

AI Protocols for Job Readiness Assessment: Design and Implementation of DIJOB in Côte d'Ivoire

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Abstract- In modern days, getting his first job is a very hard process for newly graduated students. Several factors contribute to this issue: no experience, poor resume qualities, few knowledge of job market and required skills for a given job title, no real exposure to job interview (phone, virtual, physical). In the past 30 to 50 years, structured human resources agencies played great role helping young graduates to be well prepared for job readiness. Techniques as how to write a good resume, determining job title and job profile in a particular domain, how to handle a phone, virtual and physical interview were taught to a candidate. Traditional advisory systems are often insufficient in addressing these structural issues at scale. This paper presents an AI-powered web-based career development platform designed to enhance employability among students and job seekers in Côte d'Ivoire. The built application is called DIJOB (Digitalized Job), DIJOB integrates Groq's LLaMA 3.3-70B large language model to provide four core services: intelligent job search with AI-based CV matching, automated résumé quality assessment, skill compatibility scoring against job descriptions, and a personalized eleven-module career coaching system. The coaching module includes salary estimation in FCFA, LinkedIn profile optimization, and interview preparation guidance. The system is implemented using Jakarta EE 10, GlassFish 7, MySQL 8, and a responsive XHTML frontend, following a three-tier architecture with a RESTful API layer. Results indicate that the platform provides real-time, actionable career insights, including résumé scoring, skill gap analysis, and personalized career recommendations. DIJOB shows strong potential in improving alignment between job seekers and employer expectations, thereby contributing to reduced skills mismatch and improved employability outcomes.

Keywords- Résumé, Job Readiness, Career Advisory, Recommendation System, Ivorian, Côte d'Ivoire, LLaMA 3.3, Groq API, Jakarta EE, Artificial intelligence, career development, job platform, employability, resume analysis, skill matching.

I. INTRODUCTION

The global labor market is undergoing a profound transformation driven by rapid technological advancement, digitalization, and the growing integration of Artificial Intelligence (AI) into recruitment and talent management processes. In this evolving environment, one of the most persistent challenges faced by job seekers, particularly students and recent graduates, is the ability to effectively present their qualifications and competencies in a manner that aligns with both recruiter expectations and automated recruitment systems. The résumé remains the primary gateway to employment opportunities; however, many applications are rejected not because candidates lack relevant skills, but because their résumés are poorly structured, insufficiently optimized, or inadequately aligned with job requirements.

In Sub-Saharan Africa, these challenges are amplified by broader socio-economic constraints. Youth unemployment remains a major concern despite increasing access to higher education. In Côte d'Ivoire, many graduates encounter prolonged job search periods due to limited professional guidance, insufficient exposure to labor market expectations, and a growing mismatch between academic training and employer needs. This skills mismatch contributes significantly to the youth underemployment and reduces the effectiveness of traditional employment support mechanisms. Existing career services provided by universities, informal mentoring networks, and private consulting agencies often lack scalability and are unable to provide personalized guidance to the increasing number of job seekers entering the labor market each year.

Recent advances in Artificial Intelligence and Large Language Models (LLMs) have opened new opportunities for addressing these challenges. Modern AI systems are capable of extracting information from résumés, identifying technical and professional competencies, comparing candidate profiles against job descriptions, detecting skill gaps, and generating personalized recommendations. Commercial platforms such as LinkedIn, Indeed, and Jobscan have introduced AI-based functionalities for résumé optimization and job matching. However, these solutions are primarily designed for developed labor markets, operate as proprietary systems, and often provide isolated functionalities rather than comprehensive employability support. Furthermore, they rarely address the specific employment realities, educational contexts, and career development needs of job seekers in Côte d'Ivoire and similar developing economies.

A significant gap therefore exists between existing recruitment technologies and the broader objective of job readiness assessment. Current systems largely focus on either résumé evaluation or job matching, while providing limited support for competency gap identification, personalized training recommendations, and long-term career development. Consequently, job seekers often receive fragmented feedback that does not adequately guide them toward improving their employability.

