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GenAI-Powered ATS: Enhancing Recruitment with Skill Fitment Analysis

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Abstract
This study introduces a novel candidate-job matching framework leveraging Generative AI (GenAI) as an alternative to conventional Natural Language Processing (NLP) techniques. While existing research predominantly focuses on NLP-based resume parsing and keyword matching, our methodology utilizes GenAI to produce comprehensive skill assessments by evaluating candidate qualifications against job descriptions. The framework extracts candidate profiles from CVs and analyses their alignment with job requirements, classifying proficiency levels into four tiers: Beginner, Intermediate, Competent, or Expert. This GenAI-driven approach not only demonstrates higher matching accuracy compared to traditional methods but also provides actionable insights for both candidates and hiring managers, thereby streamlining recruitment workflows.
Keywords: *Application Tracking System; Artificial Intelligence (AI); Generative AI; Large Language Models (LLM); Retrieval Augmented Generation (RAG)*

1. Introduction
In the rapidly evolving recruitment landscape, the demand for precise and efficient candidate assessment tools has become paramount. This introduces GenAI-Powered ATS: Enhancing Recruitment with Skill Fitment Analysis, a framework designed to transform traditional hiring systems by employing Generative AI (GenAI). Unlike conventional Applicant Tracking Systems (ATS) that depend on keyword-based Natural Language Processing (NLP) [1,2], our approach uses GenAI to dynamically evaluate and align candidate competencies with job specifications. The framework parses resumes and job descriptions, then performs a granular comparison of Candidate Skills and Proficiency Levels (e.g., Beginner, Intermediate, Competent, Expert) against Required Skills and Target Proficiency Levels. By generating actionable insights into skill gaps, strengths, and developmental opportunities, the framework streamlines recruitment workflows, elevates match accuracy, and enhances hiring decisions [3]. This advancement represents a paradigm shift in talent acquisition, offering recruiters and candidates a more transparent, data-driven evaluation process.

1.1. What is an Applicant Tracking System (ATS)?
An Applicant Tracking System (ATS) is a software used to automate and accelerate the hiring process. It is a single point of entry for publishing job postings, collecting applications, setting up interviews, and matching recruiters with applicants. There are two broad categories of ATS: conventional systems, which apply manual screening and keyword matching, and AI-based systems, which apply machine learning to scan resumes, cover letters, and other hiring materials for enhanced candidate matching. AI-based ATS also monitor candidate interactions, give feedback, and even employ chatbots, which makes them more efficient for recruiters and hiring managers.

1.2. Generative Artificial Intelligence (GenAI)
1.2.1. Application of Generative AI in the System
This system incorporates Generative AI through the Retrieval-Augmented Generation (RAG) framework, which integrates AI-driven reasoning with precise information retrieval. Using Natural Language Processing (NLP) techniques, job descriptions and resumes are converted into semantic vector embeddings. These embeddings are then stored in a vector database, enabling rapid and efficient

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candidate-job alignment. The Generative AI model analyzes the retrieved data to generate real-time recommendations and insights, such as identifying skill gaps, assessing cultural fit, and providing personalized feedback for recruiters and candidates. Furthermore, the system compiles structured reports, offering valuable insights to streamline decision-making and enhance the recruitment process, Figure 1.

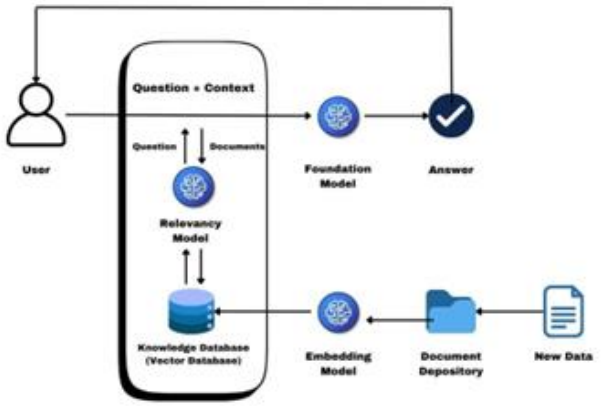

Figure 1 Generative AI Working

1.2.2. Importance of Generative AI

Generative AI is pivotal to this as it addresses the inefficiencies and biases prevalent in traditional ATS. By offering context-aware and adaptive solutions, it enables a more holistic evaluation of candidates beyond static keyword matches. The integration of generative AI enhances the system's ability to process complex and diverse datasets, ensuring a more accurate representation of candidates' skills and compatibility with job requirements. organizations of varying sizes and industries. Its ability to adapt to changing recruitment trends ensures that the proposed ATS remains relevant and impactful in an evolving job market, establishing it as a significant advancement in recruitment technology.

