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AI BASED INTERVIEWING ANDPROCTORING SYSTEM

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***Abstract* — Artificial Intelligence (AI) is being used more frequently in the employment process since it provides a more effective and impartial way to evaluate prospects . However, current AI-based interviewing methods can be biased and frequently fall short of completely assessing a candidate's suitability for a position. By creating an AI-based interviewing and proctoring system that integrates sophisticated natural language processing with proctoring technologies like computer vision and machine learning, our project attempts to address these problems. In order to stop cheating during online exams, AI-based proctoring uses artificial intelligence to anticipate, flag, and record even the smallest differences and suspicions. Eye movements that indicate distraction, the applicant being invisible, the detection of an unauthorised gadget, the presence of another individual, etc. are only a few of the numerous AI flags. Similar to a human proctor, AI-based proctoring involves evaluating a test-taker's behaviour, surroundings, and movement. In AI-based proctoring, an expert-trained AI algorithm is used to anticipate, detect, and record even the tiniest anomalies and suspicions. Distracted eye movements, the candidate not being visible, partial visibility, the identification of an unauthorised device, the presence of another person, the speaker not being seen on the camera, opening any unauthorised website, etc. are some examples of AI flags. In order to assess candidate's responses in real time and determine whether they are a good fit for the position, the system will be able to conduct virtual interviews with them. These measures will take into account more than just the substance of the candidate's responses.**

Keywords — Machine learning, Computer Vision, Natural Language Processing

I. INTRODUCTION

AI-based proctoring use artificial intelligence to foresee, flag, and record even the smallest

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anomalies and suspicions in order to prevent cheating during online exams. A handful of the many AI flags include eye movements that suggest distraction, the applicant being invisible, the detection of an unauthorized gadget, the presence of another individual, etc.

AI-based proctoring entails assessing test-taker behavior as well as their surroundings and mobility, much like a human proctor would. An expert-trained AI algorithm is utilized in AI-based proctoring to detect, record, and highlight even the minute inconsistencies and suspicions. A few AI flags include distracted eye movements, the candidate not being visible, partial visibility, the identification of an unauthorized device, the presence of another person, the speaker not being seen on the camera, opening any unauthorized websites, etc.

For a proctored exam, examiners can monitor remotely. They use video, audio, and different anti-cheating measures to maintain the integrity of the exam. Because numerous students cannot be observed at once, manually proctoring an online exam when it is being taken remotely is difficult. During manually supervised tests at the centers, a teacher can examine pupils physically and using all of their senses. By keeping an eye out for the students' sounds and motions, they can simply make sure that the event works successfully. Online tests offer less monitoring because the teacher is not physically present. A good remote online proctoring solution should make it easier to detect movement and sound.

A. Issues Identified

Flexibility: The convenience of proctoring over the internet is significantly greater. On the one hand, organizations can supervise and carry out evaluation on a much larger scale and across numerous time zones. On the other hand, students are free to choose their own preferred time slots and schedule their own preferred test periods in order to avoid having to travel for tests.

Task automation: A virtual surveillance system can be used by institutions to streamline time-consuming procedures including printing, setting up test sites, and hiring human invigilators.

Cheating and dishonesty: Candidates running the danger of employing illegal materials or receiving assistance from outside sources during traditional interviews and proctoring processes

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jeopardize the validity of the evaluation. .

Human errors: In conventional interview and proctoring processes, human errors, such as faults in evaluation, recording, or interpretation of results, may occur, resulting in erroneous evaluations and unreliable conclusions..

Lack of authenticity: Since candidates may have the chance to rehearse or influence their responses in traditional interviews and proctoring processes, it may be challenging to determine the veracity of their responses or performance.

Privacy concerns: Traditional proctoring methods, such in- person invigilation, could cause privacy issues because candidates might feel uneasy about being watched or videotaped while taking the assessment.

Cost and logistics: Traditional interviewing and proctoring procedures can be expensive in terms of venue rental, travel expenses, and other logistical considerations, which can be difficult for organizations with minimal funding.

1. B. Objective

Automation of Recruitment Process: Develop an AI-based architecture that automates multiple hiring procedures, such as candidate profile analysis, initial screenings, and evaluation based on established criteria, to save time and resources.

