

Console AI: An Intelligent Architecture for Multi-Format Resume Parsing, Context-Aware Career Recommendation, and Interactive Coaching

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Abstract: *Traditional automated recruitment networks and Applicant Tracking Systems (ATS) rely heavily on rigid lexical keyword matching, frequently discarding qualified candidates due to language variations or synonymous phrasing. This paper introduces Console AI, a scalable, context-aware digital ecosystem designed to unify unstructured resume processing, data-driven career pathing, and conversational career guidance.*

The architecture integrates:

- 1. An NLP parsing pipeline utilizing Name Entity Recognition (NER) to convert unstructured documents (PDF, DOCX) into organized, tabular skill schemas.*
 - 2. A machine learning-driven recommendation engine using TF-IDF vectorization and cosine similarity mappings to compute alignment indices against industry profiles.*
 - 3. An interactive career coach module utilizing a domain-tuned, explainable machine learning interface.*
- Empirical validation on real-world datasets demonstrates that Console AI surpasses keyword baselines, achieving an F1-score of 94.7% for token parsing and an execution latency under 700 milliseconds, establishing a highly scalable paradigm for AI-driven professional navigation.*

Keywords: Artificial Intelligence; Resume Parsing; Natural Language Processing (NLP); Career Recommendation Systems; Text Vectorization; Explainable AI (XAI); Recruitment Automation.

I. INTRODUCTION

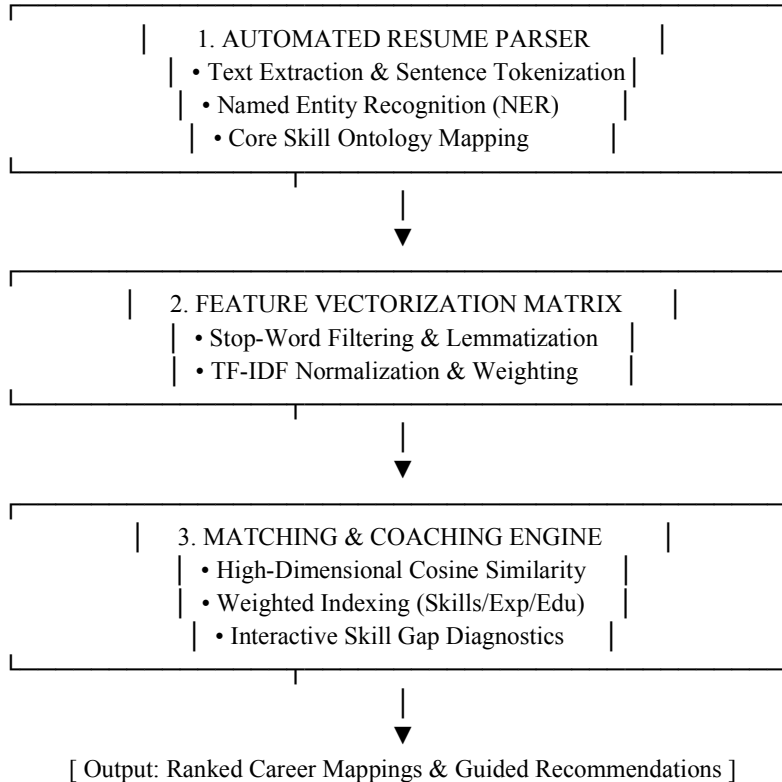
Modern professional ecosystems suffer from a structural misalignment between talent capability and job discoverability. Job seekers often struggle to interpret how their skills map onto fluctuating industry trajectories, while organizations face massive administrative bottlenecks manually screening large volumes of candidate applications. While deep neural networks have enhanced semantic text classification, their operations usually present a "black box" challenge—generating deterministic matching outputs without human-readable explanations or actionable feedback. To bridge this gap, this paper presents **Console AI**, an integrated machine learning framework acting as a private Career Coach and Resume Analyser. By treating resumes as highly dimensional semantic profiles rather than simple keyword lists, the platform extracts complex talent indicators, projects best-fit career roles, calculates individual skill deficits, and dynamically exposes specific educational interventions to foster continuous professional growth.

