Talent Lens – AI-Based Resume and Job Description Matching System for HR Automation

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Abstract - *Recruitment is a complex and time-consuming process due to its high application count, unstructured resume format, and imprecise assessment methods [1],[18]. The traditional approach toward resume screening may result in inept candidate evaluation and undervalued talent discovery [5],[14]. Talent Lens is an AI-driven resume and job description matching tool designed to fully automate and optimize the recruitment process [3],[6]. This tool uses Natural Language Processing and machine learning to extract important information such as skills, education, work experience, and certifications from resumes and job descriptions [4],[15]. This tool calculates semantic similarities for objective ranking and matching of apt talent for respective job roles [1], [9], [20]. Talent Lens will act like an intelligent decision aid for HR analysts by allowing ranked candidate listing, skill gap analysis, and data visualization that may assist in informed recruitment decisions. This automated resume analysis and candidate ranking tool reduces manual processing efforts and promotes bias-free and efficient recruitment [14], [21]. The proposed model drastically accelerates and aims to achieve better accuracy of hiring speed and results in discovering apt talent in short time spans.*

1. INTRODUCTION

Contemporary recruitment practices entail the submission of many resumes in response to each job advertisement. Such manual evaluation takes time. Un-structurally arranged resumes, unstructured content, and subjective resume evaluation contribute to the ineffectiveness of resume screening [18].

In order to solve the above-mentioned challenges, the "Talen t Lens – AI Based Resume & Job Description Matching System for HR Automation" is proposed. Talent Lens is an AI-based system that uses Natural Language Processing techniques to analyze the resume and job description [3]. This system is capable of extracting data such as skills, education, and work experience from the resume and job description [4]. Based on this data, similarity metrics are calculated to rank the candidate as per the similarity to the job requirement [1]. Instead of replacing the recruiter, the Talent Lens system is used as an assistant tool that can enhance the accuracy of this process and speed it up [19].

1.1 RESUME EVALUATION AND JOB DESCRIPTION MATCHING

The received resumes are automatically processed for extracting key features such as skills, education, and experience using NLP techniques. Each received resume is then matched with the job description and, if available, the model CV, which is an ideal representation of the candidate profile [5]. Semantic similarity measurements are calculated, and a ranked list of candidates is obtained based on which the recruiter can easily shortlist candidates and view the gaps in skills, thus shortlisting candidates quickly and accurately [13].

1.2 RESUME PROCESSING AND BUILDER MODULE

This module enables the uploading of the resume in any form or the use of pre-set templates. All the necessary details such as personal details, educational background, skills, projects, certifications, and work experience are extracted and formatted in a standardized manner [15]. Hence, the data is formatted in a manner that enables the accurate matching process by AI algorithms and also helps in reporting in the later stage in the TalentLens System [17].

1.3 OBJECTIVES

- In order to automatically screen and shortlist resumes for recruiters
- To convert the unstructured format of resumes into a structured one to extract
- For comparing candidate profiles and job descriptions based on AI analysis
- To rank candidates on the basis of their semantic similarity and skills relevance [20]
- To offer analysis and recommendations on improvement in the skill gap [13]
- For facilitating team collaboration through shared shortlists [24]
- To minimize the routine screening process as well as the chances of judgment bias in the
  For facilitating an AI-driven recruitment assistant service [14], [12]

1.4 LITERATURE SURVEY

The transformation of recruitment technology has evolved from basic keyword matching to context-aware AI systems [18]. Early models utilized elementary machine learning to measure suitability between resumes and job descriptions [1]. Existing platforms such as LinkedIn Recruiter, Naukri RMS, and basic Applicant Tracking Systems (ATS) have traditionally relied on manual keyword searches and rudimentary filtering [24]. As application volumes scaled, the industry transitioned to Natural Language Processing (NLP) to automate the parsing of unstructured data [25]. Recent breakthroughs have introduced semantic similarity measurements and high-dimensional vector embeddings, enabling a conceptual understanding of candidate experience beyond exact word matches [20].

Research indicates that Large Language Models (LLMs), particularly Gemini-based architectures, excel in zero-shot data extraction for complex fields like education and experience [10]. Transitioning from the keyword-centric searches used in traditional portals to AI-driven semantic analysis can reduce manual screening effort by approximately 75% to 85%. Modern architectures now favor modular, service-oriented approaches to handle massive datasets while ensuring real-time processing and decision-making [17].