Efficient ML models: To detect symptoms of cheating and put a halt to fraudulent activities, develop language and computer vision models.

User-Friendly and Scalable Software: Create user-friendly, effective software that is scalable and compatible with various recruitment workflows, easily interacts with the current hiring process, and is easy to use.

Enhance Recruitment Efficiency and Fairness: By utilizing AI and computer vision technology to find the most qualified individuals based on set criteria, while minimizing biases and maintaining

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transparency, the recruiting process can be made more effective, efficient, and fair.

Innovation and Impact: By utilizing cutting-edge AI and computer vision technologies, promote innovation in the recruiting sector and develop a solution that has a beneficial impact on the recruitment process, making it more efficient, effective, and fair.

II. LITERATURE SURVEY

2. A. Related Work

Over the past few decades, a great deal of work has been done in the area of object identification, which is typically characterized as a two-stage process consisting of Feature Extraction and Classification. Extracting significant characteristics from visual data so they may be compared to a specified set is the main objective of feature extraction. Early methods of extracting information from features used visual features, edge detection, pixel analysis, and other algebraic characteristics. The following research works helped us in working on this project.

2.1 AI-based Automated Video Interviewing: A Systematic Literature Review

Authors: Pradhan, R., Patil, R., & Patil, A.

Publication: 2021 IEEE 12th Annual Information Technology, Electronics and Mobile Communication Conference (IEMCON)

Summary: The systematic literature review of AI-based automated video interviewing is presented in this paper. The most recent approaches, difficulties, and opportunities in this area are covered, including computer vision-based candidate analysis, automated scheduling of video interviews, and AI- based candidate evaluation.

2.2 Machine Learning-Based Automated Interview Analysis for Candidate Selection

Authors: Khandelwal, P., & Kavitha, S.

Publication: 2021 7th International Conference on Advanced Computing and Communication Systems (ICACCS)

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Summary: This paper proposes a machine learning-based automated interview analysis system that uses natural language processing (NLP) and sentiment analysis techniques to analyze candidate responses during interviews. It discusses the challenges of manual interview analysis and presents a novel approach to automate the process using machine learning algorithms.

2.3 Proctoring in Online Exams: An Overview of Techniques and Challenges

Authors: Sharma, A., & Sharma, A.

Publication: 2019 4th International Conference on Internet of
Things: Smart Innovation and Usages (IoT-SIU)

Summary: This paper provides an overview of proctoring techniques used in online exams, including video monitoring, audio analysis, and facial recognition. It discusses the challenges and limitations of existing proctoring methods and presents potential solutions using AI and computer vision technologies.

2.4 Using Computer Vision and Machine Learning for Automated Proctoring in Remote Exams

Authors: Shrestha, R., & Naeini, M. P.

Publication: Proceedings of the 2019 ACM Conference on Innovation and Technology in Computer Science Education (ITiCSE)

Summary: This paper presents a system for automated proctoring in remote exams using computer vision and machine learning techniques. It discusses the challenges of remote proctoring and presents a solution that uses facial recognition and gaze tracking to detect cheating behaviors during online exams.

3. B. Proposed Model

This model's goal is to create an AI-based architecture that automates the hiring process through computer vision and machine learning approaches, while providing effective and economical candidate analysis, interview scheduling, and evaluation. In order to stop cheating, the model also attempts to build a robust proctoring system for online exams.

Components of the Proposed Model:

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Automated Video Interviewing: Create a computer vision- based system that can evaluate interviewee responses in real time. To evaluate a candidate's suitability for the position, tools including sentiment analysis, speech recognition, and facial expression analysis may be used.

Candidate Evaluation using AI Algorithms: Implement machine learning algorithms that can instantly assess applicant responses in accordance with predetermined standards, such as job-related abilities, work history, and cultural fit. This could entail using NLP algorithms to evaluate candidates' responses and rank them according to relevancy.

Interview Scheduling Automation: Create an automated interview scheduling system that takes into account the availability of the interviewee and the interviewer as well as any scheduling restrictions. This could entail interview candidates and interviewers receiving automatic notificationsand interaction with calendar systems.

