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AI-POWERED RESUME SEARCH ENGINE

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Abstract:

Modern recruitment processes face significant challenges due to the exponential increase in job applications per vacancy. Conventional Applicant Tracking Systems (ATS) primarily rely on keyword-based filtering mechanisms, which often fail to capture contextual meaning, transferable skills, and semantic relationships within resumes. As a result, qualified candidates may be overlooked, while less suitable applicants may pass screening through strategic keyword optimization.

This paper presents an AI-Powered Semantic Resume Screening System designed to enhance recruitment accuracy, fairness, and authenticity verification. The system integrates Large Language Models (LLMs) for contextual understanding of resumes and job descriptions, enabling semantic similarity-based candidate ranking. It incorporates role-specific skill assessments, plagiarism detection, AI-generated content verification, and automated anonymization of Personally Identifiable Information (PII) to reduce bias.The proposed architecture follows a modular client–server design using Fast API for backend orchestration, Next.js-based frontend interfaces, PyMuPDF and OCR for document processing, and MySQL for structured data storage. Experimental validation demonstrates improved candidate-job alignment, enhanced integrity, and reduced manual recruitment workload. The system represents a next-generation intelligent hiring platform emphasizing transparency, meritocracy, and efficiency.

Keywords: Resume Screening, Semantic Search, Large Language Models, Natural Language Processing, Applicant Tracking System, Bias Reduction, Plagiarism Detection, AI-Generated Text Verification, Candidate Ranking, Recruitment Automation.

I.INTRODUCTION:

The digital transformation of recruitment has fundamentally reshaped the hiring ecosystem, leading organizations to receive an unprecedented number of applications for each vacancy through online job portals, professional networking platforms, and automated submission tools. While this expanded accessibility broadens the available talent pool, it simultaneously introduces significant screening complexities. To manage this volume, Applicant Tracking Systems (ATS) were developed to automate resume filtering by scanning documents and comparing them with job descriptions using keyword-based algorithms. Although such systems reduce manual workload and accelerate initial screening, they operate primarily at a surface lexical level and lack deeper contextual interpretation. They are unable to recognize synonymous skills such as "data analysis" and "statistical modelling," identify transferable expertise across domains, evaluate the true relevance of experience beyond literal phrasing, or understand conceptual relationships between projects and job roles. As a result, qualified candidates may be unintentionally rejected, while less suitable applicants may receive higher rankings due to strategic keyword placement.

The rapid growth of AI-assisted resume writing tools and generative language models has introduced new challenges in recruitment, particularly in verifying the authenticity of candidate submissions. Applicants

can now create highly polished resumes with minimal effort, making it difficult for recruiters to assess whether the listed skills truly reflect genuine competency. Moreover, visible personal identifiers such as names, photographs, and demographic details may unintentionally influence hiring decisions, leading to unconscious bias. Despite automation improvements, current recruitment systems remain heavily dependent on keyword matching, lack mechanisms to detect plagiarism or AI-generated content, and provide limited contextual evaluation. These shortcomings reduce screening reliability and highlight the need for a context-aware, authenticity-validated, bias-reduced, and scalable AI-driven recruitment framework.

[1], AI-based resume screening systems are increasingly adopted, but they raise concerns related to trust, transparency, and recruiter acceptance of algorithmic decisions [2], Deep learning-based screening methods may introduce bias, leading to unfair discrimination in candidate selection based on factors like origin or demographics [3], AI and data-driven recruitment systems enhance hiring efficiency by automating resume analysis and improving candidate-job matching [4], AI-powered recruitment significantly outperforms traditional methods by improving accuracy, reducing manual effort, and enabling better candidate evaluation [5], Automated resume screening systems using NLP and machine learning help extract relevant information and streamline the hiring process.

II.RELATED WORK:

[1], AI-based resume screening systems are increasingly used to support recruiters in decision-making. However, the study highlights concern regarding trust, transparency, and acceptance of algorithmic recommendations. Recruiters tend to rely on AI suggestions but still seek human control in final decisions. This indicates the need for more explainable and reliable AI systems in recruitment [2], Deep learning-based automated resume screening systems can unintentionally introduce bias in hiring decisions. The study shows that such systems may discriminate based on sensitive attributes like national origin. This raises ethical concerns regarding fairness and accountability in AI-driven recruitment. It emphasizes the importance of bias mitigation techniques in hiring systems [3], AI-driven recruitment systems improve hiring efficiency by automating resume analysis and candidate filtering. These systems use machine learning techniques to match candidate skills with job requirements. The study demonstrates that automation reduces manual effort and speeds up the hiring process. It also enhances accuracy in identifying suitable candidates [4], A comparative analysis shows that AI-based recruitment systems outperform traditional methods in terms of speed and accuracy. AI techniques enable better evaluation of resumes by understanding context rather than relying only on keywords. The system reduces human workload and improves decision-making quality. It highlights the effectiveness of AI in modern recruitment processes [5], Resume screening systems powered by AI utilize NLP and machine learning to extract relevant information from resumes. These systems help in identifying key skills, qualifications, and experience efficiently. The study shows that automated screening improves consistency and reduces human bias. It supports the development of intelligent and scalable hiring solutions.

