

Interview Assistant -- AI Powered Interview Preparation and Assessment Platform

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ABSTRACT: In today's highly competitive job market, effective interview preparation plays a pivotal role in achieving career success. However, conventional preparation methods often fail to provide personalization, real-time feedback, and comprehensive performance assessment. To address these challenges, this research presents the AI-Driven Interview Assistant — an intelligent, adaptive, and comprehensive AI-powered interview preparation and assessment platform. The proposed system leverages Natural Language Processing (NLP), speech analysis, and computer vision to simulate realistic interview environments while delivering actionable feedback and personalized improvement recommendations.

The platform employs Large Language Models (LLMs) such as OpenAI's GPT and Google's Gemini for intelligent question generation and response evaluation. Real-time speech-to-text conversion using Google Speech-to-Text API or Whisper AI enables seamless voice interaction, while sentiment analysis with Hugging Face transformers evaluates emotional tone, confidence, and engagement. The core evaluation engine analyzes responses based on content relevance, communication clarity, technical accuracy, and behavioral competence. Optional computer vision modules assess facial

expressions and body language for holistic performance insights.

From a technical standpoint, the system is built with a React.js frontend and Node.js/Express backend, ensuring a smooth, interactive user experience. WebRTC integration enables live audio-video interview simulations, while MongoDB or PostgreSQL store detailed performance analytics for adaptive learning. The platform also integrates with job portals and company databases to deliver role-specific and industry-oriented interview preparation.

Keywords – Artificial Intelligence (AI), Interview Preparation, Natural Language Processing (NLP), Large Language Models (LLMs), Speech Recognition, Whisper AI, Sentiment Analysis, Hugging Face Transformers, Computer Vision, Adaptive Learning, Real-time Feedback, Emotion Detection, React.js, Node.js, WebRTC, MongoDB, PostgreSQL, Interview Simulation, Candidate Assessment, Skill Enhancement

Abbreviations -

AI- Artificial Intelligence

NLP- Natural Language Processing

LLM- Large Language Model

CV- Computer Vision

SPT- Speech-to-text

HCI- Human-Computer Interaction

KPI- Key Performance Indicator

NER- Named Entity Recognition

DBMS- Database Management System

API- Application Programming Interface

1. INTRODUCTION:

In today's competitive job market, interview preparation plays a crucial role in determining career success. Traditional preparation methods often lack personalization, real-time feedback, and comprehensive assessment. Many candidates struggle with anxiety and limited practice opportunities, making it essential to develop an intelligent and adaptive system that provides realistic simulations and actionable insights.

The proposed **AI-Driven Interview Assistant (AIDA)** is an **Artificial Intelligence (AI)**-powered platform that conducts mock interviews, provides **real-time feedback**, and offers **personalized improvement recommendations**. By integrating **Natural Language Processing (NLP)**, **Machine Learning (ML)**, and **Computer Vision (CV)**, AIDA evaluates speech patterns, content relevance, and behavioural cues to deliver a holistic performance assessment. The system leverages **Large Language Models (LLMs)** such as **OpenAI's GPT** or **Google's Gemini** for question generation, **Speech-to-Text (STT)** conversion via **Whisper AI** or **Google Speech-to-Text API**, and **sentiment analysis** using **Hugging Face Transformers** to assess emotional tone and confidence levels.

Built with a **React.js** frontend and **Node.js/Express** backend, AIDA ensures an interactive and seamless **User Interface (UI)** experience. **WebRTC** integration enables live audio-video simulations, while **MongoDB** or **PostgreSQL (DBMS)** securely store user performance data. Through adaptive learning algorithms, the platform continuously improves question relevance and feedback accuracy.

1.1 Challenges

Despite the growing adoption of technology in recruitment, interview preparation still faces several limitations. Traditional methods often lack personalization, real-time feedback, and realistic simulation, leaving candidates without meaningful insights into their performance. Most platforms provide only static question banks without evaluating tone, confidence, or emotional state, which are critical to interview success. The absence of intelligent feedback systems and reliance on subjective human judgment lead to inconsistent assessments and limited improvement opportunities. Furthermore, integrating multiple **Artificial Intelligence (AI)** components such as **Natural Language Processing (NLP)**, **Speech-to-Text (STT)**, **Sentiment Analysis**, and **Computer Vision (CV)** into a unified framework presents technical challenges in achieving real-time accuracy, scalability, and data privacy. Addressing these issues is essential to create a fair, adaptive, and effective AI-powered interview preparation and assessment platform.