Challenges in traditional recruitment:

- **Laborious Manual Screening**: Recruiters spend excessive time manually scanning resumes for high-volume roles, leading to fatigue and slow hiring cycles.
- **Keyword Rigidity**: Traditional systems often reject qualified candidates who lack specific "buzzwords," despite possessing the relevant expertise.
- **Subjectivity and Bias**: Manual evaluation frequently results in inconsistent shortlisting based on subjective human judgment [14].
- **Lack of Actionable Insights**: Legacy tools typically fail to provide skill-gap analysis, leaving managers without a clear understanding of candidate rankings [13].
- **Unstructured Data Handling**: Existing systems struggle to parse diverse formats effectively, such as multi-column PDFs or image-based resumes

1.5 PROPOSED SYSTEM

Talent Lens is an automated system for resume processing and candidate-job matching that replaces manual effort with AI-driven precision [3]. The platform utilizes a web interface developed in React.js for recruiters to upload resumes and job descriptions. The backend is supported by an NLP server built with Fast API, leveraging Gemini 2.5 Flash for high-accuracy extraction and analysis. The AI matching engine assesses the similarity between profiles and requirements through semantic embedding's, enabling context-aware ranking.

Recruiters interact with the system via a modern three-page layout: candidate lists (left), an AI-assisted chatbot for natural language commands like "show top 3 candidates" (middle), and candidate profiles (right). This consolidated approach offers significant advantages over traditional systems:

- **Increased Efficiency**: Automated resume parsing reduces initial screening time by approximately **85%**.
- **Enhanced Accuracy**: Semantic matching ensures more precise candidate identification than basic keyword filtering..
- **Interactive Guidance**: The integrated AI assistant provides real-time search refinement and ranking justifications [12] .
- **Visual Insights**: Tools like skill-gap maps and heatmaps help identify training needs and candidate deficiencies [13].
- **Format Versatility**: The system seamlessly handles multiple formats, including PDF, DOCX, and images.
- **Objective Ranking**: Automated scoring eliminates subjective human bias, supported by a scalable architecture [14] for large recruitment volumes.

2. SYSTEM ARCHITECTURE

The Talent Lens architecture follows a Modular Dual-Backend design, separating standard business logic from intensive artificial intelligence processing [17]. This "blueprint" ensures that heavy Large Language Model (LLM) operations, such as resume parsing and semantic scoring, do not interfere with core user functions like authentication or job management [7], [17].

The architecture is built on a Sync Bridge strategy that connects three primary layers:

- **Frontend Layer (React.js)**: A single-page application (SPA) that manages the user experience, role-based navigation, and real-time UI state through a custom CSS variable system [25].
- **Business Backend (Node.js & Express)**: Operates on Port 5000 and handles **MongoDB** operations for user authentication (JWT), job postings, and application records [16], [22].
- **Intelligence Backend (Python & FastAPI)**: Operates on Port 8000 and interfaces with Google Gemini 2.5 Flash for resume parsing and semantic scoring [10], [16].
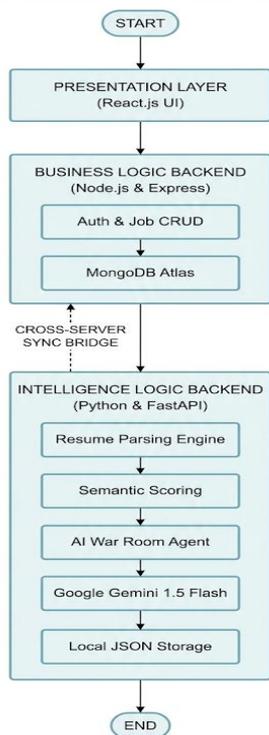
Fig - 1: Talent Lens System Architecture

2.1 System Theory and Logic

The system's operational efficiency is driven by a specialized data synchronization strategy [11]. To prevent data siloing, a Cross-Server Sync Bridge replicates application records from the Node.js server to the Python server immediately upon creation [17].

The intelligence hub of the system, known as the "War Room," performs a triple-join operation by integrating job descriptions, applicant lists, and raw resume text into a single ranked output [19]. This logic allows for Semantic Match Scores to be generated in real-time, enabling context-aware ranking that identifies the most qualified candidates beyond simple keyword relevance [8], [21]. Access to these features is governed by a Role-Based Access Control (RBAC) model, ensuring that sensitive data and AI analysis tools are only available to authorized recruiters [14].

