AI-BASED HR INTERVIEW SCREENING CHATBOT WITH AUTOMATED SCORING SYSTEM

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Abstract
Recruitment is a fundamental process in modern organizations, playing a crucial role in selecting qualified candidates efficiently. However, traditional hiring methods involve manual resume screening, written assessments, and interviews, which are time-consuming, labor-intensive, and prone to human bias. With the increasing number of job applications, organizations face significant challenges in processing candidate data and making accurate decisions.
This paper presents the design and implementation of an AI-based HR interview screening chatbot with an automated scoring system. The proposed system integrates multiple components, including resume parsing, Applicant Tracking System (ATS) scoring, online assessment evaluation, and AI-based chat screening, to streamline the recruitment process. Resume screening is performed using Natural Language Processing (NLP) techniques, where TF-IDF is used for feature extraction and machine learning models such as Support Vector Machine (SVM) are applied for classification.
The system also includes an online assessment module that evaluates candidates through multiple-choice questions, automatically calculating scores based on correct responses. Additionally, an AI-powered chatbot interacts with candidates to assess communication skills and generate intelligent screening scores. All candidate data and evaluation results are stored in a Snowflake database and visualized using Power BI dashboards for effective decision-making.
Experimental analysis shows that the proposed system significantly reduces manual effort, improves screening accuracy, and enhances the overall efficiency of the recruitment process.

Key Words
Artificial Intelligence, Recruitment System, ATS Scoring, Machine Learning, Resume Screening, Chatbot

I. INTRODUCTION

Artificial Intelligence has emerged as a transformative technology across various domains, including healthcare, finance, education, and human resource management. In the context of recruitment, AI enables automation, data-driven decision-making, and improved efficiency. Traditional recruitment processes involve multiple stages such as resume screening, written examinations, and interviews, which require considerable time and effort. As organizations receive thousands of applications for a single job opening, manual evaluation becomes increasingly difficult and inefficient.
One of the major challenges in traditional hiring systems is the presence of human bias and inconsistency. Recruiters may unintentionally favor certain candidates or overlook qualified individuals due to time constraints or subjective judgment. Additionally, manual processes often lead to delays in hiring, which can result in the loss of potential candidates.
To overcome these challenges, there is a growing need for intelligent systems that can automate recruitment tasks and ensure fair evaluation. The proposed AI-based HR screening chatbot system aims to provide a comprehensive solution by integrating multiple evaluation stages into a single platform. The system automates resume analysis using machine learning techniques, conducts online assessments to evaluate technical skills, and utilizes an AI chatbot to assess communication abilities.
By combining these components, the system provides a holistic evaluation of candidates, reducing dependency on manual processes. The use of machine learning algorithms ensures accurate and consistent evaluation, while the chatbot enhances interaction and engagement. Overall, the proposed system represents a significant advancement in recruitment technology, offering a scalable and efficient solution for modern hiring needs.

II. Literature Review

The development of intelligent recruitment systems has been an active area of research in recent years. Traditional Applicant Tracking Systems (ATS) primarily rely on keyword matching techniques to filter resumes. While these systems are effective for initial screening, they often fail to capture the semantic meaning of candidate profiles, leading to inaccurate results.
Machine learning approaches have been introduced to improve resume screening by analyzing patterns and relationships within data. Algorithms such as Support Vector Machines, Decision Trees, and Neural Networks have been widely used for classification tasks. SVM, in particular, is known for its ability to handle high-dimensional data and provide accurate classification results. However, these models require proper feature extraction and preprocessing to achieve optimal performance.
Recent advancements in Natural Language Processing have enabled more sophisticated analysis of textual data. Techniques such as TF-IDF, word embeddings, and transformer-based models allow systems to understand contextual meaning rather than relying solely on keywords. These approaches significantly improve the accuracy of resume evaluation.
In addition to resume screening, online assessment systems have been developed to evaluate candidate skills. These systems provide objective evaluation through standardized tests but often lack integration with other recruitment stages. Similarly, chatbot-

based systems have been introduced to interact with candidates and assess communication skills. However, many existing systems operate independently and do not provide a unified evaluation framework.
The proposed system addresses these limitations by integrating resume screening, online assessment, and chatbot-based evaluation into a single platform. This comprehensive approach ensures accurate and holistic candidate evaluation, improving the overall efficiency of recruitment processes.

III. SYSTEM ARCHITECTURE

The architecture of the proposed AI-based HR screening chatbot system is designed to provide a seamless and efficient workflow for candidate evaluation. The system consists of multiple interconnected modules that work together to automate the recruitment process.
The first module is the candidate registration and data collection module, where applicants submit their personal details and upload resumes through a user-friendly web interface. The system ensures secure storage of candidate data and provides easy access for further processing.