To address this gap, this paper proposes an Artificial Intelligence-based Job Readiness Framework built upon three complementary and interoperable protocols:

- The Skills Matching Protocol, which evaluates the alignment between candidate competencies and job requirements through automated skill extraction and compatibility analysis;
- The Resume Improvement Protocol, which assesses résumé quality and generates structured recommendations to enhance relevance, readability, and recruitment readiness;
- The Training Proposal Protocol, which identifies competency deficiencies and recommends personalized learning pathways to improve employability outcomes.

Building upon this framework, this paper presents DIJOB (Digitalized Job), an AI-powered web-based career development platform designed specifically for students, graduates, and young professionals in Côte d'Ivoire. DIJOB integrates intelligent job search, AI-assisted résumé assessment, competency matching, and personalized career

coaching into a unified ecosystem that supports users throughout their employment preparation journey.

The main contributions of this work are summarized as follows:

- A novel AI-driven Job Readiness Framework that combines résumé assessment, competency matching, and personalized career development within a single architecture.
- The design of three interoperable AI protocols Skills Matching, Resume Improvement, and Training Proposal that formalize the process of evaluating and improving candidate employability.
- The development and implementation of DIJOB, a web-based platform leveraging Large Language Models through Groq's LLaMA 3.3-70B to deliver real-time employability analysis and career recommendations.
- An AI-powered career coaching approach that extends beyond traditional job matching by providing individualized guidance, salary estimation, LinkedIn optimization, interview preparation, and professional development recommendations.
- A contextualized solution for the Ivorian labor market, addressing challenges related to skills mismatch, limited career guidance, and employment readiness among students and graduates.

The remainder of this paper is organized as follows. Section II presents the motivations underlying the study. Section III reviews existing literature and related work. Section IV discusses the problem statement and associated challenges. Section V introduces the proposed solution framework and AI protocols. Section VI describes the system architecture and implementation. Section VII presents experimental results and evaluations. Finally, Section VIII concludes the paper and outlines future research directions.

II. MOTIVATIONS

The primary motivation for this work originates from direct observation of the challenges faced by students and recent graduates in Côte d'Ivoire when transitioning from education to employment. Across multiple academic cohorts, a recurring pattern has been identified: many graduates enter the labor market without a clear career direction, a sufficient understanding of employer expectations, or adequate tools to present their competencies effectively.

A major difficulty lies in the limited awareness of labor market requirements. Many students are unsure about which certifications to pursue, which technical skills to develop, or how to align their academic background with targeted career paths. When job opportunities arise, they often struggle to evaluate the gap between their current skill set and job requirements, and they lack structured mechanisms to address these deficiencies. This situation leads to repeated application failures, increased frustration, and prolonged unemployment periods after graduation.

This challenge is not limited to job seekers. Recruiters also face significant inefficiencies due to the high volume of poorly structured, incomplete, or misaligned résumés submitted during recruitment campaigns. Since the résumé represents the primary point of contact between candidates and employers, its quality plays a decisive role in hiring outcomes. However, many graduates lack formal training in résumé writing, professional positioning, and career planning.

These observations, supported by a student survey conducted within the scope of this project, motivated the development of DIJOB, an Artificial Intelligence-powered platform designed to provide integrated career support, including résumé analysis, skill gap identification, career orientation, and personalized training recommendations within a unified system tailored to the Ivorian context.

Motivation from the Ivorian Labor Market Context

Côte d'Ivoire has experienced sustained economic growth over the past decade, with GDP growth rates consistently exceeding 7% (World Bank, 2023). Despite this strong macroeconomic performance, youth unemployment and underemployment remain significant structural challenges, particularly among university graduates (Institut National de la Statistique de Côte d'Ivoire, 2022).

This paradox highlights a critical issue: the unemployment challenge is not primarily driven by a lack of job opportunities, but rather by a persistent mismatch between the competencies of graduates and the requirements of employers. According to the International Labour Organization (ILO, 2023), this skills gap is reinforced by limited access to structured career guidance, insufficient exposure to labor market expectations, and inadequate tools for self-assessment and professional positioning.

