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Talentscan AI: Design and Implementation of an AI-Powered Resume Screening and Career Evolution Intelligence System

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Abstract

Online recruitment now produces resume volumes that surpass reliable manual review, leading to delayed screening, inconsistent judgments, and higher bias risk. This paper presents TalentScan AI, an AI-powered resume screening and career evolution intelligence system that converts resumes into structured indicators and generates interpretable rankings. The platform integrates resume parsing, Resume Evolution Score (RES), Role Adaptability Index (RAI), fatigue detection, plagiarism detection, Explainable AI decision graphs, and Ethical Risk Score (ERS). Prototype testing showed stable processing, efficient screening, and better decision transparency.

Keywords: resume screening, explainable AI, natural language processing, ethical AI, career analytics

1. Introduction

Online job portals have expanded access to employment opportunities and widened the reach of recruitment processes. At the same time, they have created a screening burden because a single vacancy may attract a very large number of applications. Manual review under such conditions often becomes slow and difficult to standardize. In practice, recruiters are frequently required to shortlist candidates quickly, which can increase oversight and reduce consistency. Bias risk also rises when the screening process depends heavily on subjective judgment or limited contextual information.

Most automated resume screening systems focus on keyword overlap and direct skill matching. These methods can accelerate early filtering, yet they often fail to capture career progression, continuous learning, and transferable skills. In addition, many systems remain opaque, which weakens trust among recruiters and applicants. High-volume recruitment also introduces quality concerns, including generic submissions, repetitive phrasing, and template-based resumes.

To address these limitations, TalentScan AI was developed as a decision-support platform for resume screening and career evolution analysis. The system is designed to quantify career growth over time, identify role-adjacent potential, detect low-effort or duplicated submissions, and generate interpretable ranking rationales. The ethical risk signal is used only for audit support and awareness, not for automatic rejection. A secure web application was implemented to assist recruiters through structured analytics and transparent outputs.

2. Literature Review

Recent advances in natural language processing (NLP) have improved semantic matching in text-intensive decision systems. Transformer-based models such as BERT [1], Sentence-BERT [2], and the HuggingFace ecosystem [3] have provided richer language representations than exact keyword matching. In recruitment, AI-based parsing and matching systems [4] have reduced the effort required to extract skills and experience from resumes. Prior studies on traditional recruitment have also shown that automation can reduce manual workload while introducing stronger requirements for transparency and consistency [5].

Despite these improvements, several gaps remain. Many screening models still depend on surface similarity and do not account for career momentum, transferable capabilities, or submission quality. Explainable AI methods have been proposed to improve trust in resume ranking [6], but they are often not integrated with ethical risk auditing. TalentScan AI addresses these limitations by combining growth-oriented scoring, authenticity checks, and explainable ranking within a modular framework.

S.No.	Author & Year	Technique Used	Key Contribution	Limitation / Research Gap
1	Devlin et al. (2019)	BERT contextual embeddings	Improved semantic representation for text matching	Requires domain adaptation for recruitment tasks
2	Reimers and Gurevych (2019)	Sentence-BERT similarity modeling	Efficient sentence-level matching	Limited task-specific career signals
3	Alsharef et al. (2020)	AI-based resume parsing and job matching	Automated extraction and matching of resume content	Limited transparency and bias control
4	Harsha et al. (2022)	Explainable AI for resume screening	Improved trust through interpretable ranking	Does not fully address career growth and authenticity

Table 1: Literature Comparison

3. Methodology

TalentScan AI was implemented as a modular web-based decision-support system that transforms unstructured resumes into structured candidate indicators. The input layer accepts PDF and DOCX documents. Text is then extracted, normalized, and segmented through NLP pipelines. Flask is used to expose RESTful endpoints, while spaCy supports tokenization, section detection, and entity extraction. Numerical processing and similarity computation are handled with scikit-learn, NumPy, and Pandas. Structured analytics and metadata are stored in PostgreSQL, and uploaded files are retained in object storage for traceability.