2. Literature Survey

Several studies have explored the application of Generative AI and NLP-based techniques in Applicant Tracking Systems (ATS). A study by Surya et al. [1] presents a Smart Applicant Tracking System utilizing Google Gemini for semantic resume-job matching. The system leverages Natural Language Processing (NLP), cosine similarity, and automation to enhance the recruitment process. However, the complexity of generating synthetic training data and ensuring diversity in the candidate pool remains a challenge. Similarly, the AI Resume Analyzer proposed by Chavan et al. [2] employs NLP for resume parsing, machine learning for categorization, and a hybrid recommender system for job recommendations. Despite its effectiveness, its accuracy is limited due to variability in resume formats and keyword-based dependency. Further advancements in AI-driven ATS are seen in Meta's Llama 3 Herd of Models [3], which integrates multi-model inputs to enhance ATS analysis. While this approach improves data processing capabilities, it faces scalability challenges in handling large-scale data and diverse input types (text, image, video). Another study by Surya et al. [4] examines an NLP-based Resume Parser Analysis, incorporating machine learning for categorization and hybrid recommender systems. The system shows promise but is susceptible to bias in candidate ranking and lacks robustness in handling complex skill assessments. Moreover, Harshada et al. [5] propose an NLP-based Resume Extraction System utilizing machine learning for skill extraction and candidate ranking. While the approach effectively identifies job-relevant skills, it is limited by language compatibility issues and industry-specific adaptation challenges. These studies highlight the growing role of AI in recruitment while also underscoring the need for improved scalability, fairness, and adaptability in ATS models [6-8].

3. Methodology

The proposed system architecture involves multiple components that interact seamlessly to process and analyse CVs and job descriptions, enabling a comprehensive fitment analysis. The methodology can be described in the following steps:

3.1. Authentication and Access Control

Users securely log into the system, ensuring that sensitive data is protected against unauthorized access. The system also incorporates advanced methods such as linking existing data and generating embeddings for enhanced processing.

3.2. Data Upload and Parsing

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Users upload CVs and job descriptions through an intuitive interface. The system employs sophisticated text extraction techniques to process these documents, converting unstructured data into a structured format for further analysis.

3.3. Storage of Data

Data extracted from CVs and job descriptions is stored in a centralized database for efficient processing and retrieval. This structured storage enables both real-time analysis and future reference.

3.4. Data Processing and Analysis

Extracted information is converted into semantic embeddings using pre-trained language models and stored in a VectorDB. This setup enables sophisticated similarity searches for real-time analysis and future reference. Generative AI models then retrieve, process, and compare data from CVs and job descriptions to derive insights into candidate-job fitment and generate detailed evaluations, Figure 2.

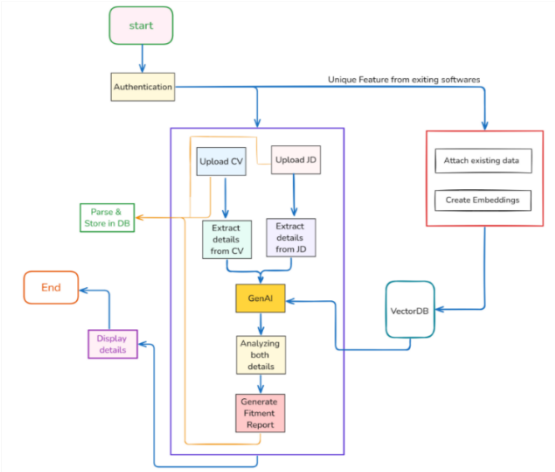

Figure 2 Proposed Methodology Architecture

3.5. Fitment Reporting and Visualization

The system produces comprehensive fitment reports that clearly outline the alignment between candidate skills and job requirements, offering actionable insights for recruiters. These reports and analytical insights are delivered through an intuitive user interface, enhancing decision-making and ensuring seamless navigation.

3.6. System Enhancements with Unique Features

The system incorporates advanced features such as linking existing data and leveraging embeddings, setting it apart from traditional methods. These enhancements enable deeper analysis and improve the accuracy and effectiveness of the fitment reports.

