

AI-Based Mock Interviews

Final Year Project

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Abstract

AI-powered mock interview platforms are emerging as a valuable resource for individuals seeking to enhance their interview skills by offering realistic and adaptive interview simulations. This project focuses on developing a web-based platform that assists users in preparing for job interviews. The system will use the Gemini API to dynamically generate personalized and follow-up interview questions based on the user's input, such as job title and description. The platform is designed to assess user responses based on parameters such as relevance, clarity, comprehension, examples provided, problem-solving ability, and technical accuracy. A custom sentiment analysis model will be developed, trained, and deployed to evaluate emotional tone effectively. The backend will leverage NestJS for scalable architecture and efficient API management, while the frontend will utilize React to deliver a seamless and responsive user interface. User data, evaluation metrics, and questions will be stored in a MongoDB database. Users can input job-specific details, such as the role and its description, enabling the system to generate customized, AI-driven interview questions tailored to the provided context. The platform will record user responses, analyze their content, and deliver instant feedback. By integrating speech-to-text capabilities and basic AI analysis, the system will highlight areas for improvement and track progress over time. At the end of each session, users will receive a detailed performance summary. Once all data is processed, a comprehensive final report, including in-depth insights and sentiment analysis, will be emailed. The platform will also generate follow-up questions dynamically, adapting to user responses to create a personalized and engaging experience that closely mirrors a real-world interview.

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Chapter 1

Introduction

1.1 Introduction to AI-Based Mock Interviews

Advancements in artificial intelligence (AI) have brought significant changes to industries like education, recruitment, and career development. For job seekers, interview preparation remains a common challenge, as traditional methods—such as reading books, practicing with peers, or attending coaching sessions—often lack the personalization and real-time feedback needed for effective improvement. In contrast, AI-driven platforms simulate real-world interview scenarios, offering immediate feedback and actionable insights. While traditional techniques have their benefits, they frequently fall short in terms of adaptability, fairness, and efficiency.

AI-powered systems go beyond basic evaluation by leveraging technologies like voice recognition and machine learning. These platforms analyze critical factors such as speech patterns, tone, and word choice to provide a well-rounded assessment of a candidate's suitability for specific roles. This level of analysis helps bridge the gap left by traditional methods, making interview preparation more thorough and personalized.

An AI-based mock interview platform offers distinct advantages over conventional approaches. It enables users to engage in realistic, job-specific interview sessions without the need for a human interviewer. The system generates tailored questions, records user responses in both audio and text formats, and uses speech-to-text technology to convert spoken answers into written form. These responses are stored in a database, allowing for easy review and analysis.

The AI evaluates user responses, pinpointing incorrect answers or areas that need improvement. This helps users gain a clear understanding of their weaknesses while preparing more effectively. Additionally, the platform performs sentiment analysis on both audio and text inputs, offering insights into the user's confidence and emotional tone during the interview process. By providing comprehensive evaluations, the platform equips candidates with tools to tackle a wide range of interview scenarios confidently.

Our goal is to empower individuals to succeed in the competitive job market through a dynamic platform that highlights their strengths and identifies areas for growth. By integrating advanced deep learning models and sophisticated data processing techniques, the system delivers accurate

and reliable assessments. This innovative approach redefines interview preparation, addressing the limitations of traditional methods with a more intelligent and efficient solution.

With this approach, candidates can navigate interviews with greater confidence and competence, making the preparation process more accessible and impactful.

1.2 System Overview

We will develop a Real-time AI Interview Website with Sentiment Analysis named AI-based mock interviews. This website will allow users to prepare for interviews, users can attempt interviews in real-time by answering questions through voice. It gives users an experience or real interviews without the need for an interviewer. At the end of the interview, the report of the interview including sentiment analysis is shared with users, so users can focus on areas of improvement and prepare well for real interviews.

The system will use the Gemini API to dynamically generate personalized and follow-up interview questions based on the user's input, such as job title and description. User responses will be evaluated on parameters like relevance, clarity, understanding, examples, problem-solving, and technical accuracy. A custom sentiment analysis model will be trained, tested, and deployed to assess emotional tone. The backend will be developed using NestJS for scalability and efficient API management, while the frontend will be built with React for a responsive user interface. User data, questions, and evaluation metrics will be stored in a MongoDB database, ensuring flexibility and scalability for dynamic data handling.

1.3 Objectives

- i. Create an AI system that generates interview questions specific to the user's chosen job field, so they can practice questions they might really face in interviews.
- ii. Set up a live, interactive interview experience where users answer questions in real time, just like they would in an actual interview.
- iii. Allow users to speak their answers out loud, which the system will then turn into text, making it easy to review and store.
- iv. Save both the audio recordings and transcribed answers securely in a database.

- v. Use AI to check if user answers are correct and complete, and provide feedback on areas they can improve to be better prepared for real interviews.
- vi. Analyze the audio and transcribed answers to perform sentiment analysis.
- vii. Based on all the analysis, give users insights into their performance, confidence level, and any patterns in their answers that might be worth focusing on.

1.4 Project Definition

With AI-based mock interviews, you can conduct real interviews, receive instant feedback on your answers, and analyze your confidence, and emotions, all in one place. AI-powered mock interviews provide users with a convenient way to sharpen their interview skills and improve their chances of success, eliminating the need for in-person practice sessions or time-consuming preparation routines.

1.5 Project Scope

Our project focuses on creating an AI-driven mock interview platform to help users prepare effectively for interviews. The platform is designed to offer a seamless and efficient experience, simulating real-time interview scenarios with questions tailored to the user's chosen role. In addition to personalized feedback based on user responses, the platform incorporates advanced tools such as audio-to-text conversion, answer validation, and sentiment analysis. These features work together to identify areas for improvement, helping users enhance their interview performance and build confidence.

1.6 Problem Statement

Preparing for job interviews can be challenging, as many candidates lack access to personalized feedback and realistic practice tools. Traditional methods often fall short, while existing mock interview solutions are either too expensive or fail to provide tailored experiences. This project focuses on building an AI-based mock interview platform to bridge this gap. The platform will simulate adaptive interviews, analyze user responses, and deliver constructive feedback, and sentiment analysis empowering candidates to confidently improve their skills and succeed in real-world scenarios.

1.7 Advantages

The advantages of AI-based mock interviews include:

- Users can practice interviews from the comfort of their own space, without the need for scheduling and interviewer.
- The real-time, interactive simulation prepares users for the actual interview experience, helping them get comfortable with live responses.
- It generates questions relevant to the user's chosen field or role, making practice highly relevant and aligned with real interview scenarios.
- With features like answer validation and sentiment analysis, users get instant feedback on their performance, so users can work on areas of improvement.

1.8 Features

Key features of AI-based mock interviews include:

- Ensures secure login and authentication for access.
- Questions are customized based on user input of role and job description.
- Spoken answers converted into text answers, stored and evaluated.
- Follow-up questions are dynamically generated on the base of user answers.
- Evaluates tone and sentiment from answers both text and audio.
- Detailed feedback report is provided at the end highlighting strengths and weaknesses.
- Real-time interview simulations to offer a more realistic environment.

Chapter 2

Existing Systems

2.1 Existing Systems

In a competitive job market, thorough and effective preparation of interviews is essential to secure your position for the next step in the hiring process. To achieve this various mock interview platforms based on AI have been developed to help users analyze their capabilities and skills before the interview and improve areas where they lack. However, these existing systems do not provide sentiment analysis of interviews that play a major role in the real world. The provided feedback lacks detailed analysis and provides a basic overview of the interview. Additionally, all of them are costly and include an excessive amount of advertisements that affect user experience and discourage users from using their services.

1. Interviews by AI [1]

Interviewsby.ai is an online platform where you can enter job description. This website provides a question set generated by AI and the answer is recorded which is then subjected to text analysis.

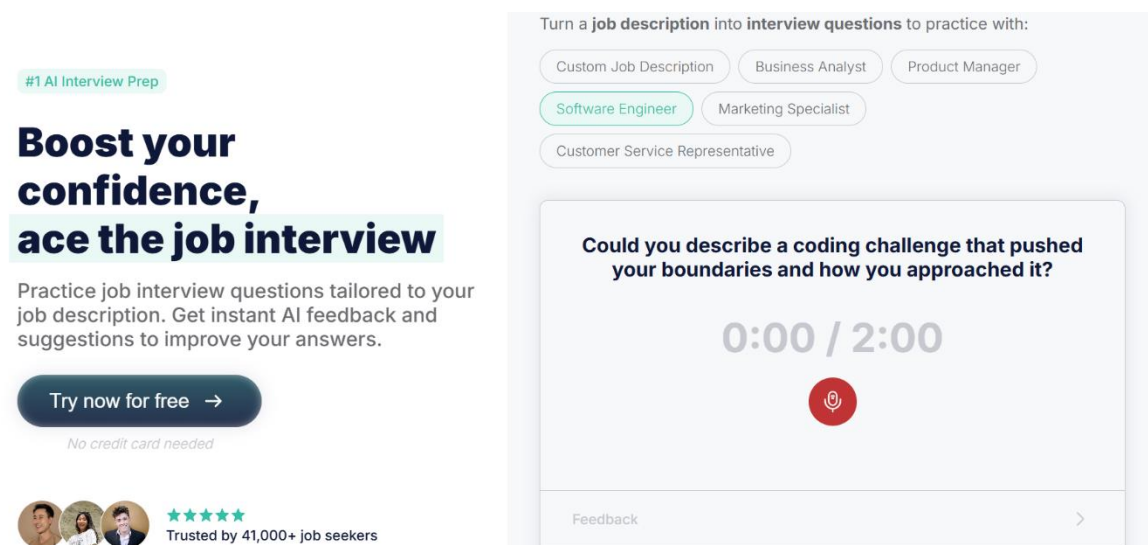


Figure 2.1 Screenshot of Interviews by AI

2. Interview Prep by AI [2]

Interview Prep by AI is an online platform where you can enter job description. This website provides a question set generated by AI and the answer is recorded also has an option for text answers which is then subjected to text analysis.