The analytical engine contains five core modules. Resume Evolution Score (RES) estimates career momentum by arranging experience, education, projects, and certifications in chronological order and

applying weighted scoring to growth indicators such as learning cadence, skill accumulation, and increased responsibility. Role Adaptability Index (RAI) measures suitability for adjacent roles by comparing extracted skills with role-specific skill clusters through semantic similarity. This allows candidates with different titles but strong transferable capabilities to be identified during ranking.

Two integrity-focused modules are used to assess submission quality. Resume Fatigue Detection estimates repetitive or minimally tailored submissions by comparing structure and phrasing across a candidate's uploads. Resume Plagiarism Detection performs database-wide similarity checks to identify duplicated or template-derived content. An Ethical Risk Score (ERS) is generated as an audit signal to flag fairness-related concerns. It is not used to penalize candidates automatically; instead, it supports human review and governance.

For transparency, an Explainable AI Career Decision Graph is rendered with D3.js to summarize how RES, RAI, fatigue, plagiarism, and ERS influence the final output. Security controls include role-based authentication, salted password hashing, and encryption in transit and at rest. The recruiter dashboard presents screening results in interpretable form and supports review before any decision is finalized.

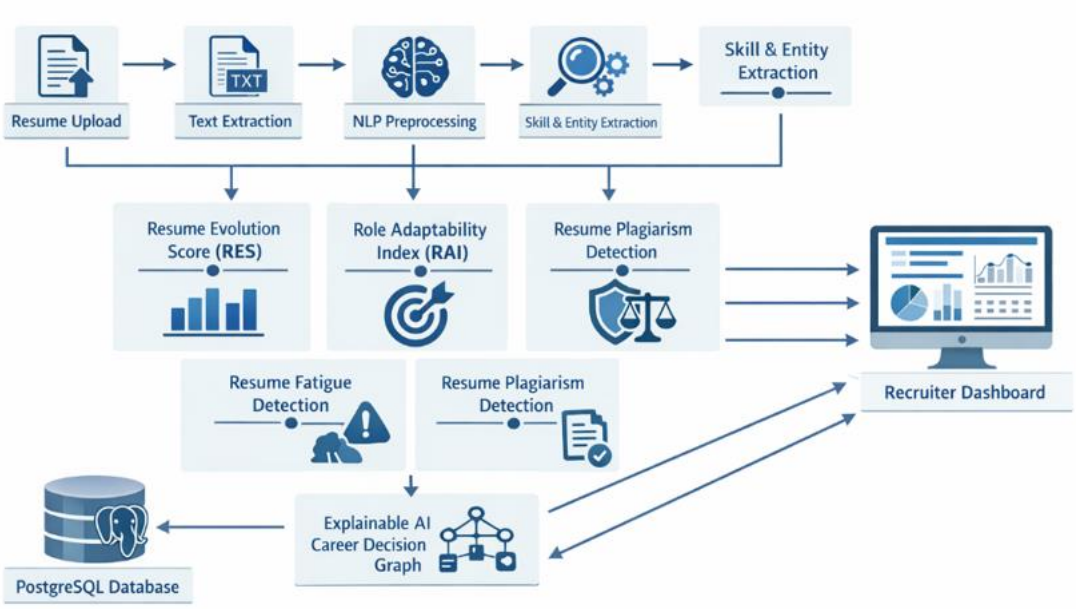

Fig 1: System Architecture Diagram

4. Results and Discussion

The prototype was evaluated through functional testing, integration testing, performance testing, and user-oriented testing. Unit tests were conducted for resume parsing, RES and RAI computation, fatigue detection, plagiarism detection, ERS generation, and explainability output generation. Integration tests verified the end-to-end flow from resume upload to storage and dashboard rendering. User-based evaluation was carried out with a small group of students and placement coordinators to assess clarity, trust, and usability.

The prototype showed stable and consistent behavior across repeated runs. Screening agreement with manual review was strong, and the system reduced reviewer workload by presenting ranked candidates

with explicit feature-based explanations. RES was useful for identifying non-linear career progressions, while RAI helped reveal candidates with strong transferable skills. The fatigue and plagiarism modules improved submission integrity by highlighting repetitive or duplicated resumes. The explainability graph increased confidence because ranking factors were presented in a human-readable form.