DIJOB was developed in direct response to this structural mismatch. The platform integrates AI-driven résumé analysis, job matching, skill gap detection, and personalized career coaching, providing users with actionable insights to improve employability outcomes in the Ivorian labor market. In addition, the system incorporates context-aware features such as salary benchmarking in FCFA and career recommendations aligned with local industry realities.

Systemic Motivation and Employer Efficiency

Beyond the perspective of job seekers, the inefficiency of the recruitment process also affects employers and institutions. Large volumes of low-quality or poorly optimized résumés significantly increase the cost and complexity of candidate screening.

Automated Applicant Tracking Systems (ATS) often filter out a large proportion of applications before human review, frequently due to formatting issues, lack of keyword alignment, or poor structuring. As a result, a substantial number of potentially qualified candidates are excluded early in the recruitment process.

By improving résumé quality before application submission and aligning candidate profiles with job requirements, DIJOB contributes to improving the overall efficiency of the recruitment ecosystem. The system operates upstream of traditional hiring pipelines by preparing candidates before they apply, rather than evaluating them after submission.

III. REVIEW OF LITERATURE

Research on AI-driven recruitment systems and intelligent career development platforms spans several interconnected domains, including résumé parsing and information extraction, skills matching and job recommendation, résumé quality assessment, learning path recommendation, and digital employment systems in developing economies. This section synthesizes existing work and identifies the key limitations that motivate the proposed DIJOB framework.

Résumé Parsing and Information Extraction

Early résumé parsing systems were primarily based on rule-based and template-driven approaches designed to extract structured information from unstructured documents. While these methods were effective in controlled environments, they

lacked robustness when faced with heterogeneous résumé formats.

Recent advances in Natural Language Processing (NLP) have significantly improved information extraction performance. Transformer-based architectures, particularly BERT (Devlin et al., 2019), have become the standard for Named Entity Recognition (NER) tasks. These models enable the identification of key entities such as skills, education, work experience, and job titles with high accuracy.

Lim et al. (2021) demonstrated that a fine-tuned BERT model trained on a labeled résumé dataset can achieve over 90% F1-score in entity extraction tasks. Similarly, segmentation-based approaches such as those presented in Resume Information Extraction with a Novel Text Block Segmentation Algorithm (2024) improve performance by leveraging structural patterns within résumés.

Despite these advances, most existing methods focus primarily on extraction accuracy and do not provide higher-level reasoning such as skill interpretation, gap analysis, or career recommendations, which are essential for job readiness systems.

Skills Matching and Job Recommendation Systems

Skills matching between candidates and job descriptions has been extensively studied within recommender systems and information retrieval research. Early approaches relied on collaborative filtering techniques (Lops et al., 2011), which use historical user interaction data to generate recommendations. However, these methods suffer from cold-start limitations when user data is sparse or unavailable.

To overcome this limitation, semantic matching approaches have been introduced. Qin et al. (2018) proposed a neural embedding model that projects both résumés and job descriptions into a shared latent space, enabling similarity-based matching beyond keyword overlap.

Standardized ontologies such as ESCO (European Skills, Competences, Qualifications and Occupations) and O*NET provide structured representations of occupational skills and facilitate consistent mapping between job requirements and candidate profiles.

However, most existing systems focus exclusively on matching scores and lack interpretability. They rarely provide explicit

explanations of skill gaps or actionable feedback to users. The DIJOB Skills Matching Protocol addresses this limitation by introducing a transparent, step-by-step matching mechanism that identifies both aligned and missing competencies.

Résumé Quality Assessment

Beyond semantic matching, résumé quality assessment focuses on evaluating structural, linguistic, and formatting aspects of résumés. Luo et al. (2018) introduced ResumeNet, a neural network-based framework for automatic résumé quality assessment trained on approximately 10,000 résumés. Their work highlights the importance of structural consistency between résumé sections as a key indicator of quality.

Similarly, Maheshwari et al. (2020) developed machine learning models that predict résumé shortlisting probability based on features such as keyword density, action verb usage, and section completeness. Hassan et al. (2019) further incorporated readability metrics and Applicant Tracking System (ATS) simulations to evaluate résumé effectiveness.

Despite these contributions, most existing approaches treat résumé quality assessment as an isolated task, independent of job matching or skill development processes. This separation limits their applicability in holistic career development systems.

