PrepAI: AI-Powered Interview Feedback System

A

Project Report

submitted in partial fulfillment of the requirements for the award of the degree of

BACHELOR OF TECHNOLOGY

in

COMPUTER SCIENCE & ENGINEERING

by

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CANDIDATE'S DECLARATION

We hereby certify that the project work entitled **"PrepAI: AI-Powered Interview Feedback System"** in partial fulfillment of the requirements for the award of the Degree of **BACHELOR OF TECHNOLOGY** in **COMPUTER SCIENCE AND ENGINEERING** with specialization in **Data Science**, submitted to the Data Science Cluster, School of Computer Science, UPES, Dehradun, is an authentic record of my/our work carried out during a period from **January, 2025** to **May, 2025** under the supervision of **Dr Sandeep Chand Kumain, Assistant Professor**.

The matter presented in this project has not been submitted by me/us for the award of any other degree of this or any other University.

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This is to certify that the above statement made by the candidate is correct to the best of my knowledge.

Date: 06th March 2025

Dr Sandeep Chand Kumain
Project Guide

Acknowledgement

We wish to express our deep gratitude to our guide Name, for all advice, encouragement and constant support he/she has given us throughout our project work. This work would not have been possible without his support and valuable suggestions. We sincerely thanks to our respected Name of HoD, Head Department of _____, for his great support in doing our project in _____. We are also grateful to Dean SoCS UPES for giving us the necessary facilities to carry out our project work successfully. We also thanks to our Course Coordinator, (NAME) and our Activity Coordinator (NAME) for providing timely support and information during the completion of this project. We would like to thank all our friends for their help and constructive criticism during our project work. Finally, we have no words to express our sincere gratitude to our parents who have shown us this world and for every support they have given us.

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Abstract

PrepAI is an AI-based platform that automates the interview preparation process for students through innovative approach and robust anti-cheating technology. The system combines multiple analytical components to deliver personalized feedback on interview performance. Through integrated modules for facial expression analysis, eye tracking, and personality assessment using the OCEAN model. PrepAI provides a general evaluation of both verbal and non-verbal communication skills. It provides a web-based interface through which organizations can carry out interview and analysis candidate's every minor movement, for the candidate, they can get real-time feedback of their interview. Its architecture contains specialized modules for speech-to-text conversion, natural language processing, and detailed report generation. The main distinguishing feature of PrepAI is its complete automation and accessibility for students. Once the question sets are uploaded, the system independently handles the whole interview process, from conducting sessions to generating full feedback. This way, professional interview preparation resources become available to a wider audience of students without compromising the uniformity of assessment.

This strategic focus allows PrepAI to act as an efficient tool for improving the interview skills of objective feedback-seeking students and for organizations seeking a clean interview for candidate selection.

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Chapter 1

Introduction

In today's competitive professional landscape, an efficient, objective, and data-driven interview process is crucial for both candidates and organizations. However, traditional interview methods come with significant challenges, such as scheduling constraints, interviewer subjectivity, inconsistent feedback, and resource-intensive execution. Additionally, candidates often struggle to receive detailed insights into their non-verbal communication, speech patterns, and personality traits, all of which are essential for making a strong impression during an interview. The lack of a standardized, data-driven approach further complicates the process, making it difficult for organizations to fairly and accurately assess candidates' true potential.

PrepAI offers a fully automated, AI-driven interview system that streamlines the entire process, ensuring both efficiency and fairness. By allowing organizations to upload their question sets, PrepAI autonomously manages interview assessments through eye tracking, face detection, voice analysis, and personality evaluation. This multi-dimensional approach helps evaluate a candidate's engagement levels, emotional responses, voice modulation, and personality traits, providing a holistic understanding of their interview performance. Advanced natural language processing (NLP) further enhances the assessment by analyzing content coherence, relevance, and fluency, ensuring a thorough and unbiased review of candidate responses.