1.2 Need of AI in interview Assistant

The growing competition in the job market demands smarter and more efficient ways to prepare for interviews, as traditional methods fail to offer personalized practice, detailed feedback, and adaptive learning. Candidates often lack structured platforms that evaluate both technical and behavioral aspects of performance. Hence, there is a strong need for an **AI-powered system** that can provide real-time, data-driven insights to enhance communication, confidence, and analytical skills. The proposed **AI-Driven Interview Assistant (AIDA)** fulfills this need by integrating **Natural Language Processing (NLP)**, **Speech-to-Text (STT)**, **Sentiment Analysis**, and **Computer Vision (CV)** to analyze candidate responses holistically. By leveraging **Large Language Models (LLMs)** for question generation and adaptive feedback mechanisms, AIDA transforms traditional interview preparation into an intelligent, personalized, and interactive learning experience that effectively bridges the gap between theory and real-world performance.

2. LITERATURE REVIEW

[1] The integration of **Artificial Intelligence (AI)** in recruitment and interview processes has gained significant momentum in recent years. The emergence of AI-powered interview assistants represents a convergence of multiple technologies such as **Natural Language Processing (NLP)**, **Machine Learning (ML)**, **Speech Recognition**,

and **Behavioral Analysis**. Research emphasizes the growing need for intelligent systems that can enhance interview preparation while maintaining fairness and objectivity in candidate assessment. Suen et al. (2019) demonstrated that AI-based video interviews can provide consistent evaluation criteria and reduce interviewer bias, though human oversight and ethical considerations remain essential.

[2] **NLP** has played a crucial role in automating the understanding and evaluation of interview responses. Studies by Naim et al. (2016) revealed that analyzing verbal content, prosodic features, and visual cues through NLP techniques can predict interview outcomes effectively. Transformer-based models and **sentiment analysis** have shown significant potential in capturing the emotional and contextual meaning behind candidate responses, moving beyond surface-level text evaluation. These approaches contribute to more objective and data-driven assessment mechanisms.

[3] Advancements in **Automatic Speech Recognition (ASR)** have further enhanced the ability to process and evaluate spoken responses in real time. Chen et al. (2020) demonstrated that integrating **Speech-to-Text (STT)** systems with linguistic and acoustic analysis provides more comprehensive insights than traditional text-only evaluation methods. Similarly, **ML-based adaptive algorithms**, as explored by Chrysafiadi and Virvou (2013), have been instrumental in providing personalized learning experiences. When applied to interview preparation, such adaptive systems can offer targeted feedback and recommendations based on a candidate's previous performance trends.

[4] Recent progress in **multi-modal analysis** has enabled the combination of textual, auditory, and visual data to deliver more holistic evaluations. Hemamou et al. (2019) highlighted that integrating facial expression analysis, tone, and content interpretation improves the accuracy of personality and competency assessments compared to single-modal approaches. Furthermore, the introduction of **Large Language Models (LLMs)** such as **GPT-3/4** and **Google Gemini** has revolutionized dynamic question generation. Brown et al. (2020) demonstrated that LLMs can generate contextually relevant, domain-specific questions that adapt intelligently to candidate responses.

[5] Finally, real-time feedback and ethical considerations form the foundation for trustworthy AI systems. Anderson and Krathwohl (2001) emphasized that immediate feedback significantly enhances learning efficiency by

allowing users to refine their responses instantly. However, as Dastin (2018) noted, fairness and transparency remain major concerns in AI-driven recruitment systems due to potential algorithmic bias. The proposed **AI-Driven Interview Assistant (AIDA)** builds upon these research foundations by combining **LLM-powered question generation**, **speech and sentiment analysis**, and **multi-modal feedback mechanisms** to create an adaptive, ethical, and data-driven interview preparation and assessment platform.

Objectives and Scope of work

3.1 Objectives

The primary objective of the **AI-Driven Interview Assistant (AIDA)** is to enhance the effectiveness of interview preparation by providing a personalized, adaptive, and comprehensive learning environment for candidates. Specifically, the system aims to simulate realistic interview scenarios, generate **role-specific questions** using **Large Language Models (LLMs)**, and evaluate responses through **Natural Language Processing (NLP)**, **Speech-to-Text (STT)**, and **Sentiment Analysis**. Additional objectives include delivering **real-time feedback** on content, communication clarity, confidence, and emotional cues, assessing non-verbal behavior through **Computer Vision (CV)**, tracking candidate performance over time, and providing tailored improvement recommendations. Furthermore, AIDA seeks to integrate multi-modal assessment tools to provide a holistic view of candidate abilities, combining textual, vocal, and visual data for more accurate evaluation. The platform also aims to maintain ethical and bias-aware AI algorithms to ensure fairness and transparency in candidate assessment. Another objective is to offer adaptive learning capabilities that adjust difficulty and feedback according to individual progress, helping candidates build confidence efficiently. By storing and analyzing performance metrics in secure databases like MongoDB or PostgreSQL