Learning Path and Training Recommendation Systems

Learning path recommendation is a well-established research area in educational data mining and adaptive learning systems. Drachsler et al. (2015) categorize recommendation techniques into content-based, collaborative, and knowledge-based approaches.

More recent studies, such as Deldjoo et al. (2021), propose graph-based and deep learning models that generate personalized learning sequences based on learner behavior and course metadata. These approaches enable adaptive recommendations that align with user performance and preferences.

In practice, platforms such as Coursera, edX, and LinkedIn Learning provide API-based access to course catalogs, allowing external systems to recommend training programs based on skill profiles. However, these systems are generally designed for global audiences and do not account for local labor

market constraints such as regional certification relevance, salary structures, or employment conditions.

Digital Employment Systems in Sub-Saharan Africa

Research on digital employment systems in Sub-Saharan Africa highlights both opportunities and structural limitations. Hjort and Poulsen (2019) demonstrate that increased internet access significantly improves employment outcomes by expanding access to job information and digital platforms.

However, Batchelor et al. (2014) emphasize that digital employment solutions must be context-aware and adapted to local labor market conditions in order to be effective. Generic platforms designed for developed economies often fail to address structural challenges such as informal employment systems, limited professional networks, and regional skill mismatches.

In Côte d'Ivoire, official statistics from the Institut National de la Statistique (INS, 2022) indicate that youth unemployment and underemployment remain significant despite sustained economic growth. The International Labour Organization (ILO, 2023) further identifies skills mismatch as a primary driver of graduate unemployment in the region.

These findings highlight the need for localized, intelligent systems that integrate job matching with skill development and career guidance.

Artificial Intelligence in Career Development

Artificial Intelligence has increasingly been applied to recruitment and career development systems. Early work by Hong et al. (2013) introduced semantic similarity techniques for matching résumés and job descriptions using vector-based representations.

More recent approaches, such as Qin et al. (2018), demonstrate that machine learning models trained on large recruitment datasets can outperform traditional rule-based systems in terms of matching accuracy and scalability.

With the emergence of large language models (LLMs) such as GPT, LLaMA, and Gemini, new opportunities have emerged for personalized career guidance systems. These models can analyze user profiles, identify competency gaps, and generate tailored recommendations in natural language.

However, most LLM-based career systems are optimized for Western labor markets and do not incorporate local constraints such as salary structures, educational pathways, or regional employment dynamics.

DIJOB addresses this limitation by integrating the Groq-hosted LLaMA 3.3-70B model into a structured AI protocol framework that generates context-aware career guidance, including salary estimation in FCFA, locally relevant certification recommendations, and region-specific job preparation strategies.

Research Gap

Despite significant progress in AI-driven recruitment and career development systems, existing solutions remain fragmented. Most systems address individual components such as résumé parsing, job matching, résumé evaluation, or learning recommendations independently.

To the best of our knowledge, no existing framework integrates all four components résumé parsing, skills matching, résumé improvement, and learning path recommendation into a unified, interpretable AI-driven job readiness architecture tailored to the labor market context of Côte d'Ivoire.

This gap motivates the development of DIJOB, a holistic AI framework that provides end-to-end job readiness assessment by combining skill extraction, competency matching, personalized résumé feedback, and adaptive training recommendations within a single system.

IV. PROBLEM DESCRIPTION AND CHALLENGES

Context

The transition from higher education to employment in Côte d'Ivoire remains a structurally constrained process rather than an individual challenge. Many students and recent graduates complete their academic programs without a clear understanding of career pathways, labor market expectations, or the competencies required to compete effectively in a skills-driven job market. This issue reflects not a lack of ambition, but rather a lack of structured career development infrastructure.

A survey conducted among students and recent graduates at IUGB (International University of Grand Bassam) and

affiliated institutions as part of this study highlights key barriers to employability. The results indicate that 70% of respondents cite lack of professional experience as the main cause of rejection, 50% report insufficient skills, and 30% identify missing certifications. Additional factors include weak CV presentation and low interview preparedness. These findings suggest that unemployment in this context is largely driven by a systemic mismatch between academic output and labor market requirements rather than isolated individual deficiencies.