Proctoring System for Online Exams: Implement a strong proctoring mechanism for online tests to stop cheating. To identify and highlight any suspicious actions occurring during the exam, this may involve using gaze tracking, voice analysis, facial recognition, and video monitoring tools.

Cost-effective Software: To ensure successful resource utilization and cost effectiveness in the hiring process, choosecost-effective software tools and libraries for implementing the AI-based architecture.

Ethical Considerations: Throughout the system's design and implementation, keep ethical issues in mind, such as fairness, bias, privacy, and accountability. Take action to ensure fair applicant evaluation and proctoring by reducing any biases.

C. Conclusion

The suggested approach intends to automate the hiring process, enhance candidate evaluation, streamline interview scheduling, and develop a strong proctoring system for online tests using AI and computer vision technology. This strategy offers the ability to improve the effectiveness,

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efficiency, and cost-effectiveness of the hiring process while simultaneously addressing ethical concerns. With further study and development, the suggested model can be enhanced and verified in actual environments.

III. METHODOLOGY

The process entails developing a web-based application that enables recruiters to login, create new opportunities, and verify applicant results while also enabling job searchers to log in, apply for jobs, and attempt the interview. The software offers recruiters a variety of job-related interview questions for different rounds of interviews and has the functionality to add new questions and their solutions.

This project requires python (version 3.6 or later). Most of the libraries and frameworks used for development of this project are based on python programming.

1. Scikit-learn - To train the machine learning models.
2. OpenCV - To implement computer vision models
3. MongoDB - Database to store data.
4. Flask - For web backend development.
5. HTML, CSS & JavaScript - To design the frontend of the web application.

The project is composed of six modules, including the login and signup module, job creation module, data collecting module, video analysis module, audio analysis module, interview process module, hiring module, and model history module. The subsequent section provides a description of each module.

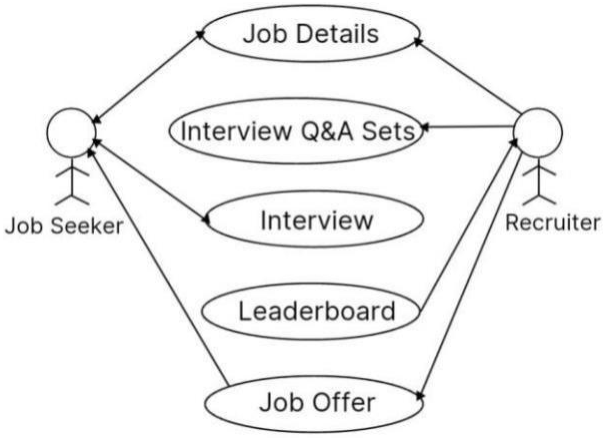

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Figure 1. Use Case Diagram

A. Login/Signup Module

In this module, the user will be authenticated. The user has to create an account by signing up by providing a unique username and password. Once the user provides the sign-in information the data is stored in the MongoDB database. Once the account is created the user can log in to the website using the username and password.

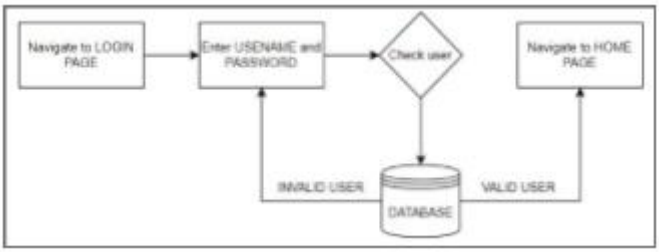

Figure 2. Login Module workflows

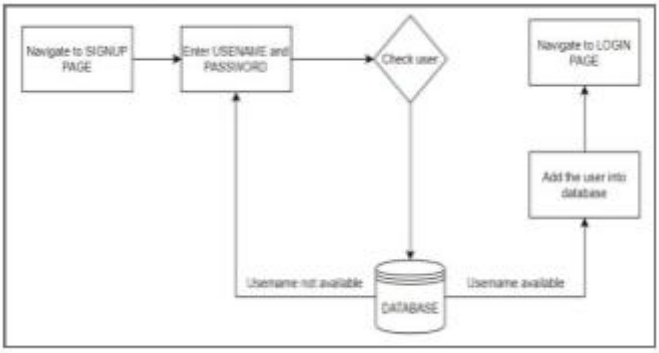

Figure 3. Signup Module workflow

B. Job Creation Module

Only the authenticated Recruiter can access this module. In this module, the recruiter has to create a job and give its description and give additional information as number of interview rounds, minimum score the candidate should score to qualify to next round and select the job-related questions from the huge Q&A set or add custom Q&A.