3. PROPOSED SYSTEM IMPLEMENTATION

The implementation of **Talent Lens** follows a modular, service-oriented architecture designed to automate the end-to-end recruitment workflow [3, 11]. By separating business logic from AI intelligence, the system ensures high-performance processing of large-scale datasets while maintaining a responsive user experience [17].

Table -1: System Components Description

Module	Description
User Management & Security	Handles secure login, roles (HR, manager, admin), and protected access to candidate data
Resume/JD/Model CV Processing	Parses and structures resume, job descriptions, and model CVs using NLP
AI-Based Matching & Ranking Engine	Computes semantic similarity and ranks candidates based on relevance
Recruiter Collaboration Hub	Enables sharing of shortlists, comments, and candidate comparisons among HR teams
AI Recruitment Assistant	Provides query‑based search help, suggestions, and explanations of ranking results
Candidate Dashboard & Visualization	Displays match scores, skill gaps, and visual analytics of candidate profiles
Web UI & REST API Backend	React/FastAPI layer for interaction, data access, and integration with external systems

3.1 User Interface

The web-based user interface allows recruiters and hiring managers to log in securely, upload resumes and model CVs, enter job descriptions or search queries, and view ranked candidate lists [18]. It provides forms and dashboards to manage job postings, search filters, and shortlists. The interface ensures smooth interaction with the Talent Lens backend through REST APIs and presents all AI results in a clear and interactive way [12].

3.2 Resume, Job Description, and Model CV Processing Module

This module processes all uploaded resumes, job descriptions, and model CVs. Using NLP techniques, it extracts key information such as skills, education, certifications, work history [4, 15], and achievements. The extracted text is cleaned, normalized, and stored in a structured format suitable for downstream AI models. When a model CV is uploaded, this module converts it into a benchmark profile against which all candidates are compared, ensuring consistent and standardized evaluation [5].
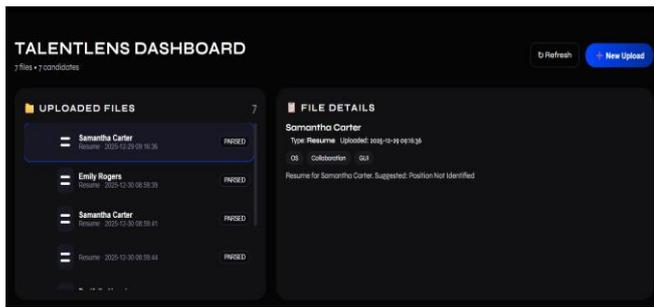
Fig -2: TalentLens dashboard

3.3 AI-Based Matching and Ranking Engine

The AI-based matching and ranking engine performs semantic similarity analysis between candidate resumes, job descriptions, and model CVs, and recruiter queries. It uses machine learning models and vector embeddings to represent profiles in a high-dimensional feature space [9, 20]. For each candidate, the engine computes a match score, highlights overlapping and missing skills, and generates an ordered shortlist. This module is central to Talent Lens, enabling accurate and context-aware candidate ranking rather than basic keyword matching [1, 5].
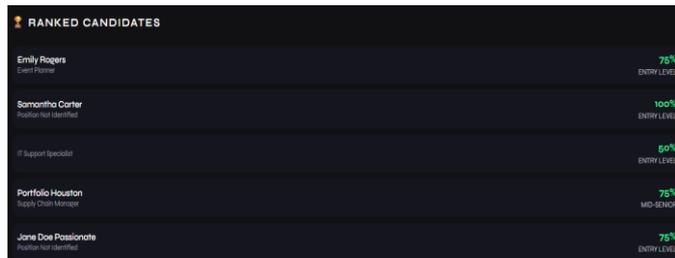

Fig -3: Ranked Candidates

3.4 Recruiter Collaboration Hub

The recruiter collaboration hub supports team-based hiring workflows. HR professionals can share search queries, shortlists, and AI match reports with colleagues [24]. Recruiters can add comments, tag candidates for follow-up, and compare multiple profiles side-by-side. Role-based permissions ensure that only authorized users can view or modify sensitive candidate data [14]. This module combines AI recommendations with human judgment to improve the quality of hiring decisions.