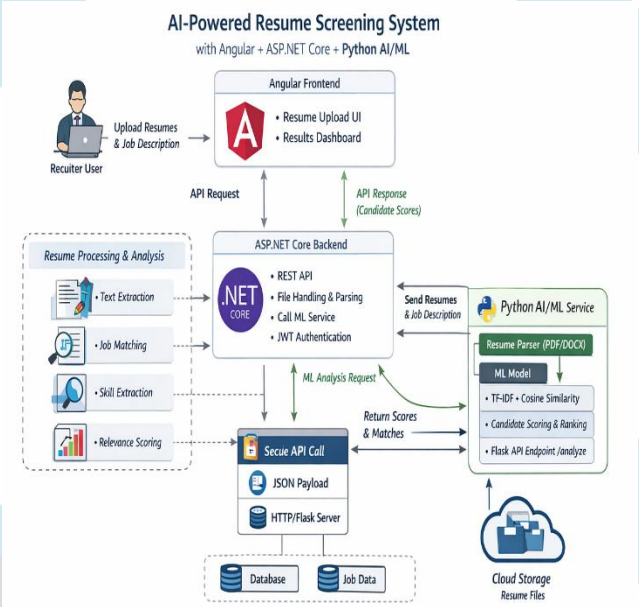

Fig 1. Architecture of AI-Based HR Screening

The resume parsing module is responsible for extracting relevant information from resumes using Natural Language Processing techniques. This includes extracting skills, qualifications, experience, and other key attributes. The extracted data is then processed and converted into a structured format for analysis.
The ATS scoring module evaluates candidate resumes based on job requirements. Feature extraction is performed using TF-IDF, and machine learning models are used to calculate relevance scores. Candidates who meet the required criteria are shortlisted for the next stage.
The online assessment module evaluates candidates through multiple-choice questions. The system dynamically generates questions and records candidate responses. Scores are calculated automatically based on correct answers, ensuring consistency and fairness.
The AI chatbot module interacts with candidates to assess communication skills and response quality. The chatbot uses natural language processing techniques to understand candidate responses and generate meaningful interactions.
Finally, the admin dashboard module provides visualization and analytics using Power BI. Recruiters can monitor candidate performance, compare scores, and make informed decisions. The overall architecture ensures scalability, efficiency, and seamless integration of all components.

IV. METHODOLOGY

The proposed system follows a structured methodology to ensure accurate and efficient candidate evaluation. The process begins with data collection, where candidate resumes and job-related information are gathered through the web interface.
The next step involves data preprocessing, where resumes are cleaned and prepared for analysis. This includes removing unnecessary characters, tokenizing text, and converting it into numerical representations using TF-IDF. This step is crucial for enabling machine learning algorithms to process textual data effectively.
The ATS scoring stage involves evaluating resumes using machine learning models. The system calculates relevance scores based on job requirements and candidate qualifications. Candidates who achieve scores above a predefined threshold are shortlisted for further evaluation.
The online assessment stage evaluates candidates through multiple-choice questions. The system dynamically generates questions and records responses. The scoring mechanism calculates the percentage score based on correct answers, providing an objective measure of candidate performance.
The chatbot evaluation stage involves interaction between candidates and an AI-powered chatbot. The chatbot evaluates responses based on clarity, relevance, and communication skills. This stage provides additional insights into candidate abilities that cannot be captured through resumes or tests.
Finally, the system combines scores from all stages to generate a final evaluation score. This composite scoring mechanism ensures a comprehensive assessment of candidates, enabling recruiters to make informed decisions.

V.MATHEMATICAL MODEL

The proposed AI-based HR screening system utilizes a combination of Natural Language Processing and machine learning techniques for candidate evaluation. The primary mathematical foundation of the system lies in feature extraction, similarity computation, and classification.

Let the resume dataset be represented as:

$$D = \{r_1, r_2, r_3, \ldots, r_n\}$$

where each $r_i$represents a candidate resume.

Each resume is converted into a numerical vector using TF-IDF:

$$TF\text{-}IDF(t,d) = TF(t,d) \times \log\left(\frac{N}{DF(t)}\right)$$

where:

- $TF(t,d)$= term frequency
- $DF(t)$= document frequency
- N= total number of documents

The similarity between resume vector $R$and job description vector $J$is computed using cosine similarity:

$$Similarity(R,J) = \frac{R \cdot J}{||\ R\ || \times ||\ J\ ||}$$

The classification of resumes is performed using Support Vector Machine (SVM), which determines an optimal hyperplane:

$$f(x) = w \cdot x + b$$

where:

- w= weight vector
- b= bias

For assessment scoring:

$$Score = \frac{\text{Correct Answers}}{\text{Total Questions}} \times 100$$

The final candidate score is calculated as a weighted combination:

$$FinalScore = w_1 \cdot ATS + w_2 \cdot Assessment + w_3 \cdot Chatbot$$

This mathematical formulation ensures accurate, objective, and consistent evaluation of candidates.