3.7. Tools and Technologies Used

The platform employs Generative AI to extract and assess information from CVs and job descriptions, whereas VectorDB retains embeddings for similarity searches. A centralized database oversees the management of parsed data, reports, and embeddings, and an intuitive interface enables users to upload files and visualize reports. The back-end is responsible for authentication and data parsing. The key components and their implementation details are as follows, Figure 3:

4. Implementation

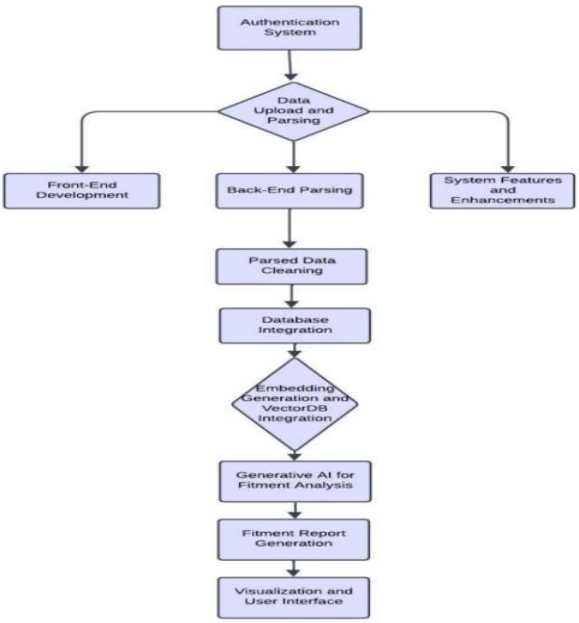

Figure 3 Workflow of Implementation

4.1. Authentication System

The implementation starts with a secure authentication mechanism to validate user credentials. The system uses OAuth-based authentication to ensure secure access. This feature is implemented using frameworks like Express.js on the back end, integrated with databases such as MongoDB to store user credentials securely.

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4.2. Parsing and Uploading of Data

- Front-End Development: The user interface is developed utilizing React.js for the purpose of uploading CVs and job descriptions seamlessly. Libraries such as react-dropzone are used for file handling.
- Back-End Parsing: Documents uploaded in PDF are routed to the backend, where PyPDF2 libraries are utilized to parse text. Parsed data is cleaned and preprocessed to extract redundant information so that only valuable data is saved.

4.3. Database and Embedding Integration

- Data Storage: Parsed data is stored in MongoDB, supporting multiple CVs and fitment reports per job description for efficient retrieval.
- Embedding Generation: Text from CVs and job descriptions is converted into semantic embeddings using models like BERT or OpenAI embeddings.
- VectorDB Use: These embeddings are stored in a VectorDB (e.g., Pinecone, Milvus, or Weaviate) to enable high-speed similarity searches and effective candidate-job matching.

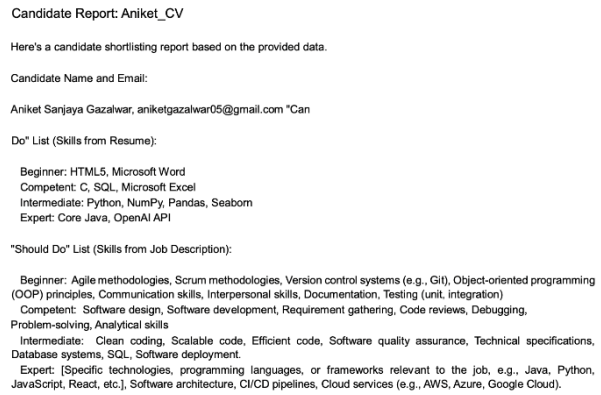
4.4. Fitment Analysis and Report Generation

The system uses generative AI to extract and categorize skills from CVs and job descriptions by proficiency, calculating a weighted fitment score for candidate-job alignment. It generates a PDF report with jsPDF, highlighting matched/unmatched skills and offering recommendations. An interactive React.js interface allows users to view, share, and compare reports.

4.5. Visualization, User Interface, and System Enhancements

The system presents fitment reports through an interactive React.js interface that lets users view, download, share, and compare reports across multiple candidates for a single job description. Additionally, it enhances usability by enabling users to link existing CVs and job descriptions, supports semantic searches via embedding-based queries in the VectorDB, and integrates seamlessly with proprietary APIs for efficient processing, Figure 4 & Figure 5.

5. Results



Candidate Report: Aniket_CV

Here's a candidate shortlisting report based on the provided data.