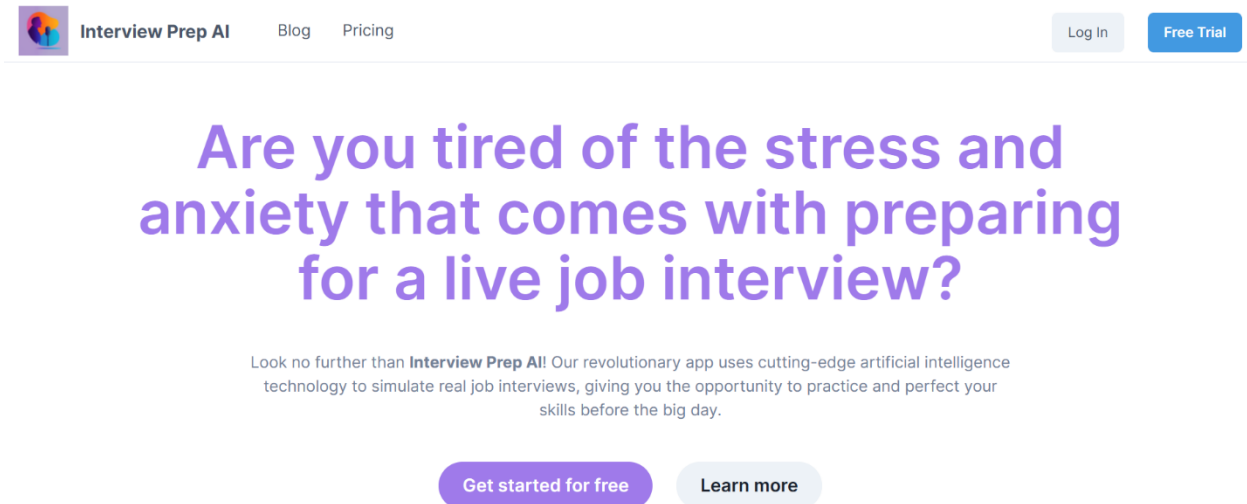


Figure 2.2 Screenshot of Interview Prep by AI

3. Final Round AI [3]

Final Round AI is an online platform where you can enter job description. This website provides a question set generated by AI and the answer is recorded also has the option of text answers which are then subjected to text analysis.

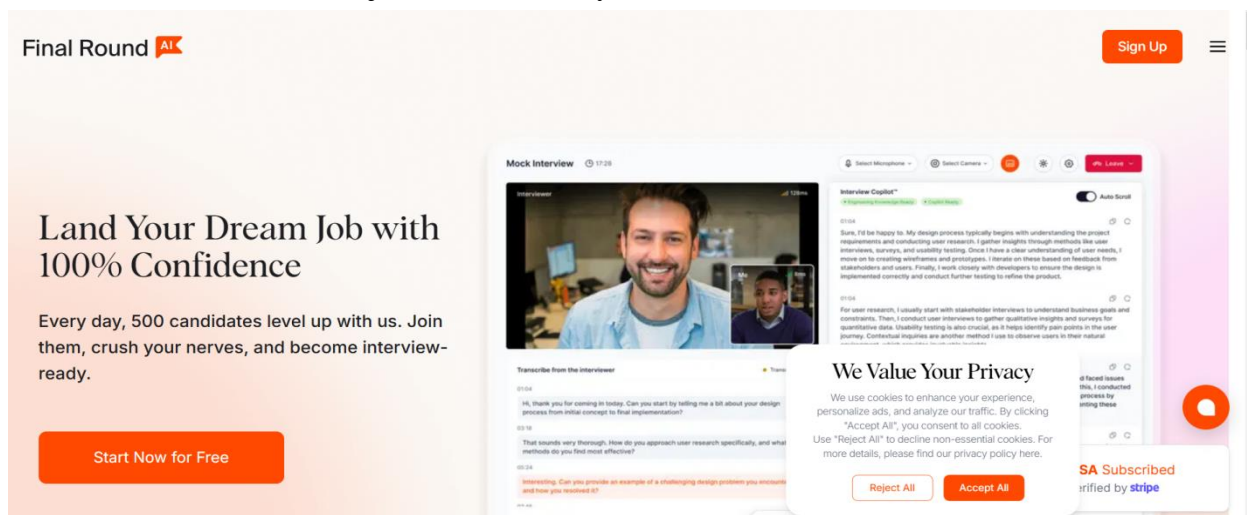


Figure 2.3 Screenshot of Final Round AI

4. Yoodli [4]

Yoodli is an online platform where you can enter job descriptions. This provides a feature of follow-up questions that are generated on the basis of previous answers and the answer is recorded also has the option of text answer which is then subjected to text analysis.

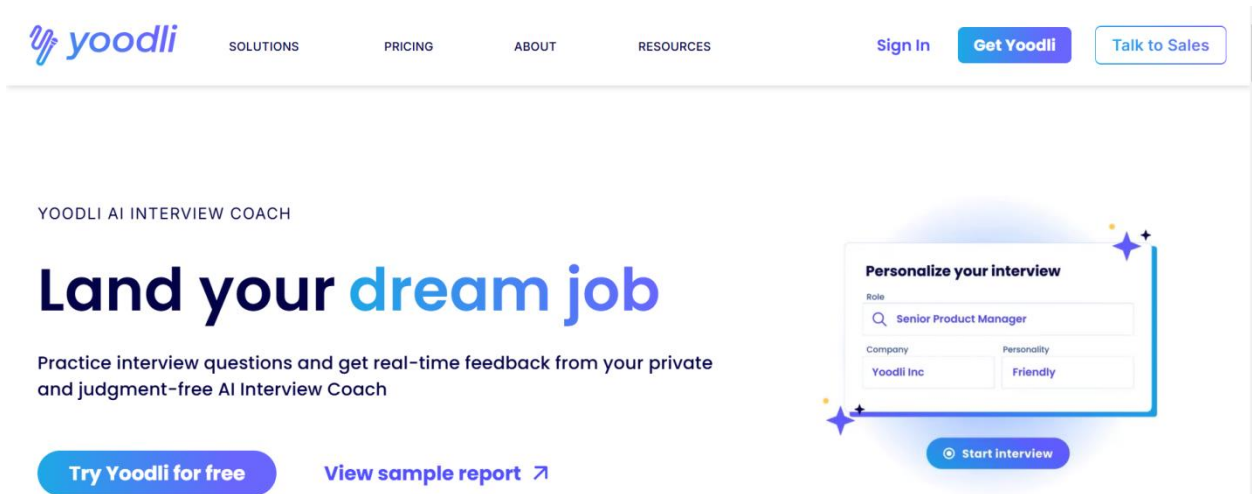


Figure 2.4 Screenshot of Yodli

5. CareerFlow AI [5]

CareerFlow AI is a platform where you can enter job descriptions. This provides a feature of follow-up questions that are generated on the basis of previous answers and also provides question banks on different topics. The answer has the option of text or audio which is then subjected to text analysis.

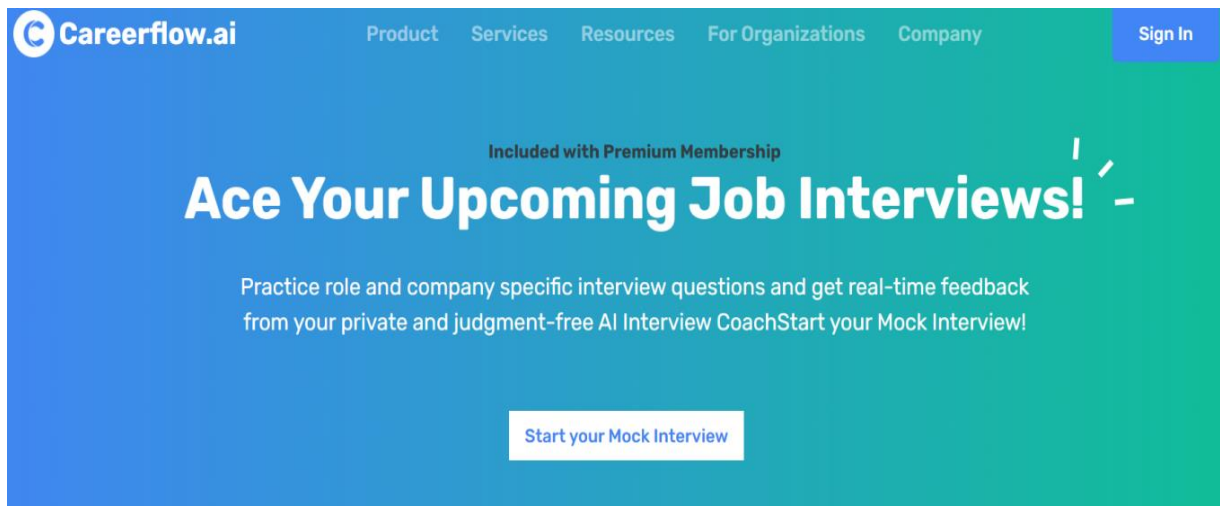


Figure 2.5 Screenshot of Careerflow AI

Links of Existing Systems

Table 2.1 Literature Review Sources

Source	URL
Interview by AI	https://interviewsby.ai/
Interview Prep by AI	https://interviewprep-ai.com/
Final Round AI	https://www.finalroundai.com/ai-mock-interview
Yoodli	https://yoodli.ai/use-cases/interview-preparation
Careerflow AI	https://www.careerflow.ai/mock-interview

2.2 Drawbacks of Existing Systems

- Existing Systems lack evaluation of emotional tone and delivery.
- Feedback generated does not focus on specific areas and only provides a basic overview
- In most systems follow-up questions are not generated and question banks are used.
- All the existing systems are provided with high costs.