By leveraging a multi-modal AI approach, PrepAI guarantees a structured, scalable, and objective evaluation system that eliminates human bias and enhances hiring efficiency. The primary goal of PrepAI is to offer organizations a seamless, end-to-end automated interview experience, while providing candidates with real-time performance feedback based on concrete, measurable parameters. Through automated reporting and comprehensive analysis, PrepAI transforms traditional interview assessments into a scalable, consistent, and insightful process. By bridging the gap between candidates and employers, PrepAI is poised to revolutionize the hiring landscape, ensuring that interviews are more accessible, data-driven, and effective in the ever-evolving job market.

1.1 History

1.2 Objectives

Objective I: Develop a fully autonomous interview simulation system:

1. The system should function without human intervention, conducting end-to-end

interviews autonomously.

2. AI-driven automation ensures a seamless experience for candidates, mimicking real-world interviews.
3. The platform should support various interview formats like technical, behavioral, and case-based interviews.

Objective II: Create seamless question delivery and response recording mechanisms:

1. The system should automatically present questions in a structured format based on the candidate's profile and performance.
2. It must record answers in multiple formats (text, audio, and video) to allow in-depth AI-driven analysis.
3. Ensures secure and lag-free recording, preventing data loss or technical glitches.

Objective III: Implement real-time feedback generation capabilities:

1. AI should analyse candidate responses in real-time and provide immediate feedback on performance.
2. Instant alerts should be generated if suspicious activities (looking away, external voices, or distractions) are detected.
3. Feedback should be structured to include technical correctness, communication clarity, and behavioural insights.

Objective IV: Develop robust voice processing for speech pattern analysis:

1. Assess clarity, confidence, and emotional tone to understand communication effectiveness.
2. Identify signs of nervousness, hesitation, or inconsistency in student.

Objective V: Integrate OCEAN personality model assessment:

1. Evaluate Openness, Conscientiousness, Extraversion, Agreeableness, and Neuroticism based on behavioral and verbal cues.
2. Generate insights into a candidate's problem-solving approach, teamwork ability, and leadership potential.
3. Helps candidates understand their strengths and weaknesses in personality-driven traits.

Objective VI: Create clear and comprehensible feedback reports:

1. Generate graphical and textual reports summarizing interview performance.
2. Use visual indicators like progress bars, scores, and heat maps for easy interpretation.
3. Provide actionable feedback with specific improvement areas for candidates to work on.

1.3 Pert Chart Legend

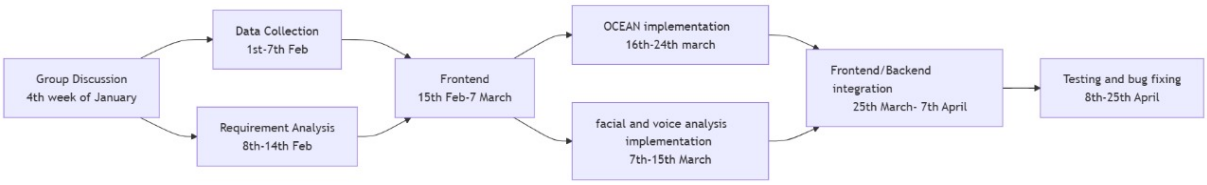

Figure 1.1: Pert Time Line Diagram

Chapter 2

System Analysis

2.1 Existing System

Several AI-powered interview feedback systems are currently available in the market:

- **Big Interview**: Offers a platform where users can record their answers on video and receive immediate AI feedback, including tips on body language, eye contact, and vocabulary use. Big Interview
- **Interviews by AI**: Provides tailored job interview questions based on specific job descriptions, with instant AI feedback and suggestions for improvement. Interviews by AI
- **HireVue**: An enterprise-level hiring platform that includes video interviewing, assessments, and AI automation to enhance the recruitment process. HireVue
- **Interviewer.AI**: An AI-powered video interview software that assists businesses in recruiting, screening, and hiring top talent efficiently. Interviewer AI
- **Final Round AI**: Offers AI tools designed to optimize resumes, provide real feedback through an interview copilot, and assist candidates in securing their desired jobs. Final Round AI
- **Metaview**: Automates note-taking and feedback sharing during interviews, allowing recruiters to focus more on the candidate interaction. Metaview
- **Tacitbase**: Utilizes AI-powered video interviewing to automate assessments, ensure fairness, and facilitate smarter hiring decisions. Tacitbase

