



International Journal of Multidisciplinary Research in Science, Engineering and Technology

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)



Impact Factor: 9.864

Volume 9, Issue 8, August 2026



International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

AI-Based Interview Preparation and Career Recommendation System

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ABSTRACT: Interview preparation is difficult for many students and fresh graduates because regular practice, personalized feedback, and progress monitoring are not always available. Existing resources such as question banks, tutorial videos, friends, and occasional mock interviews provide useful guidance, but they often do not offer immediate evaluation or a consistent way to measure improvement. This paper presents InterviewAI, an AI-based interview preparation and career recommendation web application that provides structured mock interviews for different job roles, interview categories, and difficulty levels. Users can answer through text or browser-based speech recognition, while the system records interview duration, tracks progress, evaluates responses, displays graphical performance analysis, recommends suitable career directions, stores interview history, and generates downloadable PDF reports. The application is developed using Python, Flask, Flask-SQLAlchemy, SQLite, HTML5, CSS3, JavaScript, Bootstrap 5, Chart.js, Web Speech API, and ReportLab. The present prototype uses an explainable rule-based evaluation mechanism that considers response completeness, relevant terminology, technical content, answer structure, and relevance. Therefore, it is designed as a learning and interview-practice platform rather than an automated recruitment decision system.

KEYWORDS: Artificial Intelligence, Interview Preparation, Career Recommendation, Flask, SQLite, Speech Recognition, Automated Feedback, Web Application.

I. INTRODUCTION

Job interviews are an important stage of recruitment because they allow employers to evaluate a candidate's technical knowledge, communication, reasoning, experience, and suitability for a role. A candidate may have strong academic knowledge but still perform poorly due to nervousness, lack of practice, weak answer organization, or uncertainty about the expectations of an interviewer. Students commonly prepare by reading interview questions, watching tutorials, practising with friends, or attending mock interviews arranged by teachers and placement trainers. Although these approaches are useful, they are often limited by time, availability, and lack of personalized feedback.

Static question websites mainly help users learn what questions may be asked. They do not measure how well a particular candidate answers those questions. Self-practice also provides limited feedback, while human mock interviews require another person and cannot always be repeated whenever needed. The proposed system addresses these limitations by providing a structured environment where candidates can repeatedly practise interviews, receive immediate feedback, and review their performance over time.

The purpose of InterviewAI is not to replace recruiters, placement officers, or professional interviewers. Its goal is to support learning by helping users recognize strengths, identify weaknesses, improve answer quality, and become more consistent in interview preparation.

II. PROBLEM STATEMENT AND OBJECTIVES

Interview preparation is often fragmented across several resources. A candidate may use one website for questions, another platform for career information, personal notes for tracking progress, and a separate application for communication practice. Because these activities are disconnected, it is difficult to compare previous attempts and



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determine whether performance is improving. Important information such as answers, feedback, scores, career suggestions, and interview history is rarely available in one place.

- Lack of personalized and role-based interview practice.
- Limited immediate feedback after answering questions.
- Absence of systematic progress tracking and graphical analysis.
- Limited opportunities for voice-based interview practice.
- Difficulty identifying communication and technical strengths or weaknesses.
- Lack of integrated career recommendations and consolidated interview history.
- Limited support for downloadable reports that can be reviewed later.

The main objective is to develop a secure, web-based interview preparation system that allows users to configure mock interviews, answer questions through text or speech, receive automated evaluation and understandable feedback, view performance scores and charts, obtain career recommendations, maintain interview history, and download PDF reports. Supporting objectives include user registration and login, multiple job roles and interview categories, three difficulty levels, interview timing, progress indicators, search/filter/sort functions for history, and user-specific storage of results.

III. EXISTING APPROACH AND PROPOSED SYSTEM

3.1 Existing Approach

Traditional interview preparation uses books, interview-question websites, tutorial videos, aptitude platforms, and manually conducted mock interviews. A typical static website follows the sequence User → Select Topic → Read Questions → Read Suggested Answers. This provides information but does not evaluate the candidate's own response. Human mock interviews offer richer interaction, yet they depend on the availability of a trainer, friend, or faculty member. As a result, candidates may practise repeatedly without a reliable method for measuring changes in communication, technical explanation, relevance, or overall performance.