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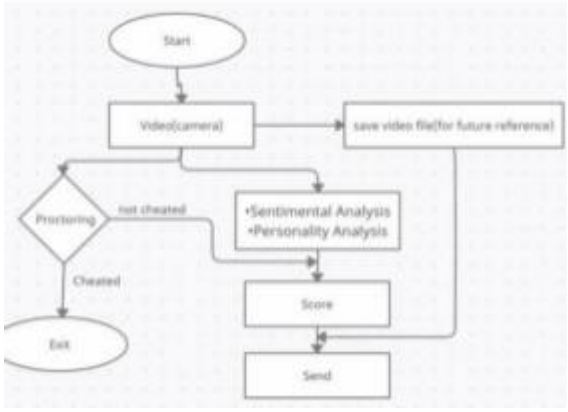

Figure 4. Job Creation Module workflow

C. Job Seeker data collection Module

Only the authenticated user can access this module. In this module, the user has to give the personal information to verify if he/she is qualified for the basic job requirements.

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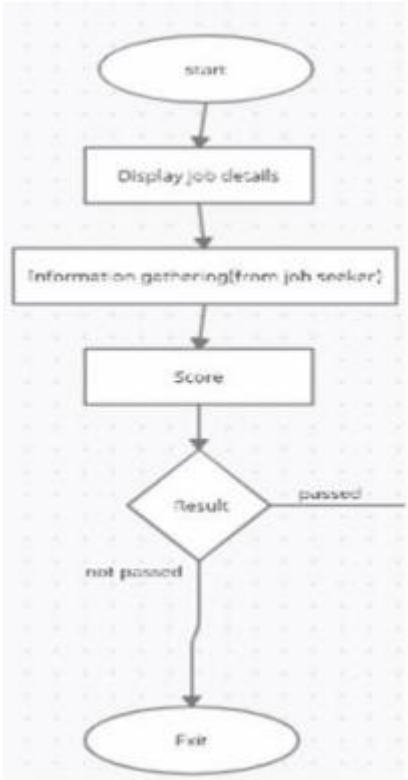

Figure 5. Candidate Data Collection Moduleworkflow

D. Video Analysis Module

After the candidate starts the assessment, the video is captured and analyzed by OpenCV to check if the candidate is not cheating in the test by continuously capturing hisposition, face angle, mouth movement, spoof checking, phone detection and face recognition. Sentimental and personality are also analyzed and given a score for his confidence.

E. Audio Analysis Module

The audio is captured continuously from his/her mic and is analyzed by converting his speech to text and also analyzing his English-speaking proficiency by using NLP models. Here the answers are verified and given a score.

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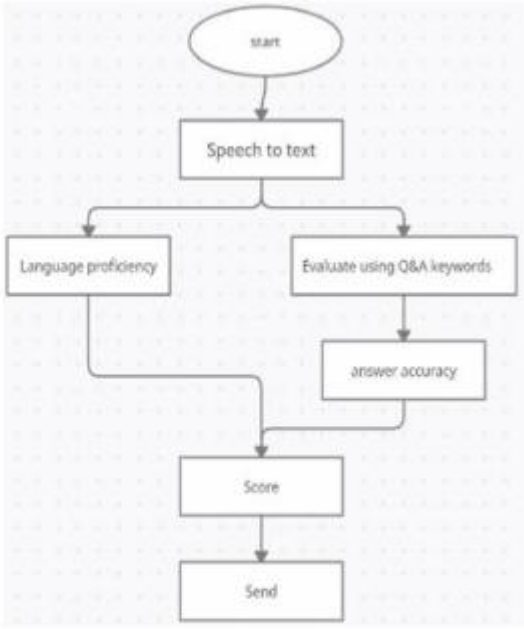

Figure 7. Audio Analysis workflow

F. Interview Module

In this the candidates are given interview questions and are proctored and analyzed using video and audio modules. If the person is found cheating, the system shows warning and after multiple warnings the test is exited. If the person passes the minimum score requirements for that round, the candidate isescalated to further rounds.

