity, readability, and documentation, facilitating easy maintenance and future enhancements.
- The platform shall be designed with extensibility in mind, allowing for the integration of new features and functionalities without significant rework.
- Regular updates and security patches shall be applied promptly to keep the system secure and up to date with the latest technological standards.

6. Compatibility:

- The platform shall be compatible with all major web browsers, including Chrome, Firefox, Safari, and Edge, ensuring accessibility to a wide user base.
- The mobile version of the platform shall be fully functional and accessible on both Android and iOS devices, providing a consistent experience across platforms.

TEST CASES

Table 2: Test Cases

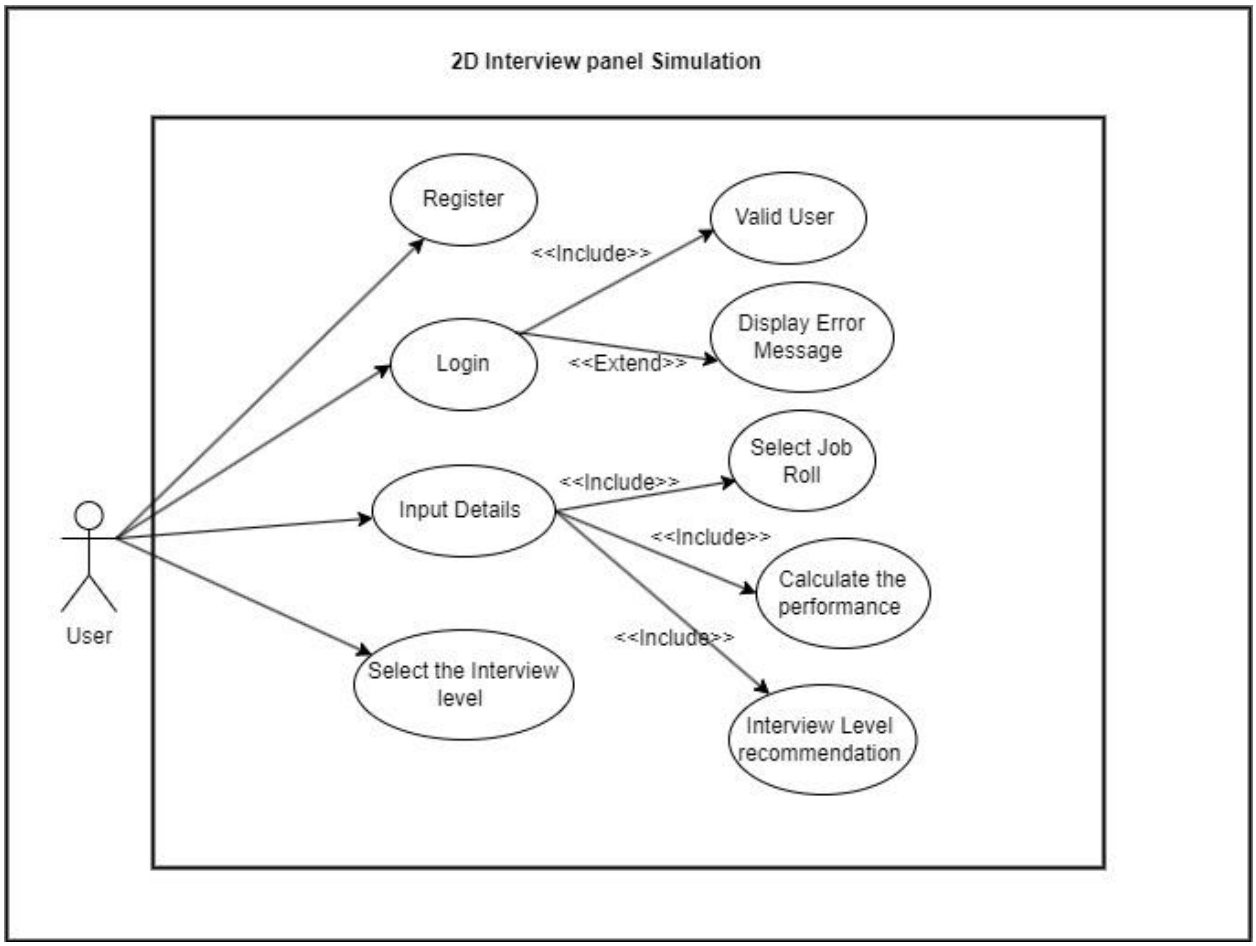
Test Case ID	Test Case Description	Test Steps	Input Data	Expect Output	Actual Output	Pass/Fail
T001	**User Login**	**1. Navigate to login page 2. Enter valid credentials 3. Click on "Login" button**	**Username: user1 Password: pass123**	**User should be successfully logged in and redirected to the dashboard**	**User logged in successfully and redirected to dashboard**	**Pass**
T002	**Invalid Login Attempt**	**1. Navigate to login page 2. Enter invalid credentials 3. Click on**	**Username: user1 Password: wrong pass**	**Error message "Invalid credentials " should be displayed, and user**	**Error message displayed user remains on login page**	**pass**