3.2 Proposed System

InterviewAI combines interview practice, automated feedback, performance analysis, career guidance, history, and reporting within one application. The overall workflow is: Register/Login → Dashboard → Configure Interview → Answer Questions → Submit Interview → Automated Evaluation → Results and Career Recommendation → History/PDF Report. After authentication, a user selects the preferred job role, interview category, difficulty level, and number of questions. The system then creates a practice session from the configured question bank and presents one question at a time.

The design supports roles such as Software Developer, Data Analyst, Data Scientist, AI/ML Engineer, Web Developer, Cybersecurity Analyst, and General Interview. Interview categories include HR, Technical, Behavioural, Project, and Mixed, while difficulty can be Beginner, Intermediate, or Advanced. This structure allows the same application to serve users with different career goals and preparation levels.

IV. MAJOR SYSTEM MODULES

4.1 User Authentication and Dashboard

The authentication module manages registration, login, logout, and user sessions. During registration, users provide their full name, email address, career field, experience level, and password. Passwords are stored using secure hashing rather than plain text. The login page can also support show/hide password, Remember Me, and session management. After successful authentication, users are redirected to a personal dashboard.

The dashboard acts as the main control centre. It summarizes the user's profile and interview performance by displaying total interviews, completed interviews, average score, best score, and recent performance. It also contains the interview configuration panel, allowing a new practice session to be started quickly without navigating through several pages.

4.2 Mock Interview Interface

The mock interview module is the central feature of the system. It presents one question at a time and records the candidate's response. The interface includes the current question, question number and category, answer text area,



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voice-input button, Previous and Next controls, question navigator, progress bar, timer, word and character count, and a final Submit button. For example, the candidate may be asked to introduce themselves and explain how their skills relate to a selected role. The answer can be typed or dictated and is stored for evaluation when the session is submitted.

4.3 Voice-Assisted Answering

To make practice closer to a real interview, the application supports speech-to-text input using the browser's Web Speech API. The flow is Candidate Speech → Microphone → Speech Recognition → Converted Text → Answer Field. This helps users practise speaking rather than relying only on typed answers. However, speech recognition depends on browser support, microphone permission, device quality, pronunciation, and background noise. Therefore, typed responses remain available as the standard and more reliable input method.

4.4 Interview Timer and Progress Tracking

JavaScript records the interview duration from the beginning of the session until submission. A progress bar indicates how much of the interview has been completed. For example, completing three of five questions corresponds to approximately 60% progress. The timer and progress indicator encourage better pacing and make the practice session more structured.

V. AUTOMATED EVALUATION AND FEEDBACK

5.1 Rule-Based Evaluation

The current prototype uses an AI-inspired, rule-based evaluation engine. It is intentionally explainable and should not be described as a trained neural network or an advanced machine-learning recruitment model. The evaluator examines measurable properties of each answer, including completeness, response length, relevant keywords, technical terminology, question relevance, answer structure, communication indicators, and confidence-related language. A very short response to "What is Machine Learning?" such as "Machine learning is AI" shows only basic awareness. A stronger response explains that machine learning is a branch of artificial intelligence in which systems learn patterns from data and use those patterns to make predictions or decisions. The second response contains more detail, terminology, and structure and therefore receives a higher practice score.

5.2 Performance Scores

The system summarizes interview performance using four main dimensions. The Communication Score considers clarity, sentence structure, completeness, and organization. The Technical Score checks for appropriate concepts and terminology, especially in technical questions. The Confidence-related Score estimates whether the response is direct, complete, and assertive based on selected language indicators; it is only a practice metric and not a psychological measurement. The Relevance Score measures how closely the answer addresses the question.

$$\text{Overall Score} = w_1C + w_2T + w_3F + w_4R$$

Here, C, T, F, and R represent communication, technical, confidence-related, and relevance scores, while w_1 to w_4 represent the weights assigned to each component. The weights can be adjusted depending on interview category. For example, a technical interview may assign greater weight to technical content, while an HR interview may place more emphasis on communication and relevance.