III. LITERATURE REVIEW:

S.No	Title	Details (Authors, Year)	Method Used	Main Findings / Achievements	Limitations / Drawbacks
1	Should I Trust the Artificial Intelligence to Recruit?	Alain Lacroux, Christelle Martin-Lacroux — 2022,	Did an online experiment with recruiters to study their trust in AI	Found recruiters trust humans more, but AI still affects their decisions.	Used sample/fake resumes; not tested in real company setups.

		Frontiers in Psychology	during resume screening.		
2	National Origin Discrimination in Deep-Learning-Powered Automated Resume Screening	Sihang Li, Kuangzheng Li, Haibing Lu — 2023, arXiv	Studied bias in AI resume screening using deep-learning models.	Found AI tools can show bias based on nationality and suggested fixes.	Small dataset; didn't cover other types of bias like gender or age.
3	AI-Powered Resume Optimizer and Job Recommendation System	Brindha M., Karthikeyan M., Jessinth T., Karthe A.S., Dhanush A. — 2025, JETIR Journal	Built a web platform using AI + NLP that improves resumes and suggests suitable jobs.	Helped users make strong resumes and find matching jobs easily.	Only a demo version; not tested in real companies yet.
4	AI-Powered Resume Screening: A Comparative Study of Traditional vs. AI-Based Recruitment Methods	Arvindh V. Babu — 2025, SRM TRP Engineering College	Compared AI-based recruitment with traditional methods using NLP tools like Word2Vec and BERT.	Made the recruitment faster and more accurate; saved time for HRs.	Couldn't assess soft skills; still showed some bias.
5	AI-Driven Intelligent Resume Recommendation Engine	Nikhat Akhtar, Sana Rabbani, Hina Rabbani, Saurav Kumar, Yusuf Perwej — 2025	Used AI and NLP (BERT) with MongoDB to match resumes and job descriptions.	Improved job matching and gave resume improvement feedback.	Focused mainly on skills; not tested on large real-world data.

IV.PROPOSED SYSTEM:

A. Overview of Proposed System:

The proposed system presents an intelligent resume screening approach that addresses the shortcomings of traditional keyword-based recruitment tools. By utilizing advanced language models, it analyses resumes and job descriptions in a contextual manner, enabling more precise matching based on meaning rather than exact wording. The system also strengthens evaluation reliability through features such as role-oriented skill assessments, detection of duplicated or AI-generated content, and validation of candidate authenticity. To support fair hiring, it removes personal identifying details that could introduce bias.

Designed with a scalable architecture and efficient data processing capabilities, this framework aims to streamline recruitment, improve decision accuracy, and ensure a more transparent and merit-focused selection process**.**

B. System Architecture:

The architecture consists of five core modules:

- User Interface & Authentication Module
- Resume Processing & OCR Module
- Data Management & Storage Module
- AI Processing & Semantic Analysis Module
- Result Handling & Communication Module