2.2 How PrepAI is Better

While the above platforms offer AI-driven interview solutions, PrepAI stands out due to its comprehensive multi-modal analysis and real-time personalized feedback. Key differentiators include:

- **Multi-Modal Analysis**: Unlike traditional systems that focus only on speech or video, PrepAI integrates **eye tracking, face detection, voice processing, and personality assessment** for a holistic candidate evaluation.

- **Real-Time Feedback**: Most existing solutions provide post-interview reports, whereas PrepAI delivers **instant performance insights**, allowing candidates to improve during the session.
- **OCEAN Personality Model**: PrepAI evaluates a candidate's personality traits (Openness, Conscientiousness, Extraversion, Agreeableness, and Neuroticism), providing deeper behavioral insights.
- **Automated Report Generation**: Unlike many platforms that require human intervention, PrepAI autonomously generates **detailed graphical reports** summarizing strengths, weaknesses, and improvement areas.
- **Scalability and Accessibility**: PrepAI is designed for **both students and organizations**, ensuring an accessible and fair assessment process across diverse demographics.

By combining these advanced features, PrepAI offers a more structured, unbiased, and insightful interview assessment system, setting it apart from current market alternatives.

2.3 Motivations

The development of PrepAI is driven by the need for a seamless, fully automated interview experience that eliminates traditional barriers in interview preparation. The current landscape presents challenges such as limited access to structured coaching, particularly for students from underprivileged backgrounds and smaller institutions, where quality preparation often comes with high costs. Traditional mock interviews rely on subjective feedback that varies between interviewers, making it difficult for candidates to receive consistent, measurable progress insights.

Additionally, the logistical constraints of in-person mock interviews restrict practice opportunities, while most preparation methods focus primarily on verbal responses, neglecting crucial elements like non-verbal communication, voice modulation, and personality assessment.

PrepAI overcomes these limitations by providing an end-to-end automated interview solution, enabling organizations to upload question sets while the system autonomously evaluates eye tracking, facial expressions, voice analysis, and personality traits. By integrating data-driven evaluation and real-time feedback, PrepAI ensures a scalable, unbiased assessment process. Looking ahead, the platform aims to integrate with educational institutions, standardize AI-driven interview preparation, and revolutionize automated professional development, making high-quality interview training accessible to all.

2.4 Proposed System

The proposed system, **PrepAI**, is an AI-powered interview feedback system that automates interview assessments using multi-modal analysis. It integrates **eye tracking, face detection, voice processing, and personality assessment** to evaluate candidates objectively. The system is designed to provide real-time feedback, ensuring a seamless and structured interview experience.

2.4.1 Automated Interview Process

- Organizations upload question sets, and PrepAI autonomously conducts interviews.
- Candidates respond through video, audio, and text, ensuring a comprehensive assessment.

2.4.2 Multi-Modal AI Analysis

- **Eye Tracking:** Detects eye movements to assess attentiveness.
- **Face Detection:** Identifies expressions and head positioning for behavioral evaluation.
- **Voice Analysis:** Examines speech clarity, tone, and confidence.
- **NLP & LLM Processing:** Analyzes text responses for coherence and relevance.
- **Personality Assessment (OCEAN Model):** Evaluates personality traits based on behavior and speech.

2.4.3 Real-Time Feedback & Reporting

- AI-driven assessment generates **instant feedback** on performance.
- **Automated report generation** provides candidates with strengths and improvement areas.
- Detection of **suspicious activities** (e.g., looking away, external voices) for fairness.

2.4.4 Web-Based Platform

- Accessible through a web interface for **students and organizations**.
- Secure, scalable, and supports **multiple interview formats** (technical, behavioral, case-based).

By leveraging AI-driven automation, PrepAI **eliminates human bias, enhances hiring efficiency, and makes structured interview training accessible** to a wide range of users.