2.3 Proposed System

The AI-Powered Mock Interview System addresses the shortcomings found in the existing platforms. It generates customized questions based on job title, description, and company level, as provided by users. An audio-to-text response enables the user to verbally respond. As any user would have thought, it makes use of AI to generate follow-up questions based on what the user has said, and real-time feedback that includes sentiment analysis allows a deeper look into users' tone and delivery. At the end of each session, report with strengths and areas for improvement. This system obviates all the limitations of the existing solutions.

2.4 Understanding the proposed system

There are two main actors in the system:

- **End Users:** Job seekers, students, and professionals looking for interview preparation.
- **Development Team:** Zainab Sarwar, Hashir Ali Ahmad

2.4.1 Initial Requirement for User

- Access to a stable internet connection.
- Ability to sign up for a free account with valid credentials (email/password).
- Microphone access to record responses.
- Option to view performance reports and receive actionable feedback.

2.5 Requirement Elicitation

The requirements engineering process provides the appropriate mechanism for understanding what the user wants, analyzing needs, assessing feasibility, negotiating a reasonable solution, specifying the solution unambiguously, validating the specification, and managing the requirements as they are transformed into an operational system. This document will provide the requirements of the end users and the system we are developing. Requirements are as follows:

2.5.1 Real-Time Interaction and AI Analysis

The system provides users with an opportunity to rehearse interviews using AI-driven, real-time interactions. The users will engage with customized questions, while the AI scrutinizes the answers according to sentiment, tone, and content.

2.5.2 Client-Side Requirements

Users require a device equipped with internet connectivity. Following the login step, users will be able to access their unique profiles and participate in mock interviews. Audio input (microphone) is mandatory for vocal communication during the interview process.

2.5.3 Database Management

Only an efficient database is necessary for maintaining user profiles, answers, and reports. Interview data, performance metrics, and analysis reports will be maintained for future study.

Table 2.2: End User Requirements

Sr No.	External Entities	Initial Requirements
1	User	User shall connect to the internet.
2	User	User shall sign up for a free account.
3	User	User shall provide an accurate email/password to log in.
4	User	User shall press the login button to continue.
5	User	User shall enable microphone access.
6	User	User shall start a mock interview session.
7	User	User shall view detailed performance reports.

Table 2.3: Allocate Resources

Sr No.	Initial Requirements	Use Case Name
1	User shall sign up for a free account	Registration
2	User shall input job details.	Provide Job Details
3	User shall start a mock interview session.	Start Interview
4	User shall enable microphone access.	Microphone Activation
5	User shall respond to interview questions	Solve Interview
6	User shall view basic analysis of interview.	Basic Analysis
7	User shall access their interview history.	Report Retrieval

Table 2.4: Prioritized Requirements

Sr No.	Rank	Initial Requirements	UC_ID	Use Case Name
1	Highest	User shall sign up for a free account	UC_1	Registration
2	Medium	User shall input job details.	UC_2	Provide Job Details
3	Highest	User shall start a mock interview session.	UC_3	Start Interview
4	Highest	User shall enable microphone access.	UC_4	Microphone Activation
5	Highest	User shall respond to interview questions	UC_5	Solve Interview
6	Medium	User shall view basic analysis of interview.	UC_6	Basic Analysis
7	Medium	User shall access their interview history.	UC_7	Report Retrieval

2.6 Non-Functional Requirements

Non-functional requirements define the quality attributes, system performance, and operational standards that ensure a system's effectiveness and usability, such as security, scalability, and reliability.

- **Performance:**

The frameworks being used in the development ensure the performance of its code. Furthermore, the code follows the standard practices and thus, it is highly optimized for performance and provide quick responses.

- **Reliability:**

The system is developed to provide accurate analysis and detailed reports and prevents data loss during interview,

- **Scalability:**

The system is designed to handle various users at a time and provide services at all times.

- **Security:**

Login system is employed to protect the system against breaches, and other vulnerabilities. Only registered people can login start interview process. The system ensures the security of private data of all users gathered during interview.

- **Ease of Use:**

The simple yet elegant user interface (UI) allows users to easily access the provided functionality to minimize complexity and confusion.

- **Portability:**

The system is highly portable and accessible, available on both web and mobile platforms, enabling users to prepare for interviews anytime and anywhere.

Chapter 3

Proposed System

3.1 Detail Description of Proposed System

The proposed system is a web-based platform developed to provide a realistic interview simulation to help users prepare for interviews and identify areas of improvement. It uses Artificial intelligence (AI) to generate tailored questions based on details provided by users such as (job title, description, and interview level) and continue the interview with follow-up questions that are generated based on their answers along with Natural Language Processing (NLP) models to evaluate their performance during interviews and generate detailed reports. The feedback provides in-depth details on all aspects including response quality, communication skills, technical analysis, and sentiment analysis. Unlike existing systems, our system ensures accurate sentiment analysis and detailed feedback of interviews as it plays a critical role in real-world interviews and helps the user to determine their preparation for interview.

3.2 Features of the Proposed System

- Ensures secure login and authentication for access.
- Questions are customized based on user input of role and job description.
- Spoken answers converted into text answers, stored and evaluated.
- Follow up questions are dynamic generated on the base of user answers.
- Evaluates tone and sentiment from answers both text and audio.
- Detailed feedback report is provided at the end highlighting strengths and weaknesses.
- Real-time interview simulations to offer more realistic environment.
- All Progress is displayed on Profile.

3.3 Advantages of the Proposed System

- Users can practice interviews on their own without any interviewer to experience a real-world scenario.

- The real-time, interactive simulation prepares users for the actual interview experience, helping them get comfortable with live responses.
- It generates questions relevant to the user's chosen field or role, making practice highly relevant and aligned with real interview scenarios.
- With features like answer validation and sentiment analysis, users get instant feedback on their performance, so users can work on areas of improvement.

3.4 Scope of the Proposed System

The scope of the proposed AI-based mock interview system is to improve the interview preparation of users as it simulates real-world interview scenarios by offering customized, tailored questions along with detailed feedback reports based on response quality, and technical and sentiment analysis. It uses AI and NLP to ensure that the system will provide users with a real-world interview scenario. This will help users identify their areas of improvement including communication skills, response quality, and sentiment analysis. Additionally, the generation of dynamic follow-up questions will be based on the user's performance and will help them engage in the interview experience. Our goal in this is to make it easier and more effective for users to prepare for interviews.

Chapter 4

Software Design and Model

4.1 Software Process Model

For the development of the AI-based mock interview website, we have chosen the Incremental Model as our software process model. This model aligns well with our project requirements and development strategy. Since we are building the platform internally without external clients, we have the flexibility to dictate how the development process will unfold.

The Incremental Model involves breaking the project into smaller, manageable modules or increments. Each increment is developed, tested, and delivered as a standalone component, which is later integrated into the complete system.

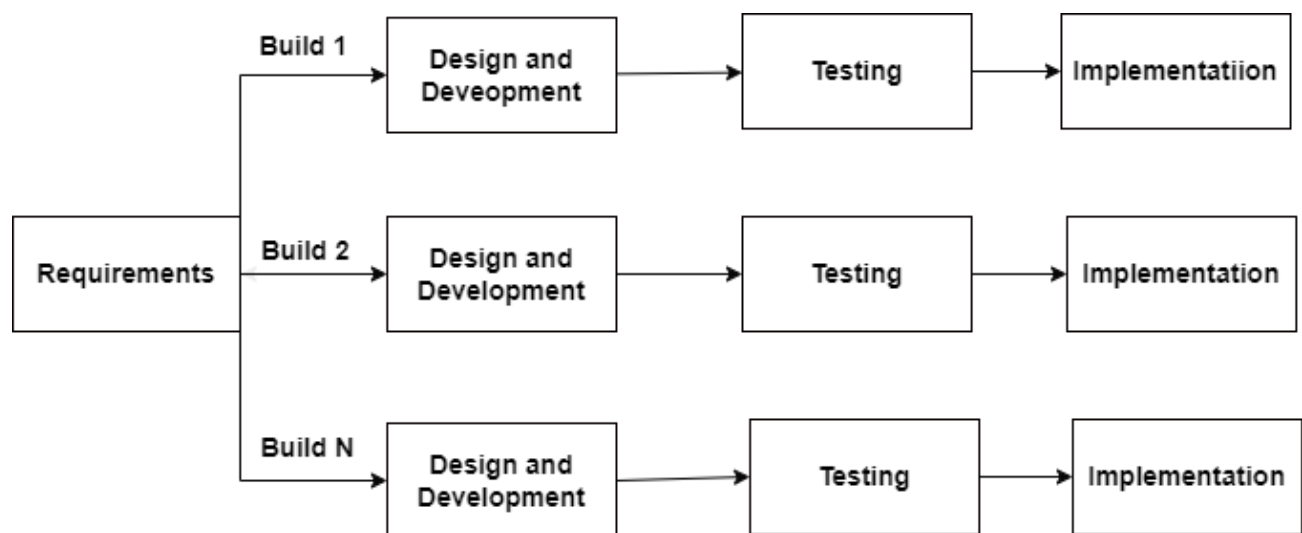


Figure 4.1 Screenshot of Incremental Model

4.2 Software Requirement Analysis

The purpose of this document is to collect, analyses and define high-level requirements, user needs and features of our website. This website is a Web based application. The initial version is under construction though tested inside the team. This document briefly describes the requirements, the characteristics of the system, constraints it applies, rules and other requirements. First part of this deliverable is all about planning and scheduling of project. This deliverable will contain following artefacts:

4.2.1 Feasibility Report

When a project is started the first matter to establish is to assess the feasibility of a project or product. Feasibility means the extent to which appropriate data and information are readily available or can be obtained with available resources such as staff, expertise, time, and equipment. It is basically used as a measure of how practical or beneficial the development of a software system will be to you (or organization). Problems and improvement opportunity, description of product and service accounting statements, financial data, legal requirements and tax obligations.