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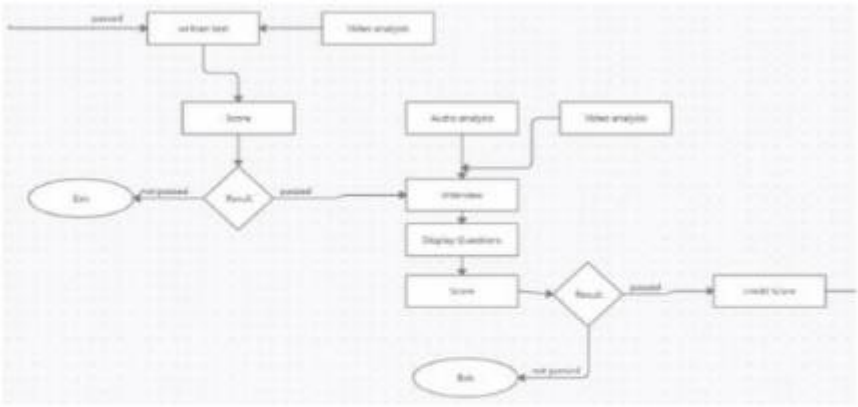

Figure 8. Interview Workflow

G. Hiring Module

Here the recruiter is allowed to check the recorded interview results and is given a choice to connect with the candidate or release the offer letter based on the performance. Here our system provides the detailed analysis of the candidate interview process and generates the report.

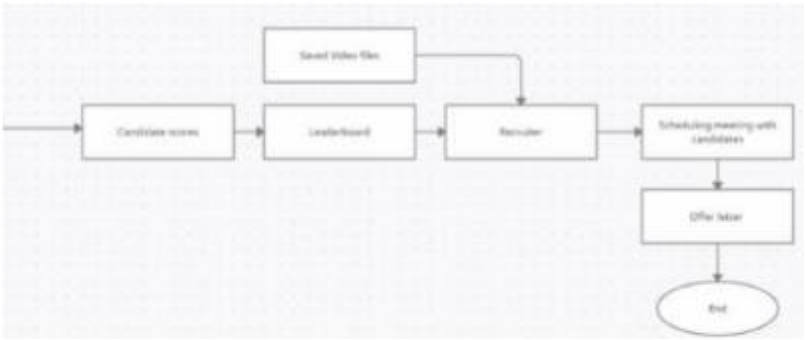

Figure 9. Hiring Workflow

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IV. RESULTS AND DISCUSSIONS

A Desktop Application and Web Application are developed where the user can login and use the application for interview purposes. The CNN and Mobile Net models are trained on a sample dataset consisting of 100 images in which 50 images belong to one class and the rest 50 images belong to the other class. The CNN model could reach an accuracy of 90% and Mobile Net base model could reach an accuracy of 92%. The real-time object tracking is simulated on a sample video of objects moving on a conveyor belt. Below are the screenshots of the working of web application and desktop application.

4.1 Home Page

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4.2 Login Page

In this page an existing user can login and access thedashboard.