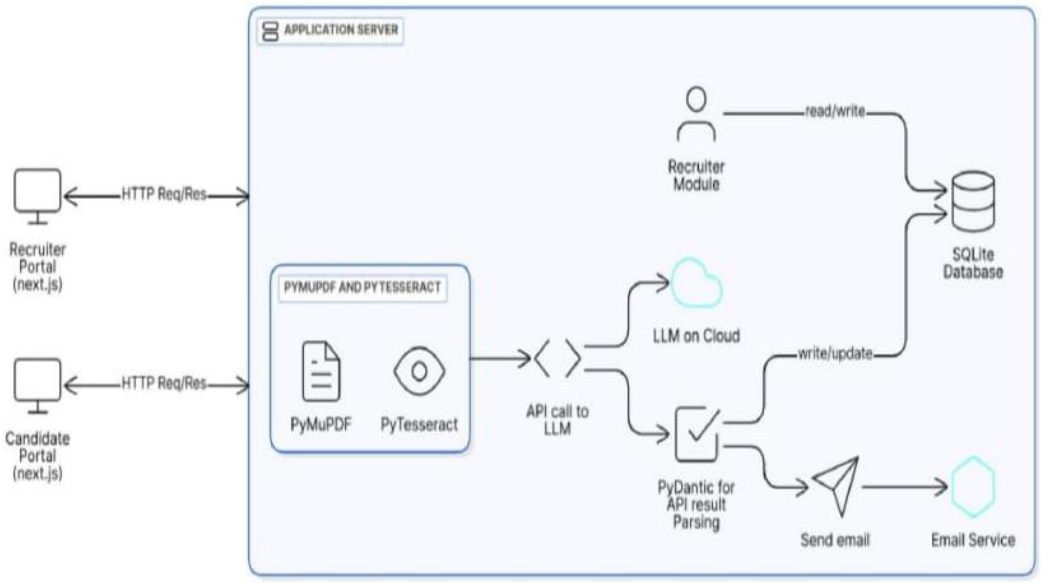


Figure: System Architecture for AI- powered resume search engine.

• **User Interface & Authentication Module** This module includes the recruiter and candidate portals developed using Next.js. It handles user interactions, secure authentication, and communication with the backend through HTTP requests and responses, ensuring smooth access to system functionalities**.**

• **Resume Processing & OCR Module** This component processes uploaded resumes using PyMuPDF and PyTesseract. It extracts textual content from PDF and image-based resumes, converting unstructured documents into machine-readable data for further analysis.

• **Data Management & Storage Module** This module manages all structured data using a SQLite database. It stores candidate information, processed resume data, job descriptions, and evaluation results, supporting efficient read/write operations for the system**.**

• **AI Processing & Semantic Analysis Module** This is the core intelligence layer where API calls are made to cloud-based Large Language Models (LLMs). It performs contextual understanding, semantic matching between resumes and job descriptions, and generates evaluation outputs.

• **Result Handling & Communication Module** This module processes the AI-generated results, structures the output, updates the database, and triggers actions such as sending notifications or emails through an integrated email service, enabling seamless recruiter communication.

V. IMPLEMENTATION:

A. Development Environment The system is developed as a full-stack web application. The frontend is built using Next.js to provide an interactive interface for both candidates and recruiters. The backend is implemented using Python with Fast API, which manages API handling, resume processing, and AI integration. SQLite is used for structured data storage, ensuring efficient data retrieval and management. The modular architecture enables scalability and easy system maintenance.

B. User Interface and Authentication Separate portals are designed for candidates and recruiters. Users can register, log in securely, upload resumes, and access system features. Authentication mechanisms ensure data privacy, while session handling enables personalized dashboards and controlled access to functionalities.

C. Resume Processing and OCR Implementation Uploaded resumes are processed using PyMuPDF for PDF extraction and PyTesseract for OCR in case of scanned or image-based documents. The extracted text is cleaned and formatted to remove noise and inconsistencies, making it suitable for further analysis.

D. LLM-Based Resume Parsing The processed text is sent to a cloud-based Large Language Model for intelligent parsing. The system extracts structured information such as skills, education, experience, certifications, and projects, which are then stored in the database for evaluation.

E. Skill Evaluation and Authenticity Verification The system conducts role-specific skill assessments and automatically calculates candidate scores. It also incorporates plagiarism detection and AI-generated content verification to ensure the authenticity and reliability of candidate submissions.

F. Semantic Matching and Ranking Semantic similarity techniques are used to compare resumes with job descriptions by generating embeddings and computing similarity scores. A final ranking is produced by combining semantic scores and skill test performance, ensuring accurate candidate evaluation.

G. Recruiter Dashboard and Communication Recruiters can view anonymized candidate profiles along with match scores, insights, and evaluation results. The system also integrates an email service to send automated notifications regarding application status, shortlisting, and final decisions.