4.2.2 Technical Feasibility

In this era of technology in which we have different type of technologies to develop excellent websites, almost every website is developed in Python or Javascript and requires different type of technologies for development. In our current website, we also require different technologies.

Technologies Required:

- **Backend Development:** JavaScript framework NestJS or Python for implementing server-side operations and integrating AI functionalities.
- **Frontend Development:** Core web technologies such as HTML, CSS, JavaScript, and React to ensure an interactive and user-friendly interface.
- **Database Systems:** MongoDB to manage and store user profiles, job title, description, and level, interview questions, answers, and generated reports.
- **AI Tools:** Gemini API to dynamically generate personalized and follow-up interview questions based on the user's input, such as job title and description.
- **Development Tools:** Postman for API testing, VS Code as an IDE, and Git for version control.

4.2.3 Operational Feasibility

This AI based mock interview platform is designed for ease of use with an intuitive interface and interactive features, making it accessible to all users. Built with modern tools, it

ensures smooth functionality and adaptability. Our dedicated team supports its development, and the platform's scalable design allows for effortless updates and feature enhancements as needed.

4.2.4 Economic Feasibility

For the evaluation of the effectiveness of the project Economic Analysis is mostly used. Cost Estimations are provided through Function Point Method FPA in this deliverable. We are not using any costly software or hardware for our project. Any user can use this website by using high speed internet.

4.2.5 Schedule Feasibility

Time is very important factor for any project. The time given to complete the Project is almost 4-5 months. We have designed our project time-line keeping in view our deliver date of a quality product. We are capable to complete the Project within available time with available resources and staff.

4.2.6 Specification Feasibility

We understand the specifications and functional requirements based on the input provided to develop an AI based mock interview system. With user friendly specification, our website will receive job information from users and after that it will generate interview questions, the user will start solving interview.

4.2.7 Information Feasibility

Information required for the development of this project is available on Internet. Up till now we have gathered quite much information which will be helpful in our further development and support in predicting success of our project in terms of its completeness, reliability and meaningfulness.

4.2.8 Motivational Feasibility

We have started our project like how a project should be started from project requirements gathered, analysis and research. And we will be moving ahead according to development lifecycle. We are preparing an online application, no need to install any extra device for use. You can easily use it from anywhere using the internet.

4.2.9 Legal & Ethical Feasibility

Our project meets the entire legal and ethical requirement. An ethical behavior for a website during its developments means not to use pirated versions of software, as we are using open-source tools and technologies so there no chance of illegal activity in this project, also we provide a complete assurance of user security for their profile/password/emails etc.

4.3 Design

This UI is a mock example; the actual UI will be more concise and user-friendly. The final version will be optimized for better usability and a seamless experience.