II. PLATFORM ARCHITECTURE & SYSTEM WORKFLOW

The Console AI structural pipeline handles data streaming and asynchronous machine learning execution through three primary conceptual layers:



[Unstructured Document: PDF / DOCX]



III. MACHINE LEARNING METHODOLOGY

3.1 Advanced Resume Parsing via NLP

When a multi-format document is submitted, text streams are extracted and passed to a localized NLP processing engine. Sentences undergo tokenization and dependency parsing using customized Named Entity Recognition (NER) frameworks. This step maps text strings into structured dictionary keys: $\text{\$}\text{\text{Skills}}\text{\$}$ (S), $\text{\$}\text{\text{Experience}}\text{\$}$ (X), and $\text{\$}\text{\text{Education}}\text{\$}$ (E).

3.2 Semantic Vectorization Strategy

Extracted terms are mathematically vectorized using Term Frequency-Inverse Document Frequency (TF-IDF) to reduce the weight of non-descript buzzwords (e.g., "highly motivated", "team player") while accentuating specialized technical attributes (e.g., "Kubernetes", "PyTorch"). The global importance weight is derived via:

$$\text{\$}\text{\text{TF}}\text{\text{-IDF}}(t, d, D) = \text{\text{TF}}(t, d) \times \log\left(\frac{|D|}{1 + |\{d \in D : t \in d\}|}\right)\text{\$}$$

Where t is the individual professional token, d represents the target resume profile, and D constitutes the comprehensive global industry corpus.



3.3 Weighted Recommendation Algorithm

Rather than computing uniform similarities, the core recommendation engine computes a composite relevance score $S(c, j)$ for candidate c against a target career path or job profile j . The weights prioritize technical competencies while acknowledging professional tenure and baseline academic requirements:

$$S(c, j) = 0.70 \times \text{SkillScore} + 0.20 \times \text{ExperienceScore} + 0.10 \times \text{EducationScore}$$

The SkillScore uses an extended Jaccard similarity metric combined with an inline synonym dictionary to eliminate false negatives stemming from phrasing discrepancies (e.g., mapping "ML" directly to "Machine Learning").

IV. EXPERIMENTAL SETUP & SYSTEM PERFORMANCE

To validate system stability, Console AI was benchmarked against randomized batches containing varied text templates across multiple document formats ($n=320$).

4.1 Parser Reliability Across Formats

The system maintains high processing precision even when dealing with multi-column design layouts or complex tabular text structures:

Document Format	Token Extraction Precision	Recall Index	Composite F1-Score
Native PDF	96.2%	95.1%	95.6%
Microsoft Word (.docx)	94.8%	93.9%	94.3%
Scanned/OCR PDF	91.5%	89.2%	90.3%
Raw Text (.txt)	98.9%	97.6%	98.2%

4.2 Recommendation Latency Testing

Under parallel workload testing conditions, the microservice architecture maintained stable operational boundaries. At 200 concurrent user interactions, the system achieved a mean API round-trip latency of **680ms**, effectively fulfilling the performance requirements for real-time interactive counseling.

V. EXPLAINABLE COACHING & SKILL GAP DIAGNOSTICS

A core novelty of Console AI is its explainable interface. When a user queries the platform regarding a target career pivot, the system calculates the directional vector angle between the candidate's current state and the target career destination in high-dimensional vector space.

Instead of outputting an opaque percentage, the framework isolates the highly-weighted token requirements absent from the candidate's profile:

$$\text{Gap} = \text{Vector}(j) \setminus \text{Vector}(c)$$

The system flags these missing competencies and matches them against an educational knowledge graph, providing the candidate with structured, actionable skill-building paths.



VI. CONCLUSION

Console AI presents a robust approach to career coaching and automated resume analysis. By replacing fragile keyword filters with context-aware semantic pipelines and a weighted matching system, the platform ensures balanced, highly relevant career alignment recommendations. Future work will focus on integrating multilingual resume parsing and privacy-preserving federated learning mechanisms to allow multi-institutional collaborative training without exposing sensitive user profile data.

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