VI. ALGORITHM:

INPUT: Resume (PDF/Image/Text), Job Description
OUTPUT: Candidate Match Score and Ranking

1. START
2. Initialize system
   Load Fast API server
   Connect to database
   Load LLM / NLP model
3. Receive input
   Accept resume from candidate
   Accept job description from recruiter
4. Extract resume text
   IF resume is PDF:
      Use PyMuPDF
   ELSE IF resume is image:
      Apply OCR (PyTesseract)

5. Preprocess text
   Clean text
   Remove noise and unwanted symbols
6. Parse resume using LLM
   Extract:
      skills, education, experience, projects
7. Store extracted data in database
8. Conduct skill assessment
   Evaluate test responses
   Calculate skill score
9. Perform authenticity checks
   Detect plagiarism
   Check AI-generated content
10. Apply anonymization
    Mask name, email, phone number
11. Perform semantic matching
    Generate embeddings for:
       resume and job description
    Compute similarity score using cosine similarity
12. Calculate final score
    final score = (w1 * similarity score) + (w2 * skill score)
13. Rank candidates
    Sort based on final score
14. Display results
    Show anonymized profiles and scores on dashboard
15. Send notifications
    Email candidate status updates
16. END

VII. RESULTS

The system was successfully implemented and tested, producing accurate candidate matching and ranking. It improved resume evaluation compared to basic methods and reduced manual effort in the recruitment process.