Signup/Login Page

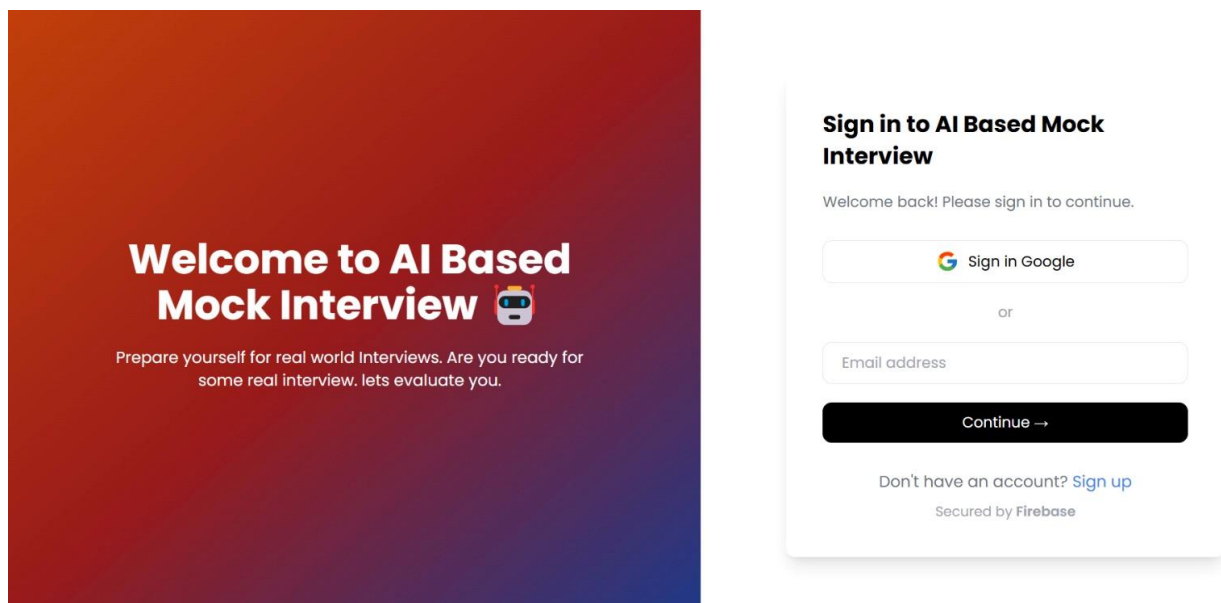


Figure 4.2 Screenshot of Signup/Login Page

Home Page

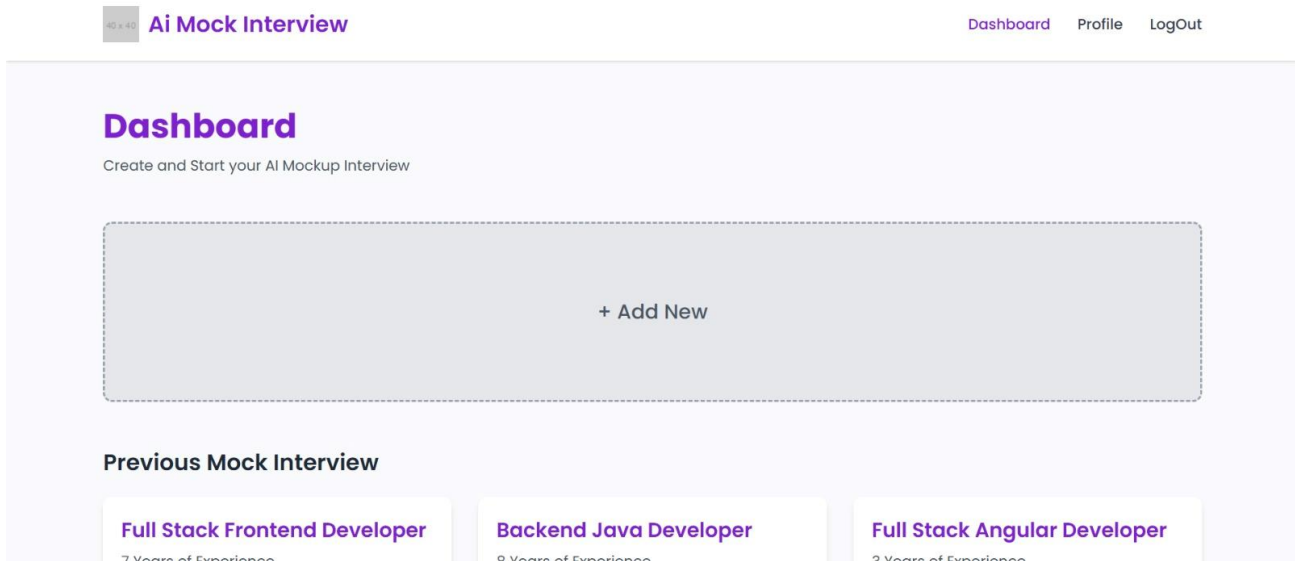


Figure 4.3 Screenshot of Home Page

User Profile

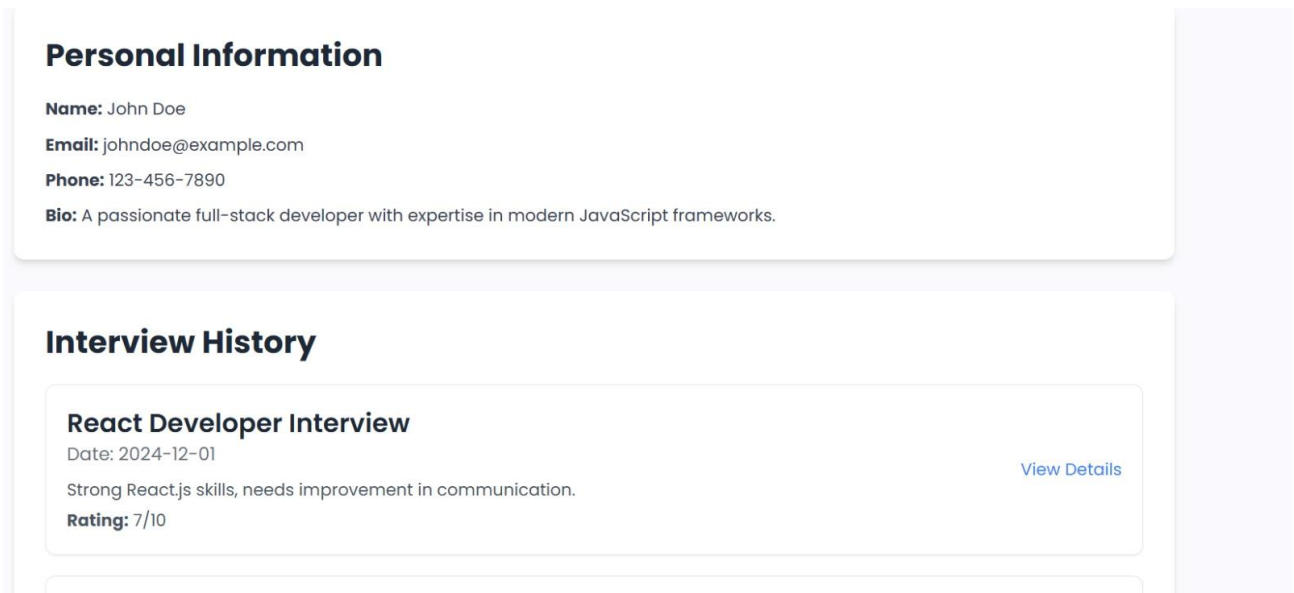


Figure 4.4 Screenshot of User Profile

Start Interview

The screenshot shows a web application titled 'Ai Mock Interview' with a navigation bar containing 'Dashboard', 'Profile', and 'LogOut'. The main content area is titled 'Dashboard' with the subtitle 'Create and Start your AI Mockup Interview'. A modal form titled 'Tell us more about your job interview' is open, prompting the user to 'Add details about your job position/role, job description, and years of experience.' The form contains three input fields: 'Job Title' (with placeholder text 'Ex. Full Stack Developer'), 'Job Description' (with placeholder text 'Ex. React, Angular, Node.js, MySQL etc.'), and 'Interview Level' (with placeholder text 'Senior'). At the bottom of the modal are two buttons: 'Cancel' and 'Start Interview'. In the background, a 'Previous Mock Interview' section is visible, showing a table with columns for job title, experience, and creation date. The first entry is 'Full Stack Frontend Developer' with '7 Years of Experience' and 'Created At: 05-06-2024'.

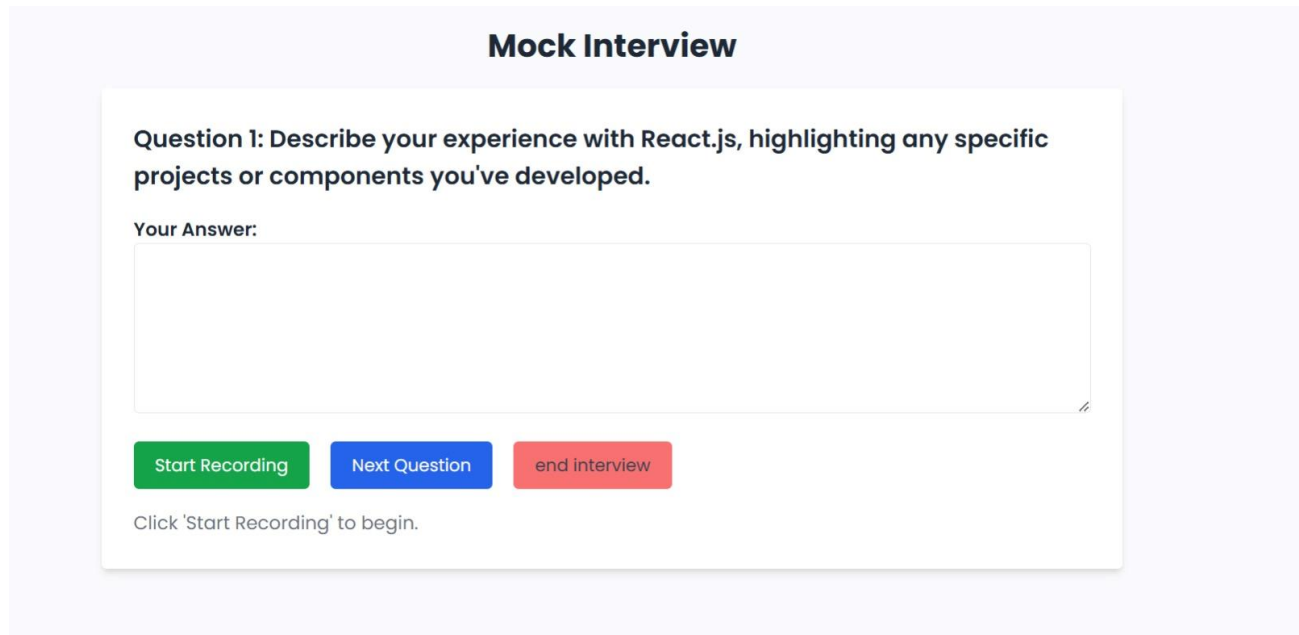
Figure 4.5 Screenshot of Start Interview

Get Started

The screenshot shows a 'Let's Get Started' page. It contains three sections: 'Job Role/Job Position:' with the value 'full stack developer', 'Job Description/Tech Stack:' with a detailed paragraph about a Full Stack Developer role, and 'Years of Experience:' with the value 'senior'. To the right of the 'Job Description/Tech Stack:' section are two buttons: 'Enable Microphone' and 'Start Interview'. At the bottom, a yellow box contains the text: 'Enable Microphone to start your AI-generated mock interview. It has questions which you can answer, and at the last, you will get the report based on your answers.'

Figure 4.6 Screenshot of Get Started

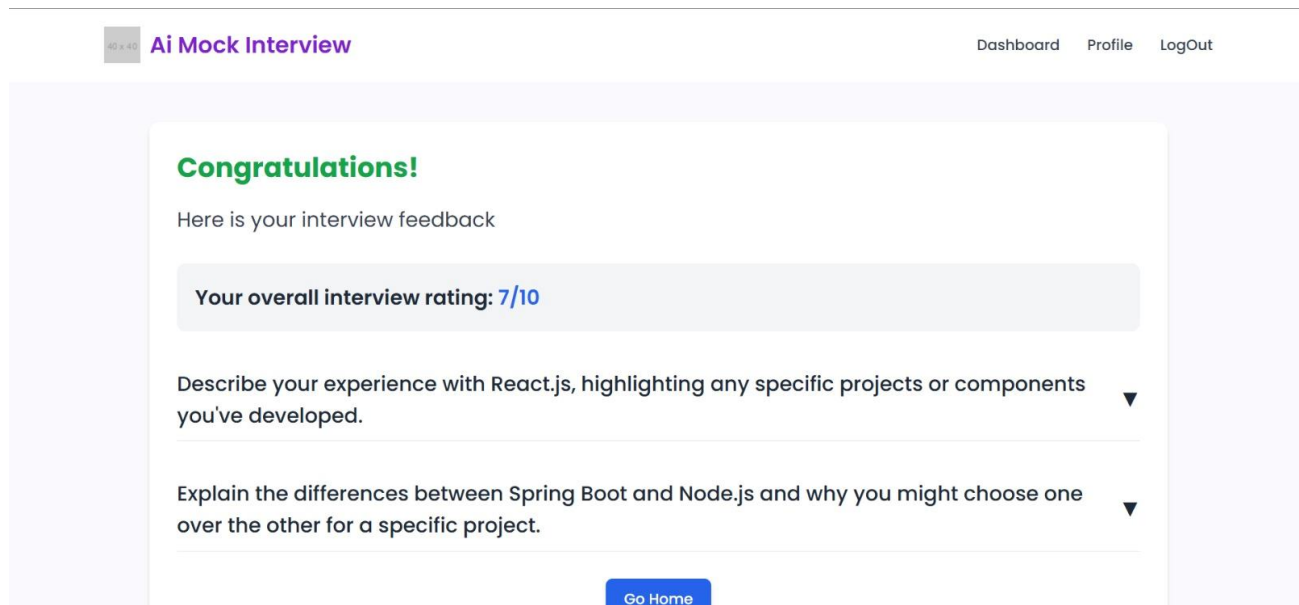
Questions Page



The screenshot shows a 'Mock Interview' interface. At the top, the title 'Mock Interview' is centered. Below it, a question is displayed: 'Question 1: Describe your experience with React.js, highlighting any specific projects or components you've developed.' Underneath the question is a text input area labeled 'Your Answer:'. At the bottom of the input area, there are three buttons: 'Start Recording' (green), 'Next Question' (blue), and 'end interview' (red). Below these buttons, a small instruction reads: 'Click 'Start Recording' to begin.'

Figure 4.7 Screenshot of Questions Page

Initial Report



The screenshot shows an 'Initial Report' page. At the top, there is a header with a logo and the text 'Ai Mock Interview'. To the right of the header are links for 'Dashboard', 'Profile', and 'LogOut'. The main content area features a 'Congratulations!' message in green. Below this, it says 'Here is your interview feedback'. A box displays 'Your overall interview rating: 7/10'. Two questions are listed with expandable details: 'Describe your experience with React.js, highlighting any specific projects or components you've developed.' and 'Explain the differences between Spring Boot and Node.js and why you might choose one over the other for a specific project.' At the bottom, there is a 'Go Home' button.