Identified Problems

Lack of Career Orientation : A fundamental issue is the absence of structured career guidance for students throughout their academic journey. Many students make critical decisions regarding field of study, specialization, and certification pathways without access to reliable information about labor market opportunities. As a result, career choices are often based on informal advice, assumptions, or social influence rather than data-driven insights. This leads to persistent misalignment between academic training and available employment opportunities.

Limited Access to Internship Opportunities : Internships represent a crucial bridge between academic learning and professional experience. However, access to internship opportunities in Côte d'Ivoire remains highly unequal and largely dependent on informal networks. Students without strong professional or social connections face significant barriers to entry, resulting in unequal access to early career experience. This inequality reinforces long-term disparities in employability.

Lack of Structured Career Guidance Resources : Students often lack access to consolidated and context-aware career development resources. Key competencies such as CV writing, interview preparation, professional communication, and salary negotiation are not systematically taught. While fragmented information exists, there is no unified platform that provides structured, localized, and actionable career guidance tailored to the Ivorian labor market.

Skills Mismatch with Employer Requirements : Even when candidates possess relevant technical competencies, they often struggle to articulate them effectively in their applications. A mismatch exists at two levels: (1) a genuine skills gap between candidate capabilities and job requirements, and (2) a presentation gap where existing skills are not properly aligned

with recruiter expectations or applicant tracking systems (ATS). Both factors significantly reduce employability and limit access to job opportunities.

Key Challenges

- **Experience Paradox:** The labor market exhibits a structural paradox: candidates require professional experience to obtain employment, yet internships and jobs are often required to acquire such experience. Due to limited access to internships, many graduates are unable to build the foundational experience expected by employers, resulting in repeated rejection cycles and declining motivation.
- **Lack of Transparent Skill Matching Mechanisms:** Candidates are typically unable to evaluate their suitability for job positions before applying. Without structured comparison tools, they cannot identify missing competencies or estimate their competitiveness for a given role. This lack of transparency results in inefficient application processes and low match quality between candidates and job postings.
- **Career Disorientation After Graduation:** Following repeated unsuccessful job applications, many graduates experience uncertainty regarding next steps in their professional development. The absence of structured feedback mechanisms prevents them from identifying whether they should improve skills, pursue additional training, or redirect their career path. This leads to stagnation and, in some cases, withdrawal from the formal employment system.
- **Fragmentation Between Job Seekers and Employers :** There is currently no effective intermediary system that provides a structured, data-driven connection between job seekers and employers. Recruiters face large volumes of poorly structured applications, while candidates lack visibility into employer expectations. This fragmentation reduces recruitment efficiency and increases the time required for matching suitable candidates to job opportunities.

V. SOLUTION APPROACH

The challenges outlined above are interdependent and cannot be addressed in isolation. Career disorientation can lead to skill mismatch, which in turn reduces internship access and negatively impacts job placement outcomes. Therefore, this

paper proposes DIJOB, an integrated Artificial Intelligence-powered career development platform designed to support job seekers throughout the entire employability lifecycle.

DIJOB is structured around five core services that collectively address the main barriers to employment in Côte d'Ivoire.

Intelligent Job Search with AI Matching

DIJOB provides a centralized job and internship discovery system that allows users to search opportunities based on multiple criteria such as keywords, industry, location, and contract type. An AI-based matching mechanism compares user CVs with job descriptions and computes compatibility scores, enabling candidates to identify roles that best align with their profiles while improving recruiter targeting efficiency.

AI-Based Résumé Analysis

To address the lack of feedback in traditional application processes, DIJOB incorporates an AI-powered résumé evaluation module. Users receive structured feedback across five dimensions: structure, content quality, keyword relevance, formatting, and ATS compatibility. The system also generates optimized résumé summaries to improve professional presentation.

Skill Matching and Gap Analysis

DIJOB performs automated comparison between candidate skills and job requirements to compute a compatibility score and identify missing competencies. This module also generates a global skills roadmap based on frequently requested skills in the labor market, enabling users to prioritize high-demand competencies.