5.3 Feedback Generation

A numerical score alone is not enough for improvement, so InterviewAI also generates written feedback. The feedback can identify strengths such as use of relevant terminology, complete explanations, appropriate length, and good answer structure. It can also point out issues such as insufficient detail, missing examples, weak technical terminology, very short responses, or content that does not directly answer the question. A typical message may state that the answer covers the required concepts clearly but could be improved by adding a practical example and organizing the explanation more effectively. This makes the result easier for students to understand and act upon.



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VI. CAREER RECOMMENDATION, RESULTS, HISTORY, AND REPORTS

6.1 Career Recommendation

The career recommendation module provides advisory suggestions using information already available in the system, such as the user's career field, target role, selected interview category, technical performance, communication performance, and overall score. For example, a user interested in Artificial Intelligence who performs strongly in technical areas may receive suggestions such as Machine Learning Engineer, Junior Data Scientist, AI Developer, or Data Analyst. These recommendations are intended as guidance only and should not be treated as a guarantee of job suitability.

6.2 Result and Performance Analysis

After an interview is submitted, the result page displays the overall score, performance level, communication score, technical score, confidence-related score, relevance score, strengths, areas for improvement, automated feedback, career recommendation, and question-level scores. A circular score indicator provides an immediate overall view. Chart.js is used for additional visualization, such as a radar chart comparing the four performance dimensions and a bar chart showing the scores obtained for individual questions. These visual summaries make it easier to recognize patterns that may not be obvious from a single numerical result.

6.3 Interview History

Completed interviews are stored in the SQLite database. The history page shows the job role, interview type, difficulty, number of questions, duration, score, status, and date for each session. Users can search previous interviews, apply filters, sort records, view earlier results, retry interviews, download reports, or delete records. Long-term history is important because a single score does not show whether a user is improving. Comparing multiple attempts allows candidates to observe changes in answer quality and preparation consistency.

6.4 PDF Report Generation

ReportLab is used to generate downloadable PDF reports. A report can include candidate information, interview details, date and duration, overall and individual performance scores, strengths, areas for improvement, automated feedback, career recommendation, questions, candidate answers, and question-level scores. Downloadable reports allow users to review their performance later without reopening the application and can also be useful during mentoring or placement-training discussions.

VII. DATABASE DESIGN AND SYSTEM ARCHITECTURE

The prototype uses SQLite and mainly contains three related tables. One user can complete many interviews, and each interview can contain multiple question-and-answer records. This one-to-many structure keeps user information separate from interview sessions while preserving detailed answer-level data.

Table	Main Fields	Purpose
Users	User ID, Full Name, Email, Password Hash, Career Field, Experience Level, Created Date, Last Login	Stores account and profile information.
Interviews	Interview ID, User ID, Job Role, Type, Difficulty, Question Count, Scores, Status, Duration, Feedback, Career Recommendation, Date	Stores one record for each mock interview session.
Interview Answers	Answer ID, Interview ID, Question, Category, Candidate Answer, Question Score, Feedback	Stores question-level responses and evaluation details.



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At a high level, the system follows a standard web architecture: User Browser → HTML/CSS/JavaScript Interface → Flask Application → Evaluation and Recommendation Logic → SQLite Database. The frontend handles form input, speech recognition, progress display, timers, and charts. Flask manages routing, authentication, sessions, data processing, and communication with the database. The evaluation component processes candidate answers and stores results that are later displayed on the result and history pages.

VIII. TECHNOLOGIES USED

Technology	Purpose
Python	Backend programming and evaluation logic
Flask	Web application framework and routing
Flask-SQLAlchemy	Object-relational database interaction
SQLite	Lightweight local database
HTML5 / CSS3	Page structure and interface styling
JavaScript	Client-side interaction, timer, progress, and validation
Bootstrap 5	Responsive layout and reusable UI components
Font Awesome	Interface icons
Chart.js	Performance graphs and score visualization
Web Speech API	Browser-based speech-to-text input
ReportLab	Programmatic generation of PDF reports

8.1 Why Flask and SQLite Were Chosen

Flask was selected because it is a simple and flexible Python framework that supports routing, Jinja templates, database connectivity, session management, and straightforward local deployment. It provides enough functionality for a student-level prototype without the complexity of a larger framework. SQLite was selected because the application does not require a separate database server. It is lightweight, easy to configure, and stores data in a single file. If the project grows into a larger production system, SQLite can later be replaced with PostgreSQL or another server-based database with relatively small changes to the data-access layer.