Figure 4.8 Screenshot of Initial Report

Final Report

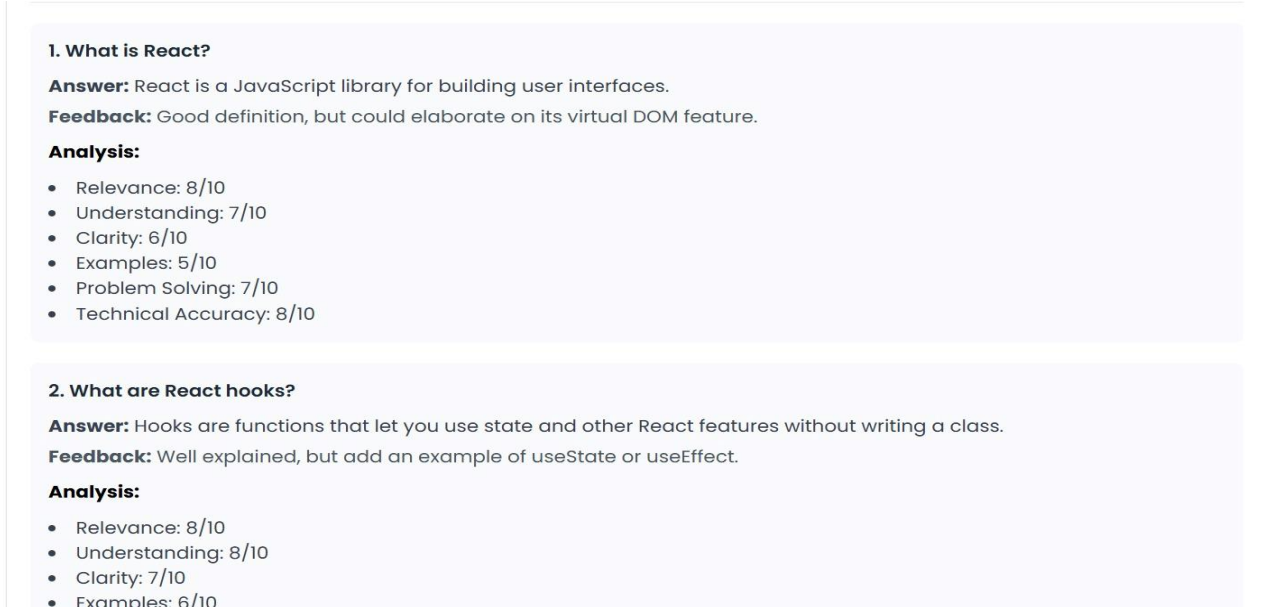


Figure 4.9 Screenshot of Final Report

4.4 Benefits of selected Model

- The software will be generated quickly during the software life cycle
- It is flexible and less expensive to change requirements and scope
- Thought the development stages changes can be done
- This model is less costly compared to others
- A customer can respond to each building
- Errors are easy to be identified

4.5 Limitations of selected Model

- It requires a good planning designing.
- Problems might cause due to system architecture as such not all requirements collected up front for the entire software lifecycle.
- Each iteration phase is rigid and does not overlap each other.

- Rectifying a problem in one unit requires correction in all the units and consumes a lot of time.