2.5 Modules

2.5.1 Eye Face Tracking

This module continuously monitors the candidate's gaze behavior and head positioning. It detects if the candidate looks away multiple times, triggering warnings. Additionally, facial detection ensures that the candidate remains engaged and prevents impersonation by identifying multiple faces in the frame.

2.5.2 OCEAN Recognition

This module assesses personality traits using the OCEAN (Openness, Conscientiousness, Extraversion, Agreeableness, and Neuroticism) model. Facial expressions and behavioral cues are analyzed to determine personality characteristics, providing insights into traits like leadership, problem-solving, and teamwork abilities.

2.5.3 Questioning Voice Transcript

The system delivers structured interview questions and records responses in text, audio, and video formats. Speech-to-text processing converts verbal responses into text for analysis, ensuring accurate evaluation of speech clarity, confidence, and emotional tone.

2.5.4 Report Generation

An AI-driven reporting module compiles candidate performance metrics into structured feedback reports. The reports include graphical indicators like progress bars and heat maps, summarizing strengths, weaknesses, and suggested improvements for interview readiness.

2.6 Use Case Diagram

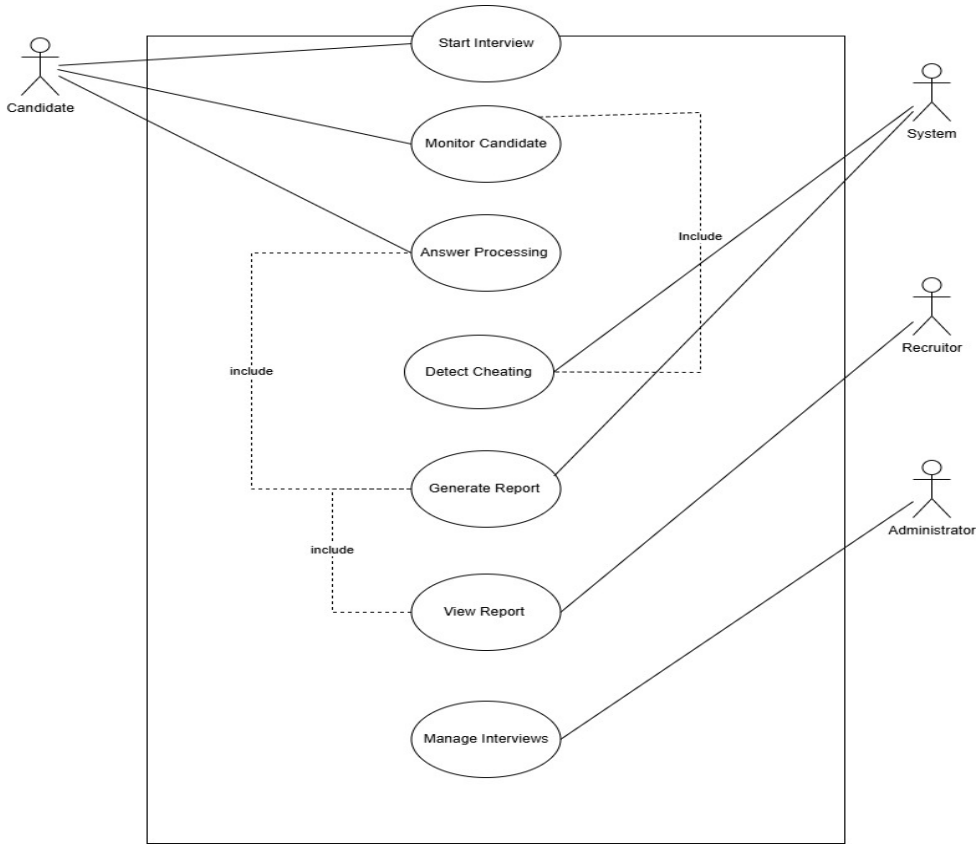

Figure 2.1: System-Level Use Case Diagram

2.7 Data Flow Diagram

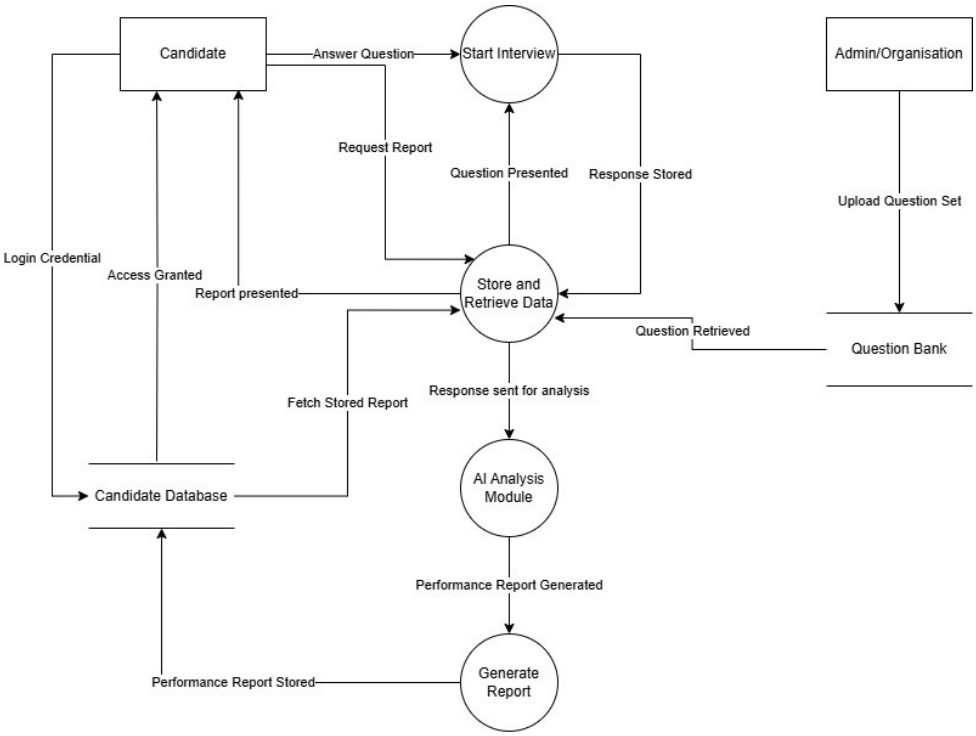

Figure 2.2: Detailed Data Flow Diagram

Chapter 3

Implementation/Results

3.1 Front-end Development

The front-end of PrepAI is a web-based interface designed for candidates. It is built using **HTML, CSS, and JavaScript**, with additional interactivity handled by **Flask**. The interface allows organizations to upload interview questions and candidates to participate in the interview seamlessly. Features include real-time video capture, response recording, and instant feedback visualization.