3.2 Scope of Work

Phase 1

Researching	Studying AI-powered interview preparation methods, including NLP, ML, Speech Recognition, Sentiment Analysis, and Computer Vision techniques.
Gathering Data	Gathering sample interview questions, candidate responses, and relevant datasets for training and testing the system.
Cuda	Installing required software and frameworks such as Python, Node.js, React.js, MongoDB/PostgreSQL, WebRTC, and AI libraries.

Phase 2

LLM Integration	Setting up Large Language Models (LLMs) like GPT or Gemini for question generation and response evaluation.
Speech-to-Text (STT) Integration	Implementing STT using Google Speech-to-Text API or Whisper AI to process candidate audio responses.

Phase 3

Sentiment and Behavioral Analysis	Using Hugging Face Transformers and Computer Vision modules to evaluate candidate emotions, tone, and body language.
Backend Development	Developing Node.js/Express server for data management, analytics, and adaptive feedback mechanisms.
Frontend Development	Creating an interactive React.js UI for candidate interaction, live mock interviews, and feedback display.
Multi-modal Assessment	Integrating text, audio, and video analysis for holistic candidate evaluation.
Testing and Evaluation	Performing system testing, validating AI models, and analyzing performance metrics to ensure accuracy and reliability.
Adaptive Learning Implementation	Developing algorithms to adjust question difficulty and feedback based on candidate performance and learning patterns.
Integration with Job Portals	Connecting the platform to job databases to provide role-specific and

	industry-specific interview simulations.
Performance Analytics	Designing modules to track, store, and visualize candidate progress over time using MongoDB/PostgreSQL.
Ethical and Bias Mitigation	Ensuring fairness, transparency, and bias-aware AI assessment mechanisms in line with ethical AI guidelines.

3. Methodology

4.1 System Architecture

The **AI-Driven Interview Assistant (AIDA)** follows a client-server architecture with a **React.js frontend** and a **Node.js/Express backend**. The frontend provides an interactive **User Interface (UI)** for candidates to participate in mock interviews, receive real-time feedback, and track their progress over time. The backend manages data storage, real-time processing, adaptive feedback generation, and AI model integration. **WebRTC** is used to facilitate live audio-video communication during interview simulations, while **MongoDB** or **PostgreSQL** securely stores candidate profiles, session data, and performance metrics to support adaptive learning and progress tracking.

4.2 Data Collection and Preprocessing:

Data for the system is collected from curated interview question sets and sample candidate responses. During mock interview sessions, candidate audio inputs are captured and converted into text using **Speech-to-Text (STT)** techniques such as **Whisper AI** or **Google Speech-to-Text API**. The textual data is then preprocessed using **Natural Language Processing (NLP)** techniques, including tokenization, stop-word removal, and semantic embedding, to prepare it for further analysis. Additionally, facial expressions, gestures, and other behavioral cues are optionally captured using **Computer Vision (CV)**

modules, enabling holistic evaluation of non-verbal communication along with verbal responses.

4.3 Model Selection:

AIDA employs multiple AI models for different functionalities. **Large Language Models (LLMs)** such as **GPT-3/4** or **Google Gemini** are used for generating contextually relevant and role-specific interview questions. NLP and transformer-based models evaluate candidate responses in terms of content relevance, grammar, and coherence. **Hugging Face Transformers** are utilized for sentiment analysis to assess emotional state and confidence, while optional CV models analyze facial expressions, posture, and gestures to evaluate non-verbal behavior. Furthermore, adaptive ML algorithms examine historical performance data to provide personalized feedback and adjust the difficulty of subsequent questions, enhancing the learning experience for each candidate.

4.4 Evaluation and Feedback:

The system evaluates candidate performance across multiple dimensions, including content accuracy, communication clarity, confidence, sentiment, and behavioral competencies. Real-time feedback is provided to help candidates adjust responses immediately, thereby improving interview skills through iterative practice. All performance data is stored and analyzed to track progress over time, identify patterns of strengths and weaknesses, and generate targeted improvement recommendations. This approach ensures both objective assessment and personalized guidance, bridging the gap between traditional interview coaching and AI-driven evaluation.