3.5 AI Recruitment Assistant

The AI recruitment assistant interacts with recruiters through a chat-style interface. It can refine search queries, suggest additional skills or filters, and explain why certain candidates are ranked higher. The assistant responds to prompts such as "show candidates similar to this model CV with cloud experience" or "list top profiles for this job description." By guiding recruiters and providing

justifications for AI decisions, this module increases usability and trust in the system.
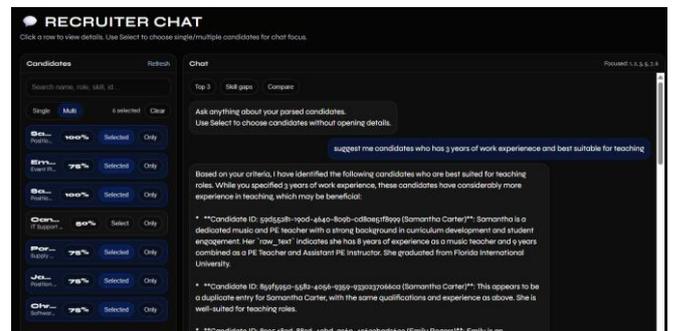

Fig -4: Recruiter Chat

3.6 Candidate Dashboard and Visualization Module

This module provides visual analytics for candidate evaluation. It displays match scores, skill maps, and experience summaries for individual candidates and entire shortlists. Recruiters can view skill-gap highlights, candidate-job fit graphs, and comparison charts between multiple profiles. Interactive filters allow HR teams to refine shortlists by experience level, skill sets, or match thresholds. These visualizations help recruiters quickly understand strengths and weaknesses and support data-driven hiring decisions.
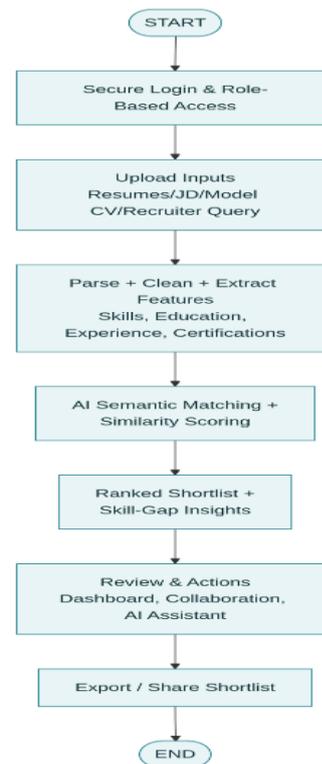

Fig -5: System Workflow Diagram

3.7 Job Description Matching Module

This module processes uploaded job descriptions (JDs) alongside resumes and model CVs, extracting key requirements such as required skills, experience levels, qualifications, and responsibilities using NLP techniques powered by Gemini 2.5 Flash. It generates vector embeddings for JDs [10, 23] and computes cosine similarity scores against candidate profiles, producing detailed match percentages and highlighting alignments or mismatches in real-time [8, 20]. Recruiters benefit from side-by-side JD-candidate comparisons, enabling precise shortlisting without manual keyword searches.
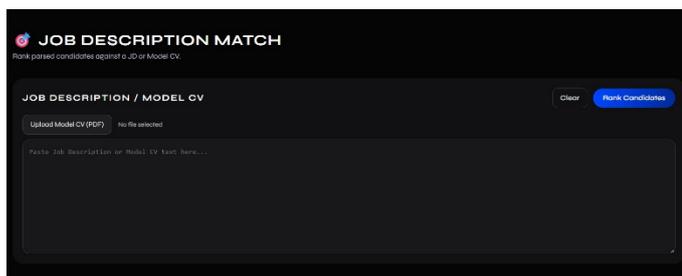