Candidate Name and Email:

Aniket Sanjaya Gazalwar, aniketgazalwar05@gmail.com "Can

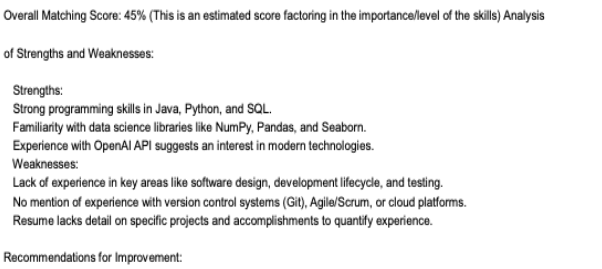
Do" List (Skills from Resume):

Beginner: HTML5, Microsoft Word
Competent: C, SQL, Microsoft Excel
Intermediate: Python, NumPy, Pandas, Seaborn
Expert: Core Java, OpenAI API

"Should Do" List (Skills from Job Description):

Beginner: Agile methodologies, Scrum methodologies, Version control systems (e.g., Git), Object-oriented programming (OOP) principles, Communication skills, Interpersonal skills, Documentation, Testing (unit, integration)
Competent: Software design, Software development, Requirement gathering, Code reviews, Debugging, Problem-solving, Analytical skills
Intermediate: Clean coding, Scalable code, Efficient code, Software quality assurance, Technical specifications, Database systems, SQL, Software deployment.
Expert: [Specific technologies, programming languages, or frameworks relevant to the job, e.g., Java, Python, JavaScript, React, etc.], Software architecture, CI/CD pipelines, Cloud services (e.g., AWS, Azure, Google Cloud).

Figure 4 Fitment Report (i)



Overall Matching Score: 45% (This is an estimated score factoring in the importance/level of the skills) Analysis

of Strengths and Weaknesses:

Strengths:
Strong programming skills in Java, Python, and SQL.
Familiarity with data science libraries like NumPy, Pandas, and Seaborn.
Experience with OpenAI API suggests an interest in modern technologies.
Weaknesses:
Lack of experience in key areas like software design, development lifecycle, and testing.
No mention of experience with version control systems (Git), Agile/Scrum, or cloud platforms.
Resume lacks detail on specific projects and accomplishments to quantify experience.

Recommendations for Improvement:

Figure 5 Fitment Report (ii)

6. Future Scope

6.1. Advanced Skill Fitment and Personalized Career Pathways

Future ATS models can move beyond traditional keyword-based matching by leveraging deep learning to analyze career progression and industry trends. AI-powered systems could provide personalized job recommendations and suggest relevant upskilling courses based on a candidate's strengths and market demand. Integration with learning platforms such as Coursera, Udemy, and LinkedIn Learning would enable job seekers to bridge skill gaps and enhance their employability.

6.2. AI-Driven Interview Simulation and Candidate Evaluation

Enhancing the ATS with AI-powered mock interview capabilities could transform candidate assessments. Through speech analysis, sentiment detection, and behavioral evaluation, AI can assess communication

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skills, technical expertise, and overall job readiness. Facial recognition and voice tone analysis could provide automated feedback, helping candidates improve their interview performance. This would allow recruiters to evaluate applicants beyond their resumes, making the hiring process more comprehensive and accurate.

6.3. AI-Enabled Diversity and Inclusion Optimization

Future ATS systems may use AI-powered bias detection to ensure fair hiring practices. By analyzing job descriptions, resume screenings, and interview data, AI can spot and reduce unconscious biases. It could suggest more inclusive language, recommend a broader range of candidate profiles, and align hiring decisions with standards like EEOC (Equal Employment Opportunity Commission) guidelines. These improvements will help organizations build fairer hiring processes and more diverse teams.

Conclusion

Gen-AI Powered ATS: Improving Hiring and Skill Match Analysis" outlines a new solution for revolutionizing recruitment processes via generative AI. Through the automation of resume screening, optimization of job matching, and delivery of data-based insights, the system overcomes the shortcomings of conventional applicant tracking systems and maximizes recruiter effectiveness while improving candidate experience. Future enhancements could include the use of blockchain for the secure authentication of credentials, real-time analysis of skill gaps, and further mobile accessibility in order to remain scalable and responsive to changing industry requirements. With continued technical progress and emphasis on ethical procedures, this AI-based ATS has the potential to emerge as a leading tool for contemporary recruitment, enabling improved hiring outcomes for businesses and candidates alike.

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