4.5 Implementation Workflow:

The methodology begins with **user profiling**, where candidates specify their target role, industry, and experience level. Based on this information, LLMs generate customized interview questions. During the mock interview, candidates respond through audio and video, which are captured and processed in real time. Textual responses are analyzed using NLP and sentiment analysis, while audio and video cues are assessed through STT and CV modules. The system then provides **adaptive feedback** and updates candidate profiles in the database for tracking long-term progress. This workflow integrates multi-modal assessment, real-time feedback, and adaptive learning into a seamless and interactive interview

preparation

experience.

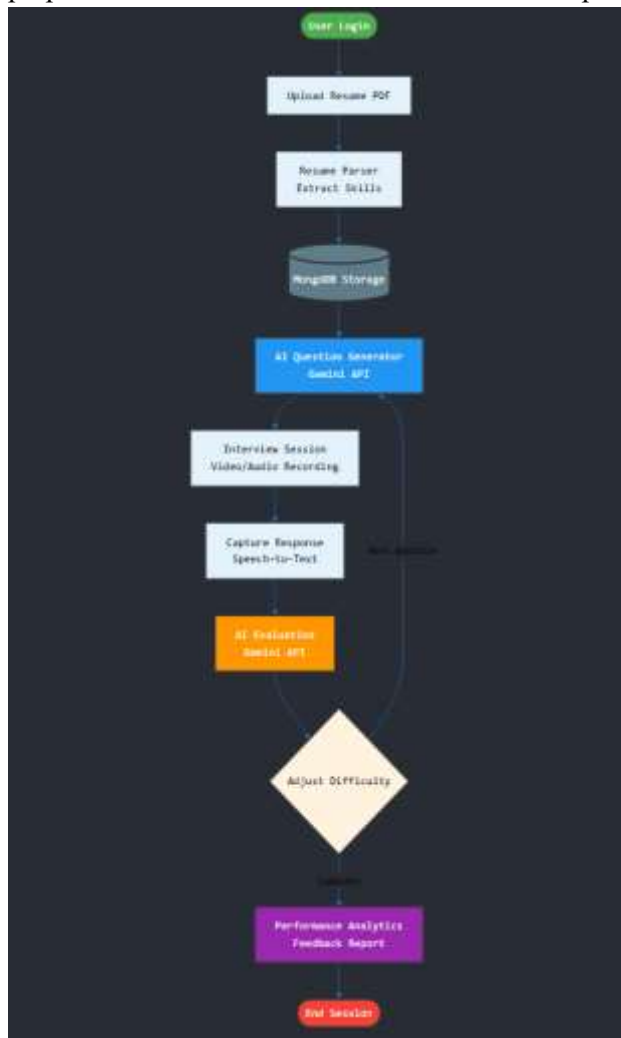


Fig. 1 Workflow Diagram

4. Conclusion And Future Work

5.1 Conclusion:

The **AI-Driven Interview Assistant (AIDA)** represents a significant step forward in leveraging **Artificial Intelligence (AI)** to improve interview preparation and assessment. By combining **Natural Language Processing (NLP)**, **Large Language Models (LLMs)**, **Speech-to-Text (STT)**, **Sentiment Analysis**, and **Computer Vision (CV)**, the system provides a comprehensive, adaptive, and personalized learning environment for candidates. Real-time feedback, multi-modal evaluation, and performance tracking empower users to identify strengths and weaknesses, enhancing confidence and interview readiness. AIDA addresses the limitations of traditional interview preparation methods by offering objective, consistent, and data-driven assessments. Overall, it provides a scalable and intelligent solution that bridges the gap between theoretical preparation and real-world interview success.

5.2 Future Work:

In the future, the **AI-Driven Interview Assistant (AIDA)** can be enhanced by incorporating more advanced multi-modal AI techniques, such as deeper emotion recognition, gesture analysis, and real-time eye-tracking for better non-verbal assessment. Integration with additional job portals and HR platforms can allow for industry-specific and role-specific interview simulations at scale. The system can also include AI-driven coaching modules that suggest improvements in voice modulation, diction, and presentation style. Expanding the platform to support multiple languages and cultural contexts will make it accessible to a wider audience. Moreover, incorporating explainable AI and fairness-aware algorithms can further improve transparency, reduce bias, and build user trust in AI-driven assessments.

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