4.6 Use Case Diagram

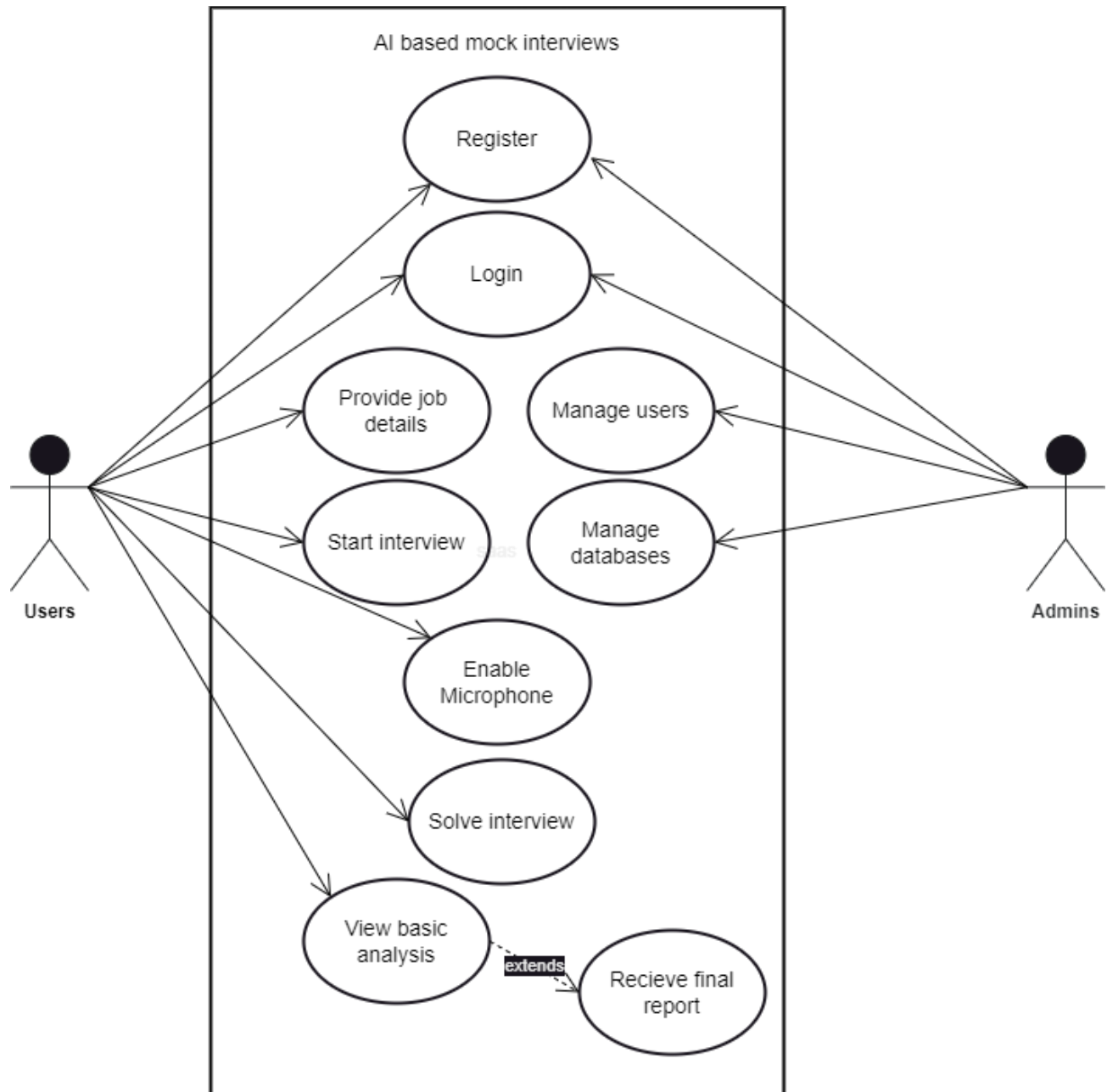


Figure 4.10 Use Case Diagram

4.7 Activity Diagram

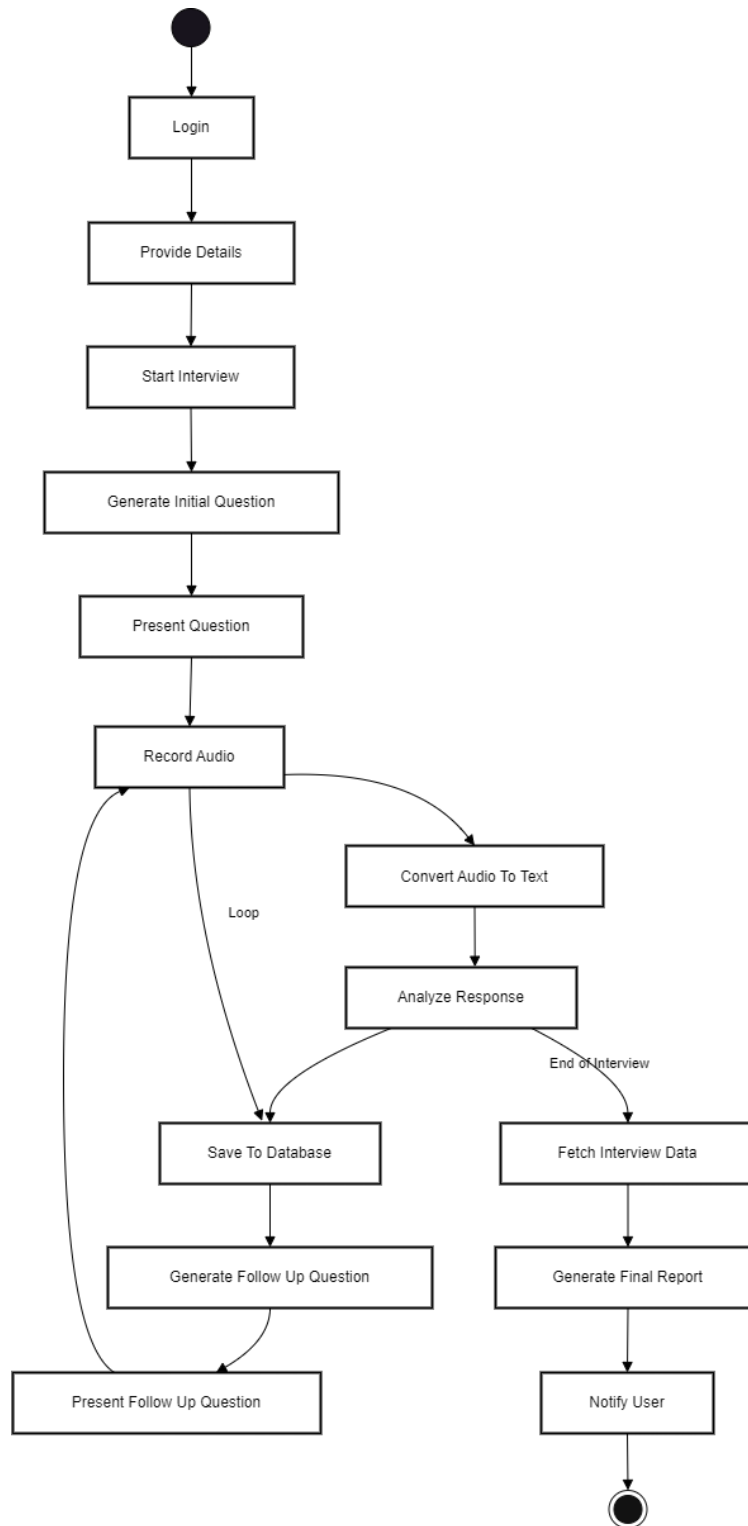


Figure 4.11 Activity Diagram

4.8 Sequence Diagram

Sign Up

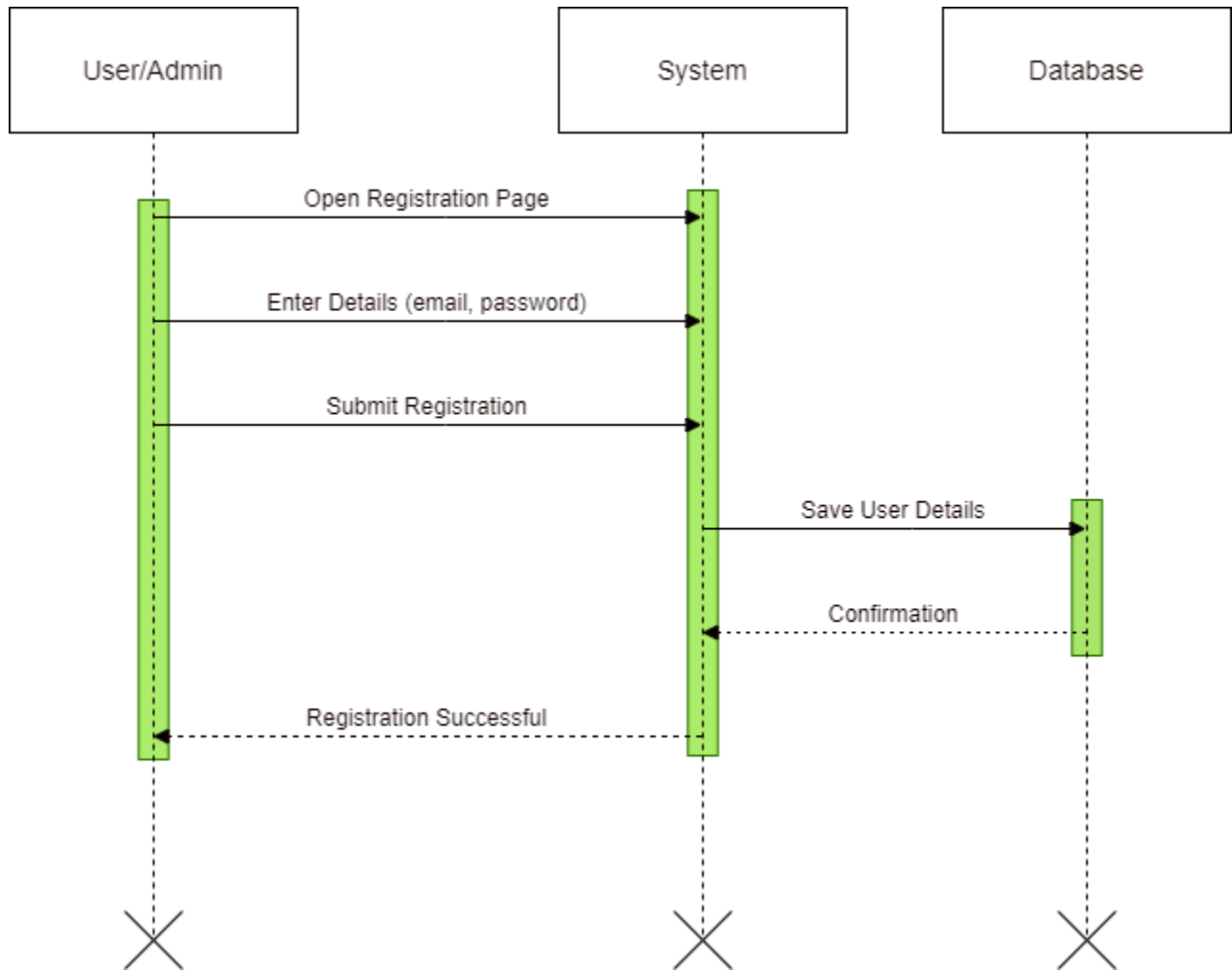


Figure 4.12 Sequence Diagram for Sign Up

Login

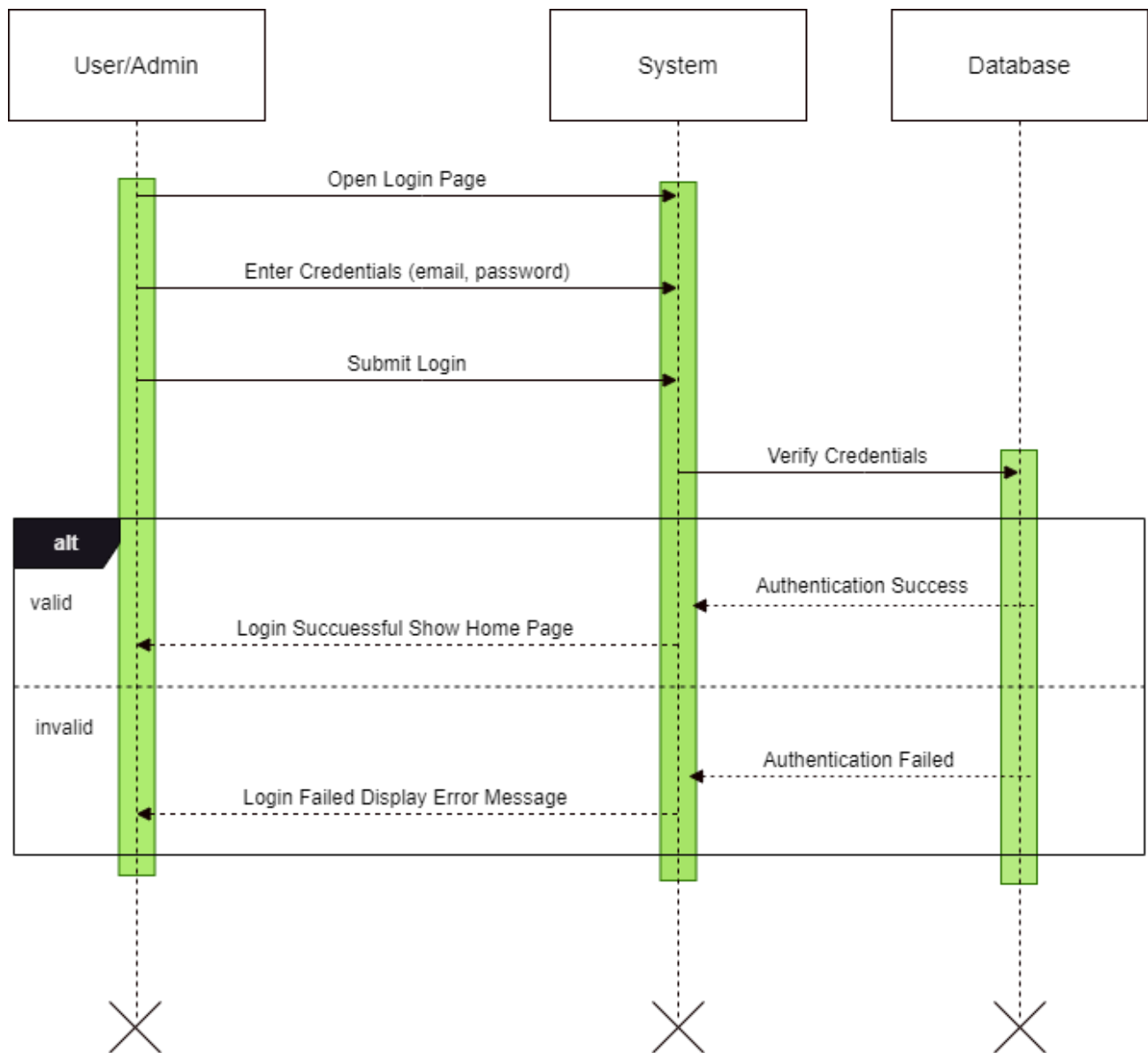


Figure 4.13 Sequence Diagram for Login

Interview Process

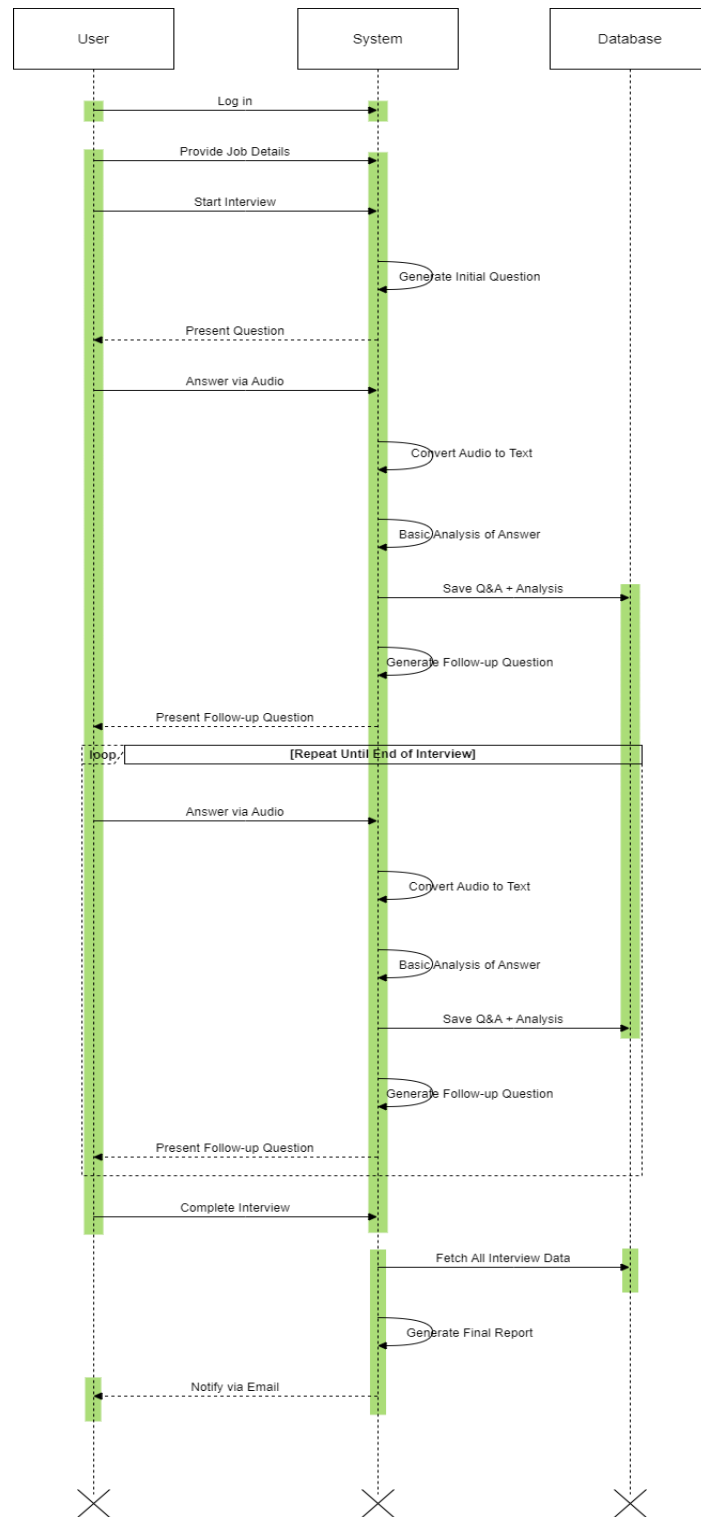