Metric	Observed Value	Notes
Screening agreement with manual review	0.86	Measured against panel-based manual screening on a pilot set
Average processing time per resume	1.8 s	End-to-end from upload to dashboard score availability
Batch throughput (50 resumes)	92 s	Asynchronous backend execution with queued processing
Plagiarism detection accuracy	0.91	Verified using injected duplicated/template samples
Fatigue detection precision	0.88	Validated on repeated and minimally modified submissions

Table 2: System Performance

The findings indicate that a multi-module screening pipeline can provide deeper decision support than keyword-only matching. ERS functioned effectively as an audit signal and supported fairness awareness without altering candidate ranking. User feedback suggested that career-growth and adaptability signals were helpful for shortlisting, and that configurable weights would be useful for adapting the system to different job families.

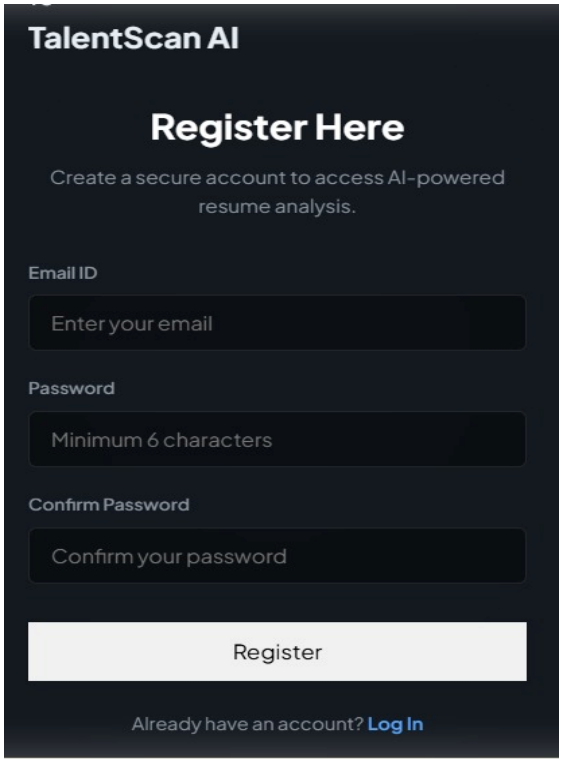

Fig 2: Application Screenshot – Home Page

Fig3: Application Screenshot – Results Page

5. Conclusion

TalentScan AI was presented as an AI-powered resume screening and career evolution intelligence system that extends conventional recruitment automation through career-growth scoring, transferable-skill analysis, fatigue detection, plagiarism detection, explainable ranking, and ethical risk auditing. The prototype demonstrated efficient processing, stable operation, and better interpretability than opaque keyword-based tools. The design supports recruiter decision-making while preserving human oversight. Future work will expand longitudinal modeling, improve semantic embeddings, and validate the system on larger and more diverse hiring datasets.

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References

1. J. Devlin, M.-W. Chang, K. Lee, and K. Toutanova, “BERT: Pre-training of Deep Bidirectional Transformers for Language Understanding,” in Proc. NAACL-HLT, 2019.
2. N. Reimers and I. Gurevych, “Sentence-BERT: Sentence Embeddings Using Siamese BERT-Networks,” in Proc. EMNLP, 2019.
3. F. Wolf et al., “Transformers: State-of-the-Art Natural Language Processing,” in Proc. EMNLP, 2020.

4. S. Alsharef, R. F. Smith, and A. P. Johnson, “AI-Based Resume Parsing and Job Matching Systems,” IEEE Access, vol. 8, pp. 123456–123467, 2020.
5. T. Sudha and R. Gunaseelan, “Challenges in Traditional Recruitment and Resume Screening Automation,” Int. J. Comput. Appl., vol. 180, no. 25, pp. 34–42, 2021.
6. T. M. Harsha, S. Tayal, and R. Oman, “Explainable AI for Resume Screening and Ranking,” Int. J. AI Res., vol. 15, no. 3, pp. 112–124, 2022.