VI. IMPLEMENTATION

The implementation of the proposed AI-based HR screening chatbot system is carried out using a combination of modern programming tools, machine learning libraries, and cloud-based technologies to ensure efficiency, scalability, and real-time performance. The system is developed primarily using the Python programming language due to its extensive support for data processing, machine learning, and web application development.

The frontend of the system is designed using the Streamlit framework, which provides a user-friendly and interactive interface for both candidates and administrators. Through this interface, candidates can register, upload resumes, participate in online assessments, and interact with the chatbot. The admin interface allows recruiters to manage job postings, monitor candidate performance, and view evaluation results in real time.

The backend of the system handles all core functionalities, including resume parsing, feature extraction, machine learning model execution, and scoring mechanisms. Resume data is extracted using libraries such as PyPDF2, which enables the system to read and process PDF documents. The extracted text is then preprocessed using Natural Language Processing techniques such as tokenization, stop-word removal, and text normalization. These preprocessing steps ensure that the data is clean and suitable for further analysis.

Feature extraction is performed using the TF-IDF (Term Frequency–Inverse Document Frequency) technique, which converts textual data into numerical vectors representing the importance of words in a document. These feature vectors are used as input to machine learning models for classification. The system utilizes Support Vector Machine (SVM) for resume classification due to its effectiveness in handling high-dimensional textual data and its ability to provide accurate results.

The online assessment module is implemented using JavaScript, where multiple-choice questions are dynamically rendered on the user interface. Candidate responses are captured in real time and evaluated automatically. The scoring mechanism calculates the total score based on the number of correct answers, ensuring a consistent and unbiased evaluation process.

The chatbot module is implemented using generative AI techniques, where the chatbot interacts with candidates and evaluates their responses. The chatbot analyzes input based on relevance, clarity, and communication quality, and generates a screening score that contributes to the final evaluation.

For data storage and management, the system uses Snowflake, a cloud-based data warehouse that provides scalability and secure data handling. All candidate data, including resumes, assessment scores, and chatbot evaluations, are stored in a centralized database. This enables efficient data retrieval and analysis.

Data visualization is performed using Power BI, which provides interactive dashboards for recruiters. These dashboards display candidate scores, rankings, and performance metrics, allowing HR professionals to make informed decisions quickly.

The overall implementation ensures seamless integration between frontend and backend components, providing a robust and scalable system capable of handling large volumes of candidate data efficiently. The modular design of the system allows for easy maintenance and future enhancements, making it suitable for real-world deployment.

VII. RESULTS AND DISCUSSION

The performance of the proposed AI-based HR screening chatbot system was evaluated using sample datasets and simulated candidate inputs to analyze its effectiveness in automating recruitment processes. The evaluation focused on key aspects such as screening accuracy, efficiency, consistency, and overall system performance.

The results demonstrate that the system significantly improves the efficiency of the recruitment process by automating multiple stages of candidate evaluation. The resume screening module effectively filters candidates based on relevance to job requirements using ATS scoring. By applying TF-IDF and SVM classification, the system accurately identifies suitable candidates, reducing the need for manual screening.

The online assessment module provides an objective evaluation of candidate technical skills. The automated scoring mechanism ensures fairness and eliminates human error. Candidates are evaluated consistently based on their performance in multiple-choice tests, and the results are generated instantly. This significantly reduces the time required for assessment evaluation compared to traditional methods.

The chatbot module adds an additional layer of evaluation by assessing communication skills and response quality. Unlike traditional recruitment systems, which rely solely on resumes and tests, the chatbot enables interactive evaluation of candidates. This helps in identifying candidates with strong communication abilities and problem-solving skills.

Fig 2. Dashboard of Result.

The integration of multiple evaluation stages into a single system provides a comprehensive assessment of candidates. The final scoring mechanism combines ATS scores, assessment scores, and chatbot scores to generate an overall evaluation. This multi-level evaluation approach improves the accuracy and reliability of candidate selection.

In terms of performance metrics, the system demonstrates high efficiency and accuracy. The automated screening process reduces manual effort and speeds up the hiring process. The system is capable of handling large volumes of candidate data without performance degradation, making it suitable for large-scale recruitment.

The use of cloud-based storage and data visualization tools enhances system scalability and usability. Recruiters can access real-time data and make informed decisions based on candidate performance metrics. The Power BI dashboard provides clear insights into candidate rankings, enabling efficient shortlisting.