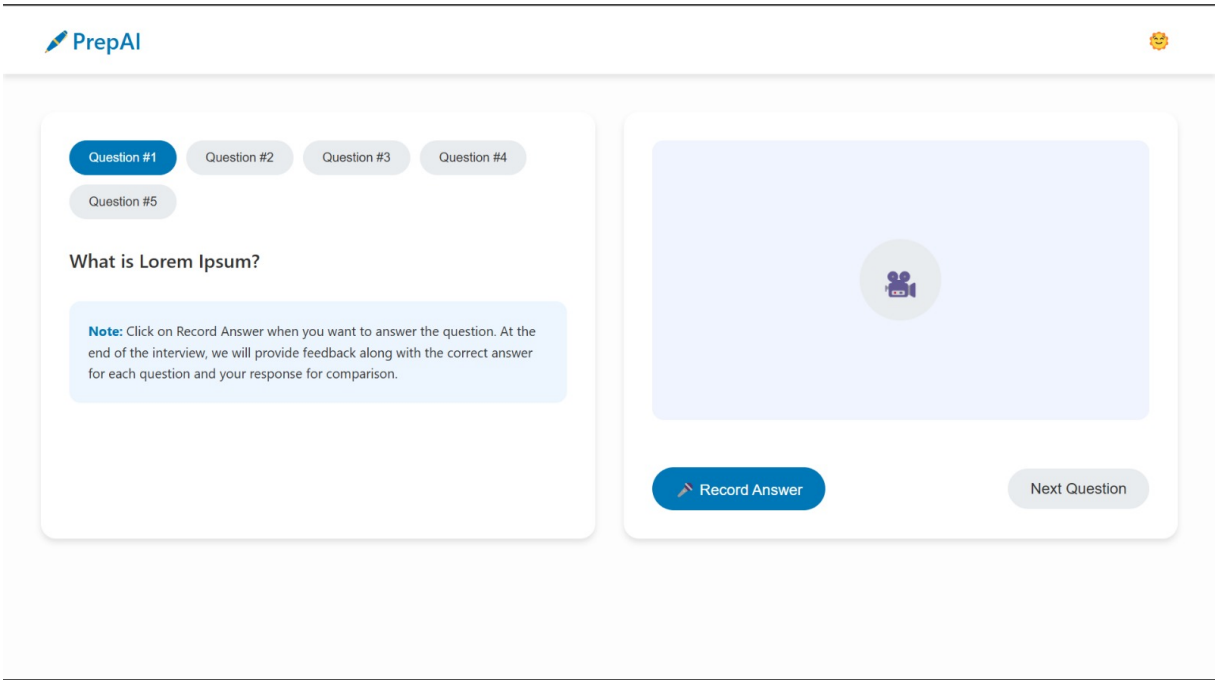

Figure 3.1: PrepAI User interface

3.2 Model Training

The AI models powering PrepAI underging efficient training to ensure accurate assessments. This includes multiple steps:

3.2.1 Data Collection

Data is gathered from various sources, including:

- **ChaLearn Dataset** for facial expression and personality trait recognition.
- **Indian Accent Dataset** for improving speech recognition accuracy.
- Custom video and voice samples to fine-tune models for diverse candidates.

3.2.2 Model Selection

Several models are used to power PrepAI's capabilities:

- **Face & Eye Tracking:** OpenCV and MediaPipe for facial tracking.