Figure 4.14 Sequence Diagram for Interview Process

4.9 Class Diagram

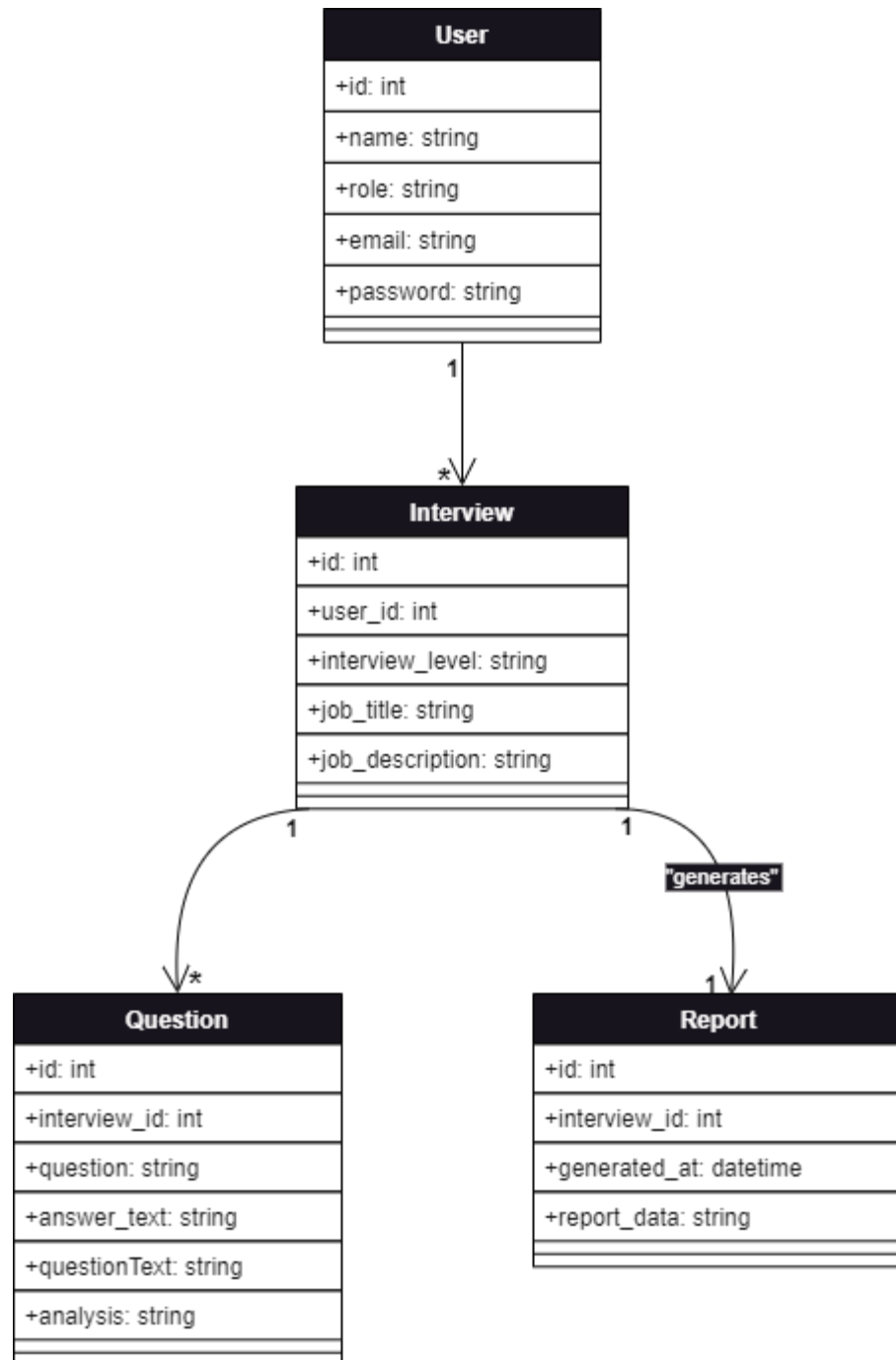


Figure 4.15 Class Diagram

4.10 ERD Diagram

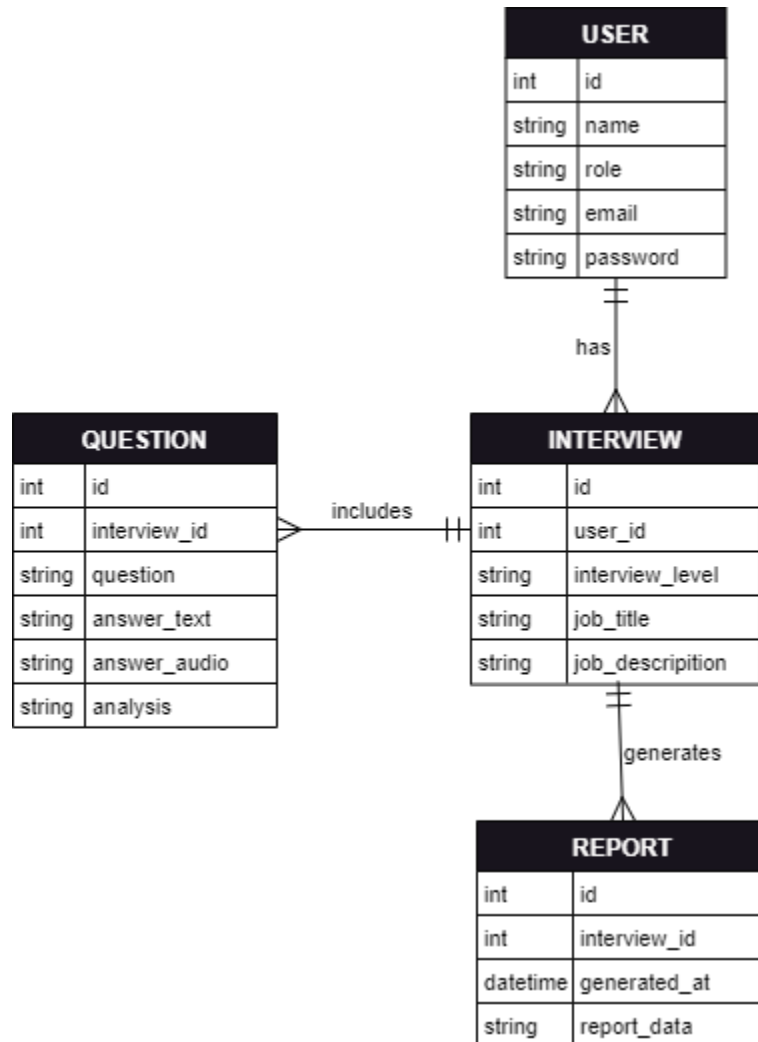


Figure 4.16 ERD Diagram

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2. <https://interviewprep-ai.com/>
3. <https://www.finalroundai.com/ai-mock-interview>
4. <https://yoodli.ai/use-cases/interview-preparation>
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