		"Login" button		**should remain on the login page**		
T003	**Access Interview Levels**	**1. Login as user 2. Navigate to "Interview Levels" section 3. Select a level**	**User is logged in**	**The selected interview level should be displayed with relevant instruction**	**Selected interview level displayed with instructions**	**Pass**
T004	**Start Interview Simulation**	**1. Login as user 2. Select interview level 3. Click "Start Simulation"**	**Interview Level: Intermediate**	**Interview simulation should start with questions displayed one by one**	**Simulation started, questions displayed one by one**	**Pass**
T005	**Real-Time Feedback**	**1. Start an interview simulation 2. Answer a question**	**Answer: "Correct Answer"**	**Immediate feedback should be displayed, indicating whether the answer was correct or incorrect**	**Feedback displayed immediately after answer**	**Pass**
T006	**Progress Tracking**	**1. Complete an interview simulation 2. Navigate to "Progress" section**	**User has completed a simulation**	**Progress should be updated, displaying metrics such as accuracy, completion rate, and improvement suggestions**	**Progress updated, metrics displayed accurately**	**Pass**

T007	**User Profile Management**	**1. Login as user 2. Navigate to "Profile" section 3. Update profile information**	**New Email: user1@example.com**	**Profile should be updated successfully, with changes reflected in the user's profile**	**Profile updated successfully changes reflected**	**Pass**
T008	**Security: Data Encryption**	**1. Perform a login operation 2. Check network requests**	**User credentials**	**Data transmitted (e.g., password) should be encrypted and not visible in plain text in network requests**	**Data encrypted, not visible in plain text in network requests**	**Pass**
	System Scalability	**1. Simulate 100 concurrent users logging in 2. Monitor system performance**	**100 simulated user logins**	**System should handle concurrent logins without performance degradation**	**System handled 100 concurrent logins without degradation**	**Pass**
T010	**Logout Functionality**	**1. Login as user 2. Click on "Logout" button**	**-**	**User should be logged out and redirected to the login page**	**User logged out successfully, redirected to login page**	**Pass**