AI Career Coach

The AI Career Coach provides personalized career development guidance based on user profiles. It generates structured career paths, recommends technical and soft skills, suggests relevant certifications, and provides guidance on interview preparation, LinkedIn optimization, portfolio development, and salary expectations adapted to the Ivorian labor market.

In addition to AI-driven services, DIJOB includes a static Career Guide accessible to all users. This module provides standardized resources on CV writing, interview preparation, professional communication, networking strategies, and career

planning. It ensures baseline access to essential career development knowledge even without system interaction.

Summary

By integrating job search, résumé analysis, skill matching, career coaching, and structured guidance into a unified platform, DIJOB establishes a comprehensive employability ecosystem. The system is designed to bridge the gap between education and employment by providing continuous, data-driven support for career development in Côte d'Ivoire.

VI. AI PROTOCOLS DESIGN

To ensure consistency, transparency, and reproducibility of AI-generated outputs, DIJOB adopts a protocol-based design architecture. Rather than directly generating responses from raw user inputs, each AI service follows a structured pipeline composed of data acquisition, preprocessing, semantic

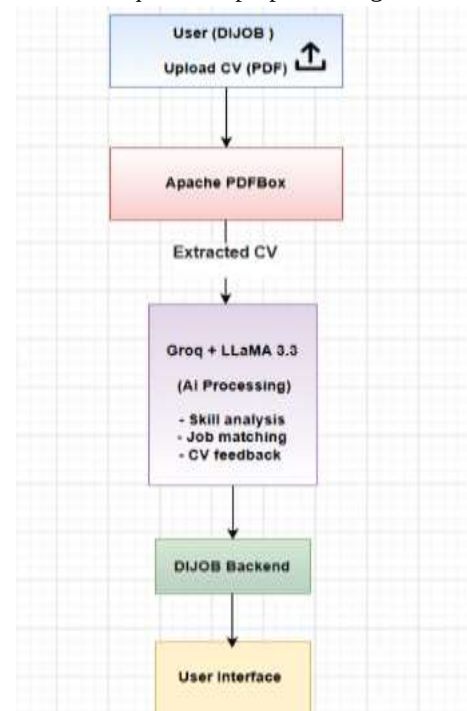


Figure 1: DIJOB AI Data Processing Pipeline

All AI reasoning tasks are handled through the Groq API using the LLaMA 3.3-70B model. DIJOB uses carefully engineered prompts that enforce structured reasoning and strict JSON output formatting. Unlike traditional keyword-based systems, the model performs semantic interpretation of candidate

profiles and job descriptions, enabling deeper understanding of skills, experience, and career alignment.

The outputs generated by the LLM are processed by DIJOB's business logic layer, which is responsible for computing compatibility scores, identifying skill gaps, evaluating résumé quality, generating training recommendations, and constructing career roadmaps.

Skills Matching Protocol

Figure 2 presents the Skills Matching Protocol workflow.

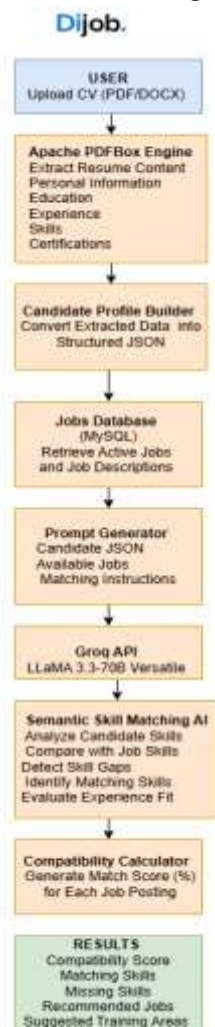


Figure 2: Skills Matching Protocol Flow

Résumé Improvement Protocol

This protocol evaluates CV quality based on structural, linguistic, and ATS optimization criteria. The AI analyzes

structure quality, keyword relevance, ATS compliance, section completeness, and writing quality. Output includes a global CV score (0–100), strengths, weaknesses, missing sections, and an optimized professional summary.

Figure 3 illustrates the résumé improvement pipeline.