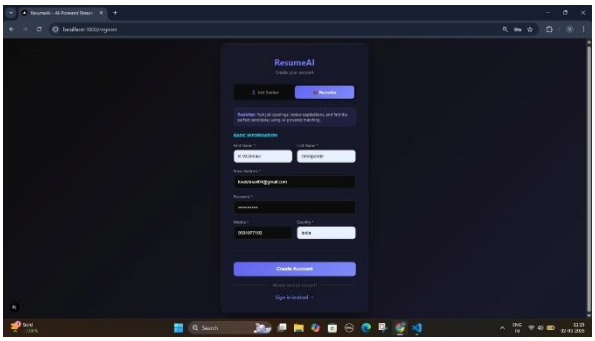


Figure 2: Recruiter Registration

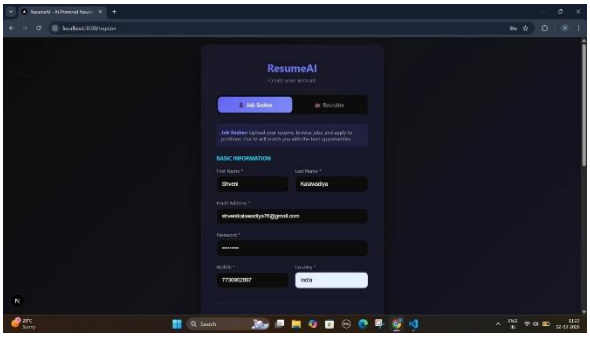


Figure 3: Jobseeker Registration

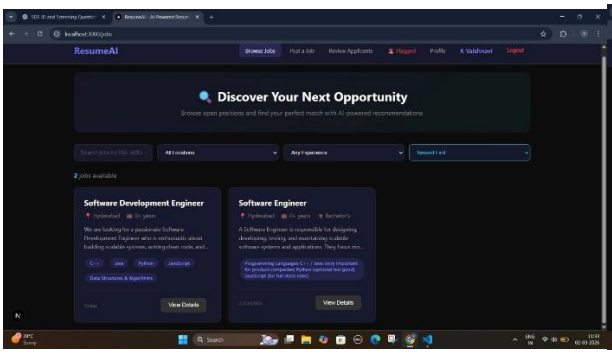


Figure 4 : Recruiter Dashboard

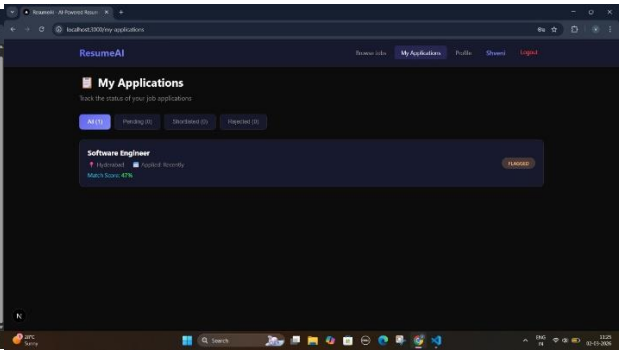


Figure 5: Jobseeker Dashboard

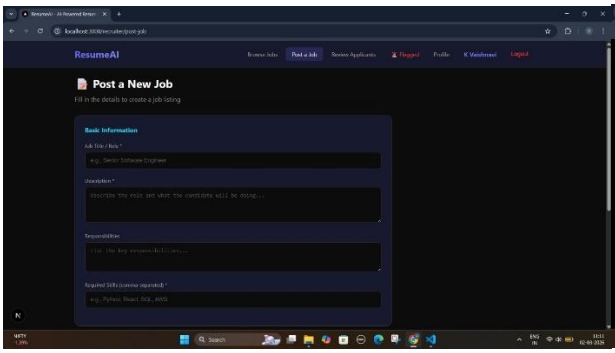


Figure 6: Job post by Recruiter

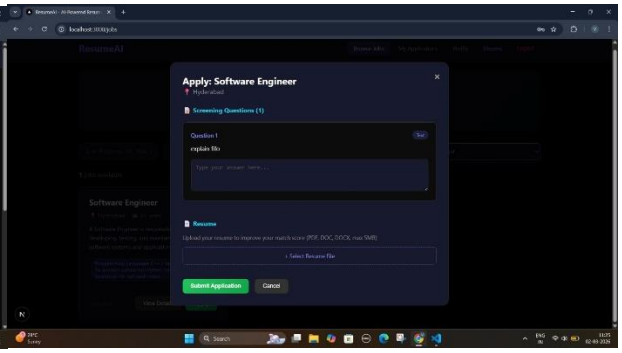


Figure 7: Job applying by Jobseeker

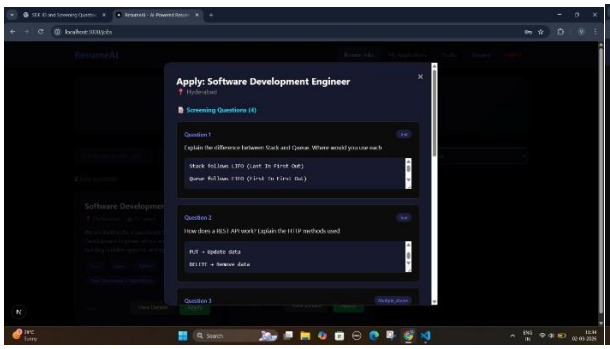


Figure 8: Screening test

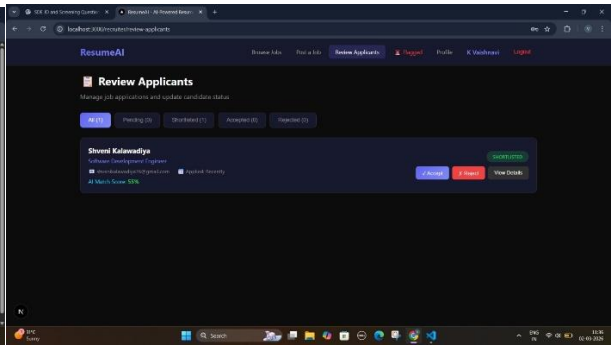
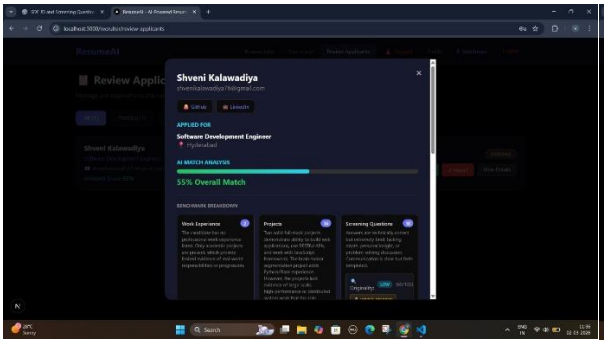


Figure 9: Reviewing application



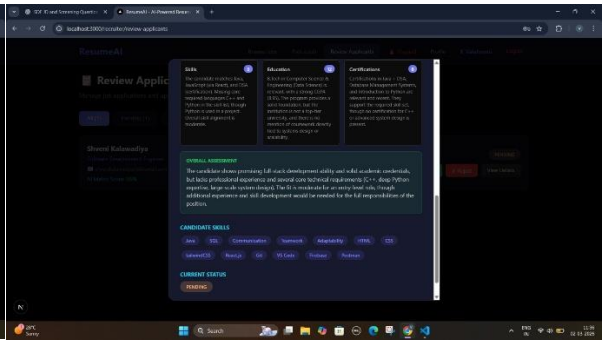


Figure 10,11: LLM parsed resume

VIII. CONCLUSION:

This paper presents an AI-powered semantic resume screening system designed to overcome the limitations of traditional recruitment methods. By leveraging language models and semantic matching, the system improves the accuracy and efficiency of candidate selection. It also incorporates features such as skill evaluation, authenticity verification, and anonymization to ensure fair and unbiased hiring decisions. The proposed system reduces manual effort while enhancing transparency and reliability in the recruitment process. Overall, it provides a scalable and effective solution for modern hiring needs.

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