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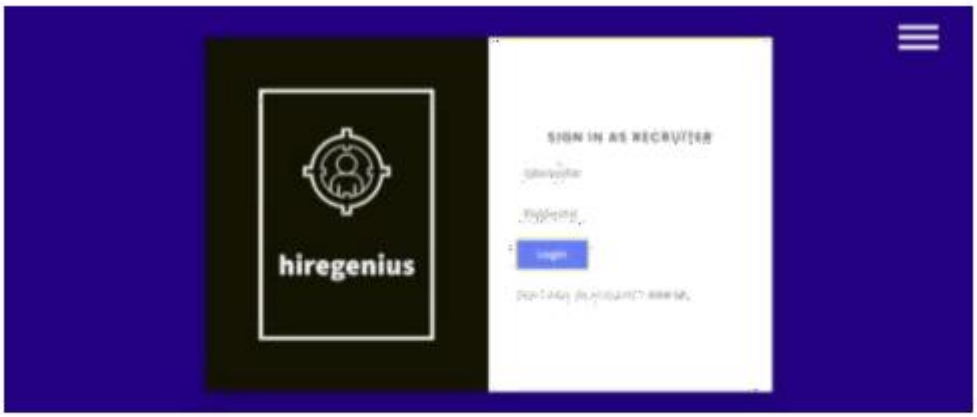

Figure 12. Recruiter Login Page

4.3 Recruiter Home Page

In this page the user can start a new job requirement or check the past created job results.

Figure 13. Recruiter Home Page

4.4 Candidate Home Page

In this page the job seeker can apply to available jobs,know applied job status and access to job interviews.

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Figure 14. Candidate Home Page

4.5 Candidate Interview Page

In this page the candidate is going to attend the interview.

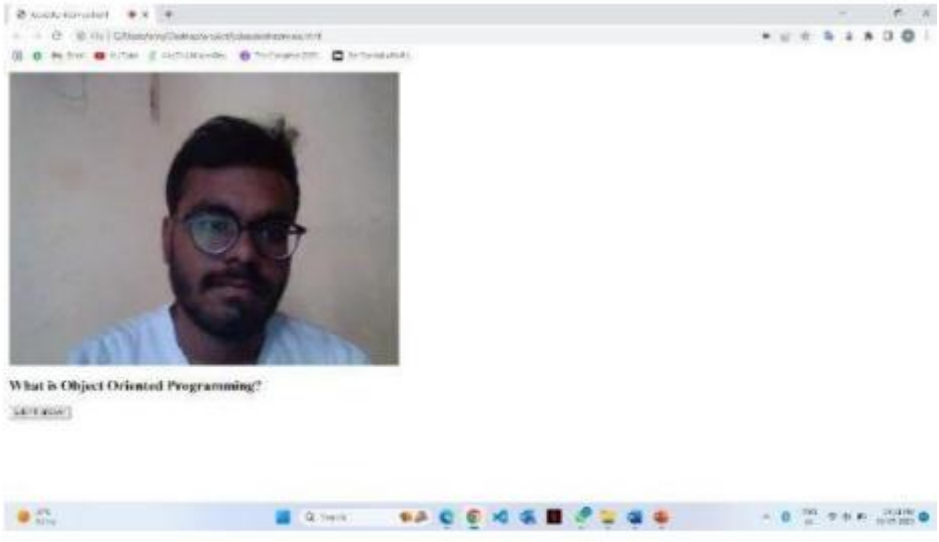

Figure 15. Interview Page

4.6 Interview Results Page

Once the candidate completed the interview, then therecruiter can check the candidate's

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performance.

6. CONCLUSION

In conclusion, by automating steps like candidate evaluation, interview scheduling, and online exam proctoring, the suggested AI-based interviewing and proctoring system has the potential to revolutionize the hiring process. The system can analyze candidate responses, assess their suitability for the job, and stop cheating during online tests by utilizing computer vision, machine learning, and NLP approaches. The suggested paradigm also takes cost-effective software and ethical issues into account.

V. FUTURE SCOPE

There are several potential future directions for this project, including:

Real-world Implementation and Validation: The proposed model can be used to improve the recruitment process, spot its strengths and weaknesses, and improve the system based on input from stakeholders including recruiters, candidates, and others. It can be implemented and validated in real-worldrecruitment scenarios.

Integration with HR Systems: The applicant tracking system (ATS) and human resource management system (HRMS) can be integrated with the AI-based interviewing and proctoring system to streamline the overall hiring process and improve the effectiveness of candidate evaluation, interview scheduling, and proctoring.

Advanced AI Techniques: In order to further improve the precision and efficacy of applicant evaluation, interview scheduling, and proctoring in the system, future research can investigate the application of more sophisticated AI approaches, such as deep learning, reinforcement learning, and natural language creation.

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