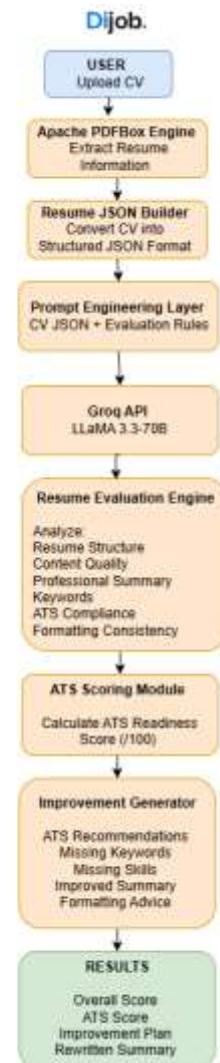


Figure 3: Résumé Improvement AI Pipeline

Training Recommendation Protocol

This protocol generates personalized learning pathways based on detected skill gaps and market requirements. The AI maps missing skills to relevant courses, certifications, and training resources. The output includes career roadmap, recommended courses, certifications, project ideas, and a structured learning timeline.

Figure 4 shows the training recommendation system architecture.



Figure 4: Training Recommendation System

VII. SYSTEM ARCHITECTURE

DIJOB is implemented using a three-tier architecture separating presentation, application logic, and data management layers. The system ensures modularity, scalability, and maintainability by isolating user interface, business logic, and data persistence.

Figure 5 presents the overall system architecture of DIJOB.

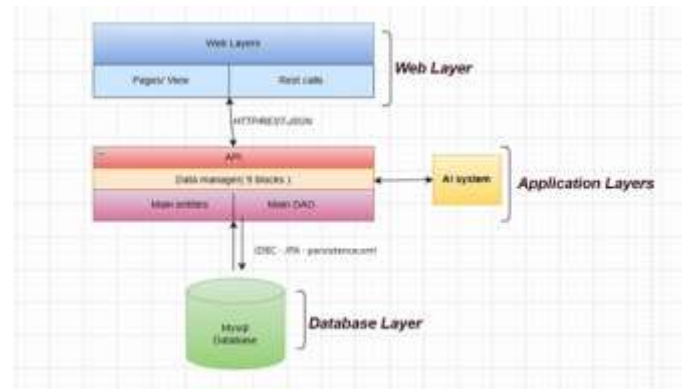


Figure 5: DIJOB 3-Tier Architecture

Web Layer : This layer includes XHTML/HTML interfaces for job search, CV upload, skill matching, career coaching, and career guidance services. It communicates with backend services via REST APIs using JSON format.

Application Layer: This layer contains REST APIs, business managers, JPA entities, DAO components, and AI service connectors. It orchestrates communication between frontend, database, and Groq AI API.

Data Layer: The data layer is implemented using MySQL and stores user accounts, job postings, CV data, skill analysis results, and AI-generated outputs.

Use Case Model

The DIJOB system involves three main actors: Job Seeker, Employer, and AI System. The Job Seeker interacts with all AI-powered services through the platform, while the Employer manages job postings. The AI System is invoked internally to perform analysis tasks such as résumé evaluation, skill matching, and career recommendation generation.

The system provides several core functionalities including user authentication, job search, CV upload and analysis, skill matching between candidates and job descriptions, AI-powered career coaching, and job posting management for employers.

Figure 6 illustrates the overall use case diagram of the DIJOB system.

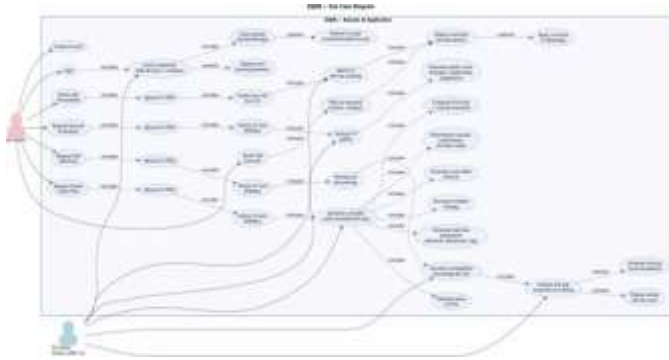


Figure 6: DIJOB Use Case Diagram

Actors: Job Seeker, Employer, AI System

Use Cases: Login, Register, Job Search, CV Upload, Resume Analysis, Skill Matching, Career Coaching, Post Job

Data Model (ERD)

The DIJOB database is designed as a relational schema supporting job matching, résumé analysis, skill extraction, and AI-driven career recommendations. The data model is normalized into multiple interconnected modules to ensure consistency between user profiles, job postings, skill relationships, and AI-generated outputs.