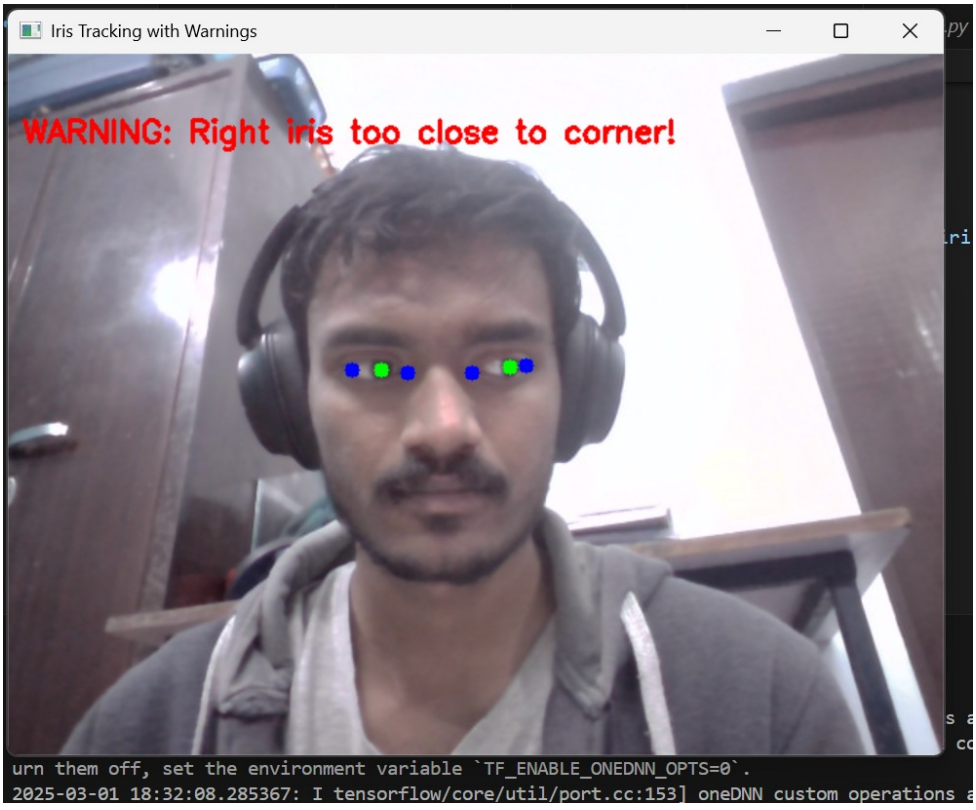

Figure 3.2: Eye Tracking Cheating Detection

- **Speech Recognition:** Transformers-based speech-to-text models.
- **Personality Assessment:** A deep learning model trained using the OCEAN framework motivated from Elena Ryumina.

3.2.3 Model Testing

After training, models will be tested on real-world interview scenarios to ensure reliability. Evaluation metrics include:

- **Accuracy:** Model performance on test datasets.

- **Real-time Processing:** Speed of response and feedback delivery.
- **Bias Mitigation:** Ensuring fairness across different demographics.

3.3 Back-end Development

The back-end is developed using **Flask**, handling:

- **Data processing:** Handling user inputs and AI-generated feedback.
- **Model execution:** Running the AI models efficiently.
- **Database management:** Storing interview responses and reports securely.

3.4 Connection Establishment

PrepAI ensures smooth communication between the front-end and back-end using APIs. This allows:

- Secure exchange of video, audio, and text data.
- Real-time feedback updates.

3.5 Future Improvement

To enhance PrepAI, future improvements include:

- **Multi-language support** to accommodate non-English speakers.
- **Integration with hiring platforms** like LinkedIn and Naukri.
- **AI-based career coaching** for personalized interview feedback.
- **Advanced cheat detection** to prevent interview malpractice.

These improvements aim to make PrepAI more accessible, efficient, and adaptable to evolving industry needs.

Chapter 4

System Requirements

To ensure the seamless functioning of **PrepAI**, the system must meet the following Python-based requirements across different components:

4.0.1 Python Version

Python 3.8+ (Recommended: Python 3.10)

4.0.2 Required Libraries & Dependencies

Core Dependencies

- **numpy** – Numerical computations
- **pandas** – Data handling and analysis
- **matplotlib / seaborn** – Data visualization
- **joblib** – Model serialization

Computer Vision & Face Detection

- **opencv-python** – Image processing
- **dlib** – Facial landmark detection
- **mediapipe** – Face and eye tracking

Speech & Voice Processing

- **speechrecognition** – Speech-to-text conversion
- **pyaudio** – Real-time audio processing
- **librosa** – Audio analysis
- **transformers** – Pre-trained LLM for voice-based analysis

NLP & Large Language Model Processing

- **transformers** – Hugging Face models for LLM integration
- **torch** – PyTorch backend for deep learning models
- **sentence-transformers** – Sentence embedding generation

Personality Assessment (OCEAN Model)

- **scikit-learn** – Machine learning models
- **tensorflow / torch** – Neural network-based model implementation

Report Generation

- **reportlab** – PDF generation
- **jinja2** – HTML templating for structured reports

Backend & Web Application

- **flask / fastapi** – Web server for handling requests
- **jinja2** – HTML rendering
- **gunicorn** – Deployment in production environments

4.0.3 System Requirements

Hardware Requirements

- **CPU**: Minimum 4-core processor (Recommended: 8-core for parallel processing)
- **RAM**: Minimum 8GB (Recommended: 16GB for handling large models)
- **GPU**: Optional but recommended (NVIDIA CUDA support for deep learning models)

Storage Requirements

- Minimum **10GB** free space (for storing models, logs, and temporary files)
- SSD recommended for faster data processing

OS Compatibility

- Windows 10 / 11
- Ubuntu 20.04+
- macOS Monterey+ (with support for TensorFlow and PyTorch)

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Chapter 5

Conclusion

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Bibliography

[1] Reference as per appearance in the chapters.