USE CASE DIAGRAM

Figure 4: Use case Diagram



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

Table 3: Budget

WORK BREAKDOWN STRUCTURE

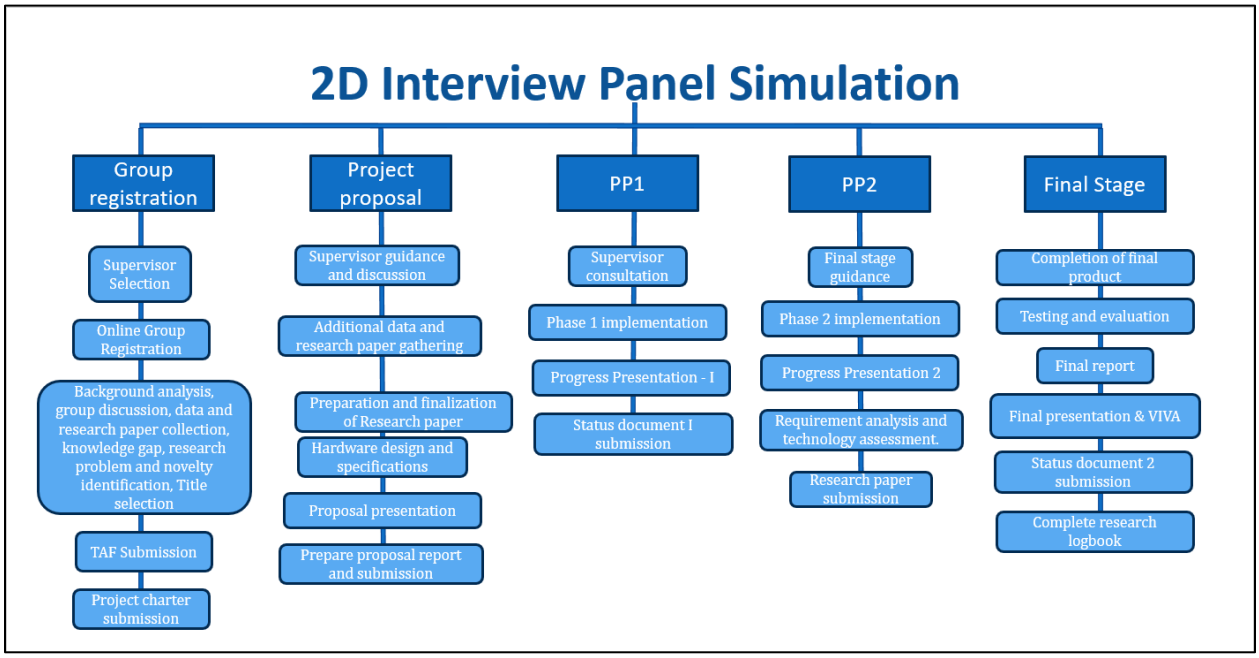


Figure 5: Work Breakdown Structure

GANTT CHART

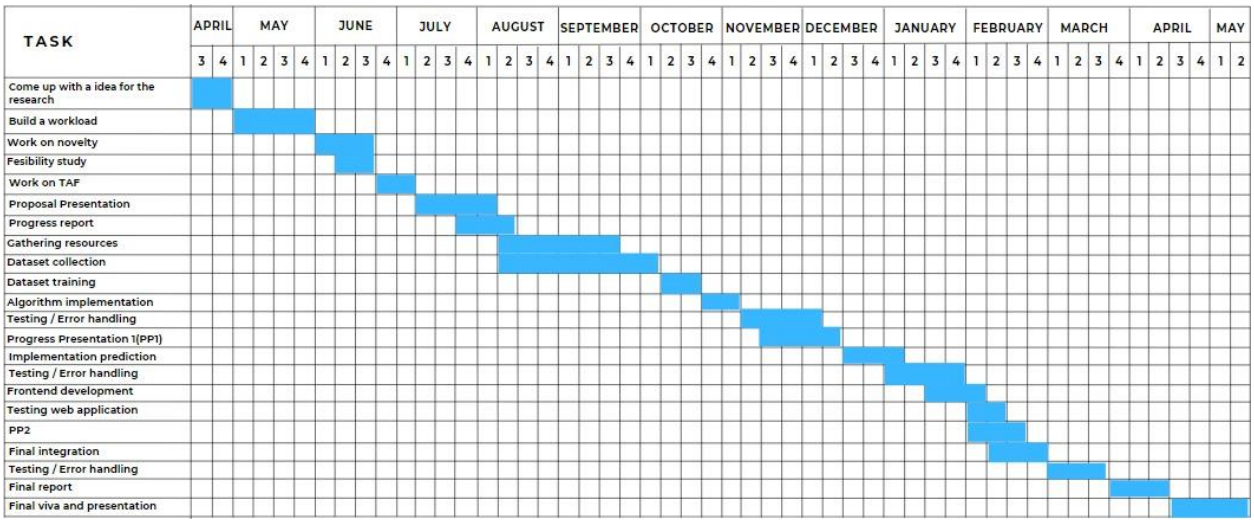


Figure 6: Gantt chart

COMMERCIALIZATION

Feature/Level	Description	Participation Limit	Payment Structure
Level 1: Beginner	One 2D avatar asks normal interview questions. Users can answer and practice.	Unlimited	Free
Level 2: Intermediate	Two 2D avatars ask questions alternately, increasing the difficulty. Users can answer and practice.	3 sessions	Free
Level 3: Expert	Three 2D avatars ask questions rapidly, making it the hardest level. Users can answer and practice.	3 sessions	Free for the first 3 sessions; requires payment for additional sessions.
Additional Sessions (Level 3)	Users can purchase additional practice sessions for the Expert level after exhausting the free sessions.	N/A	Paid: Users need to pay for each additional session.

Figure 7: Commercialization chart

REFERENCES

[1] .. T. T. ,. W. W. G. M. V. S. ,. W. M. K. ,. E. E. M. O. M. ,. K. S. R. M. J. S. R. S. K., Guru Gedara: Smart Mathematical e-learning Platform for Grade Five Students, 21 February 2021.

[2] T. Wyssenbach, "Nonverbal behavior of interviewers influences the competence ratings of observers in recruitment interviews: a study investigating social influence using 360-degree videos with virtual reality and 2D screen displays," 2022.

[3] S. A. M. S. W. D. Anais Dawson, "Lessons Learned from the Design and Evaluation of InterViewR: A Mixed-Reality Based Interview Training Simulation Platform for Individuals with Autism," IEEE, 2022.

[4] S. U. o. R. R. I. Department of Social and Economic Sciences, "Machine learning, artificial neural networks and social research," 2021.

[5] S. Z. H. A. B. P. Pegah Salehi, "A theoretical and empirical analysis of 2D and 3D Virtual Environments in Training for Child Interview Skills," IEEE, 12 August 2024.

[6] T. G. B. I. J.-C. M. David Antonio Gómez Jáuregui, "Design and evaluation of postural interactions between users and a listening virtual agent during a simulated job interview," 2021 may 28 .

[7] M. P. B. W. James Wexler, "The What-If Tool: Interactive Probing of Machine Learning Models," IEEE, 2020.