However, the system also has certain limitations. The performance of the resume screening module depends on the quality of input data and preprocessing. In cases where resumes are poorly formatted or lack relevant information, the accuracy of the system may be affected. Additionally, chatbot evaluation may require further refinement to accurately assess complex communication patterns.

Despite these limitations, the overall results indicate that the proposed system is effective in improving recruitment efficiency, reducing bias, and enabling data-driven decision-making. The system provides a reliable and scalable solution for modern recruitment processes and has the potential for further enhancements through advanced AI techniques.

VIII. ADVANTAGES

The proposed AI-based HR screening chatbot system provides several significant advantages over traditional recruitment methods. One of the primary advantages is the reduction of manual effort involved in candidate screening. By automating resume analysis, assessment evaluation, and communication analysis, the system minimizes the workload on human resource professionals and enables faster processing of applications.

Another major advantage is improved accuracy and consistency in candidate evaluation. Traditional recruitment methods often rely on human judgment, which may introduce bias and inconsistency. The proposed system uses standardized algorithms and scoring mechanisms, ensuring fair and objective evaluation of all candidates.

The integration of multiple evaluation stages, including ATS scoring, online assessment, and chatbot interaction, provides a comprehensive analysis of candidate capabilities. This multi-level evaluation ensures that candidates are assessed not only on technical skills but also on communication and problem-solving abilities.

The system also enhances scalability by enabling organizations to handle large volumes of applications efficiently. With cloud-based storage and automated processing, the system can support large-scale recruitment without performance degradation.
Additionally, the use of real-time evaluation and automated scoring enables faster decision-making. Recruiters can quickly identify suitable candidates and reduce the overall hiring cycle. The system also improves transparency by providing clear evaluation metrics and scores for each candidate.
Overall, the proposed system offers a cost-effective, efficient, and reliable solution for modern recruitment processes.

IX. APPLICATIONS

The proposed AI-based HR screening chatbot system has a wide range of applications across various domains. In corporate environments, the system can be used to automate recruitment processes, enabling organizations to efficiently manage large volumes of job applications and improve hiring decisions.
In campus placement systems, the system can assist educational institutions in evaluating student profiles and matching them with suitable job opportunities. This helps in improving placement efficiency and ensuring better career opportunities for students.
The system can also be integrated into online job portals and recruitment platforms, where it can automate candidate screening and shortlisting. This reduces the workload on recruiters and improves user experience by providing faster responses.
In HR analytics, the system can be used to analyze recruitment data and identify trends in candidate performance and hiring patterns. This enables organizations to make data-driven decisions and optimize their recruitment strategies.
The system is also suitable for remote hiring processes, where candidates can be evaluated through online assessments and chatbot interactions without requiring physical presence. This is particularly useful in global recruitment scenarios.
Additionally, the system can be extended to other domains such as employee performance evaluation, training assessment, and skill analysis. The flexibility and scalability of the system make it suitable for a wide range of applications.

X. FUTURE WORK

Although the proposed system demonstrates significant improvements in recruitment processes, there are several opportunities for further enhancement. One of the key areas for future work is the integration of advanced deep learning models such as transformer-based architectures for improved resume analysis and candidate evaluation.
Another potential improvement is the incorporation of voice-based chatbot interaction, enabling candidates to communicate through speech. This would enhance user experience and provide additional insights into candidate communication skills.
The system can also be extended to include real-time video interview analysis using computer vision techniques. This would allow evaluation of candidate behavior, facial expressions, and confidence levels.
The integration of explainable AI techniques is another important direction for future work. Providing clear explanations for candidate scores and decisions would increase transparency and trust in the system.
Additionally, the system can be enhanced by incorporating predictive analytics to forecast candidate success and job performance. This would enable organizations to make more informed hiring decisions.
The use of multilingual support can further expand the system's applicability, allowing candidates from different linguistic backgrounds to interact with the system effectively.
Overall, future work aims to improve accuracy, scalability, and user experience, making the system more robust and suitable for real-world applications.

XI. CONCLUSION

In this paper, an AI-based HR screening chatbot system has been proposed and implemented to address the challenges of traditional recruitment processes. The system integrates resume screening, online assessment, and chatbot-based evaluation to provide a comprehensive and automated recruitment solution.
The use of machine learning and natural language processing techniques enables accurate and efficient evaluation of candidates. The system reduces manual effort, minimizes bias, and improves decision-making in recruitment processes. The integration of multiple evaluation stages ensures a holistic assessment of candidate capabilities.
Experimental observations demonstrate that the system improves recruitment efficiency and accuracy compared to traditional methods. The use of cloud-based storage and visualization tools enhances scalability and usability.
Overall, the proposed system represents a significant advancement in recruitment technology and provides a reliable solution for modern hiring processes. The system can be further enhanced with advanced AI techniques and extended to various domains, making it a valuable tool for organizations.

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