Fig -6: Job Description Matching Interface

3.8 Skill Search and Filtering Module

The skill search module enables recruiters to query specific skills (e.g., "React.js + AWS") across all processed resumes, leveraging semantic search on extracted skill embeddings for fuzzy matching beyond exact keywords [8]. It returns filtered candidate lists ranked by relevance, with visual skill clouds or heatmaps showing prevalence and gaps relative to the JD [13]. Integrated with the three-panel UI, this supports dynamic refinement, such as boosting scores for certified skills or recent experience.
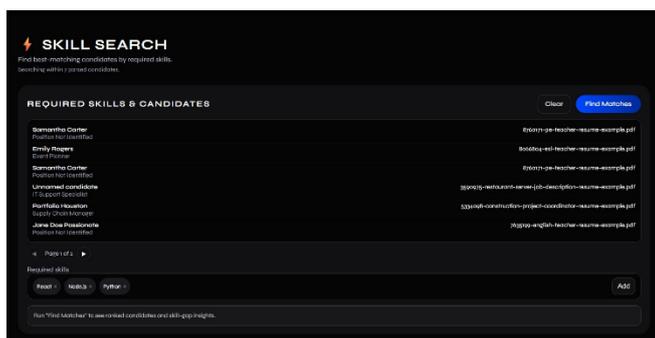

Fig -7: Skill Search Results

4. RESULT ANALYSIS

The performance of TalentLens was evaluated by measuring its efficiency in data extraction, semantic accuracy, and processing speed compared to traditional platforms like LinkedIn Recruiter or standard Applicant Tracking Systems (ATS) [1, 18]. Unlike legacy systems that rely on exact word

matches, the proposed architecture utilizes Gemini 1.5 Flash to perform context-aware analysis, ensuring that qualified candidates are not overlooked due to variations in terminology [10, 21].

4.1 Comparative Analysis

The following table summarizes the functional differences between existing recruitment tools and the Talent Lens platform [3, 5, 25].

Table - 2: Comparison of Existing and Proposed Systems

Feature	Existing Systems (Manual/ATS)	TalentLens (Proposed)
Search Logic	Rigid Keyword Matching	AI-Driven Semantic Embeddings
Screening Effort	High Manual Scanning Required	Automated Parsing and Ranking
Data Extraction	Basic Unstructured Parsing	Zero-Shot Multi-Format Extraction
Decision Support	Static List View	Interactive AI "War Room" Assistant
Accuracy	High False Rejections	High Contextual Precision

4.2 Time Efficiency and Speed

The primary advantage of Talent Lens is the significant reduction in manual screening time. Traditional screening processes typically take several minutes per resume to manually verify skills and experience. In contrast, the Talent Lens **Intelligence Logic Backend** processes and ranks an entire applicant pool in seconds.
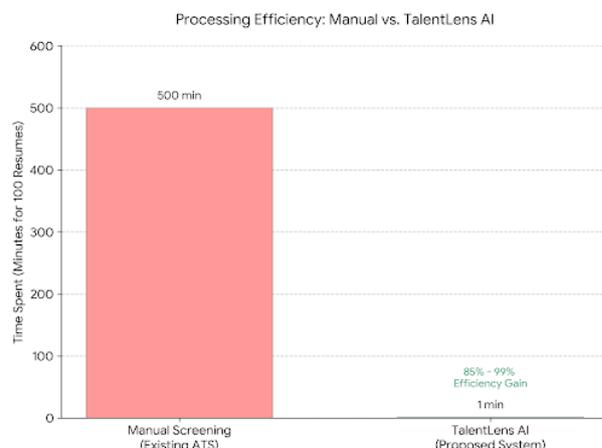

Fig -8: Processing Efficiency Comparison

As shown in Fig - 8, Talent Lens utilizes Gemini 1.5 Flash to analyze and rank the same pool of 100 candidates in approximately 60 seconds, representing an efficiency gain of approximately 85% to 99%. This enables HR professionals to bypass the repetitive "initial filter" phase and move directly into high-value tasks like candidate engagement and interview coordination.

5. CONCLUSIONS

The Talent Lens AI-Based Resume and Job Description Matching System provides a transformative solution for modern recruitment by automating the labor-intensive stages of resume parsing and candidate alignment. By utilizing a Modular Dual-Backend architecture and Gemini 1.5 Flash, the platform successfully transitions from rigid keyword matching to context-aware semantic analysis, effectively reducing manual screening effort by approximately 85% [17, 21]. This approach not only identifies candidate strengths and visualizes skill gaps with high precision but also ensures a consistent, objective evaluation process that significantly accelerates hiring cycles. As the system matures, future developments will prioritize the integration of larger, domain-specific datasets and external Applicant Tracking Systems (ATS) to further enhance scalability and accuracy in real-world HR environments [11, 25].

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