IX. USER INTERFACE, ADVANTAGES, LIMITATIONS, AND ETHICS

9.1 User Interface Design

The application uses a modern AI-inspired interface rather than a traditional form-only academic design. Visual elements include dark backgrounds, blue and purple gradients, glassmorphism panels, AI-themed illustrations, rounded components, animations, icons, responsive navigation, and mobile-friendly layouts. The objective is to make the prototype look and behave like a complete modern web product while keeping interview controls easy to understand.

9.2 Advantages

- Repeated interview practice without requiring another person.
- Role, category, difficulty, and question-count customization.
- Immediate explainable feedback and multiple performance scores.
- Text and voice-assisted answering with interview timing and progress tracking.
- Graphical analytics, career suggestions, and long-term interview history.
- Downloadable reports for later review.
- Lightweight architecture and low implementation cost without a mandatory paid large-language-model API.



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9.3 Limitations

The rule-based evaluator cannot understand natural language at the same level as an experienced human interviewer or a modern large language model. Keyword-based scoring may assign different scores to technically similar answers that use different wording. Speech recognition depends on browser, microphone, and device support, and the current version does not evaluate eye contact, body language, facial expressions, or emotions. Interview quality also depends on the size and quality of the question bank. Most importantly, the scoring mechanism has not yet been validated against a large dataset of real interviews assessed by professional recruiters. Its outputs should therefore be interpreted as practice feedback rather than hiring decisions.

9.4 Security and Ethical Considerations

Because the application stores personal information and interview responses, it should use password hashing, secure session management, user-specific record access, input validation, and safe database operations. From an ethical perspective, the system should not evaluate or make recommendations based on protected characteristics such as gender, race, religion, disability, or physical appearance. The application is intended to support learning and preparation, not to make automated employment decisions. Clear communication about the limits of automated scoring is important to prevent users from treating practice metrics as objective measures of employability.

X. FUTURE ENHANCEMENTS

Future versions can include a large language model for deeper semantic evaluation and more natural feedback. Instead of depending mainly on keywords and answer length, a semantic evaluator could examine whether the candidate explains a concept correctly, provides a suitable example, connects ideas logically, and responds directly to the question. Such a model should still provide transparent feedback so that users understand why an answer received a particular practice score. Resume analysis could also generate personalized questions from a candidate's education, projects, skills, certifications, and previous experience. This would make sessions more closely related to the user's actual profile and target role.

Adaptive interviews could automatically increase or decrease question difficulty according to previous answers, creating a more individualized learning path. A coding interview module could be added for technical roles, with support for programming questions, test cases, and basic code evaluation. Multilingual support could make the system more accessible to candidates who are more comfortable practising in languages other than English. The career recommendation component could be improved using a validated machine-learning model trained on real skill, education, job-role, and career-outcome data instead of simple advisory rules. Additional improvements could include a larger curated question bank, configurable scoring weights for different interview types, better speech-recognition handling, and progress trends across weeks or months. Most importantly, future versions should be empirically validated by comparing automated scores with assessments from trained interviewers and real candidates. Such validation would help measure reliability, fairness, consistency, and the practical usefulness of the feedback before any wider deployment.

XI. CONCLUSION

The AI-Based Interview Preparation and Career Recommendation System demonstrates how modern web technologies and explainable AI-inspired evaluation can be combined into a practical interview-learning platform. Unlike a traditional question bank, InterviewAI provides a complete workflow in which candidates configure an interview, answer through text or speech, receive automated feedback, analyse performance, obtain career suggestions, compare earlier attempts, and download reports. The current version is intentionally positioned as a practice assistant rather than an automated hiring system. Its rule-based evaluation offers transparent feedback that can help users recognize weak areas and improve through repeated practice.

From a project-development perspective, the system also demonstrates the practical integration of Python, Flask, SQLite, frontend development, speech technology, visualization, database management, report generation, security concepts, and automated evaluation in a single real-world web application. The prototype shows that a useful learning tool can be created without depending on an expensive external AI service, while still leaving a clear path for future semantic and machine-learning improvements.



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