The system is composed of 19 main entities organized into four functional domains:

- **User Management:** Account, JobSeeker, EmployerContact, Resume
- **Job Management:** PostedJob, Company, JobCategory, SeekerAppliedJob, SearchJobRegistration, Feedback
- **Skill Management:** Skills, SkillsPerJob, AISkillPerJob, RelevantSkillsPerJob, SeekerScorePerAppliedJob
- **AI and Recommendation Module:** AIResume, AIRecommendations, MatchedJobSkillsScore, Notifications

These entities allow DIJOB to store structured information for user authentication, CV storage, job postings, skill-job relationships, application tracking, and AI-generated results such as résumé evaluations, skill compatibility scores, and personalized career recommendations.

The relationships between entities ensure full traceability from a user's profile and CV to job applications and AI-generated feedback, enabling end-to-end employability tracking and recommendation generation.

Figure 10 illustrates the complete Entity Relationship Diagram of the DIJOB system.

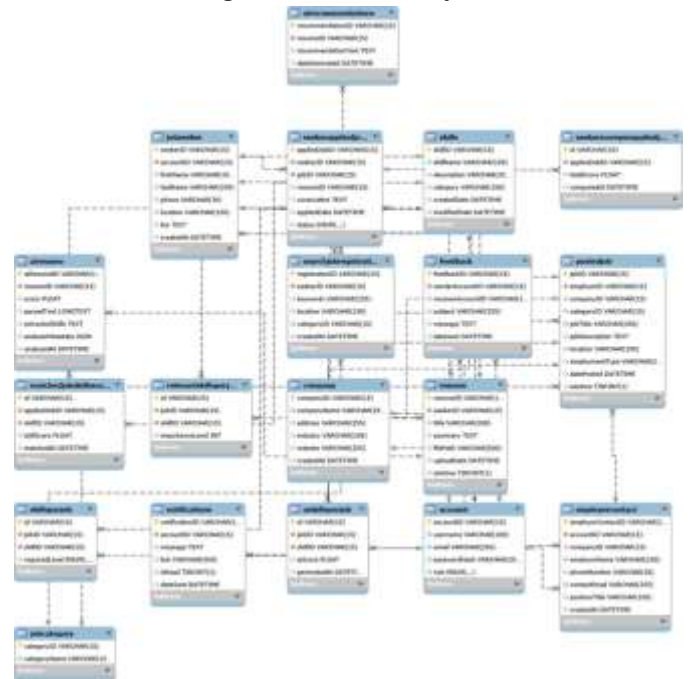


Figure 7 : DIJOB Entity Relationship Diagram (ERD)

VIII. IMPLEMENTATION AND RESULTS

Backend Architecture

The DIJOB backend is structured into five modular packages, each responsible for a specific layer of the system.

Software packages

The UtilitiesDB package contains the database connection manager (MainDAO), key generation service, and shared query utilities. It manages the JPA EntityManager lifecycle and provides standard CRUD operations across the system.

The mainEntities package contains the 19 JPA entity classes mapped to the MySQL database. Each entity uses a generated VARCHAR identifier to ensure secure and non-sequential primary keys.

The managers package includes nine business logic managers responsible for handling job processing, résumé analysis, skill matching, and AI interactions. Each manager enforces business rules and communicates with the database layer.

The localAPI package exposes four RESTful services (AccountService, JobService, TrainingService, SkillService) using JAX-RS. These services handle HTTP requests and delegate processing to the business layer.

AI Integration

AI integration is handled through the Groq API using OkHttp. Each service constructs a structured prompt combining CV data and job information. The LLaMA 3.3-70B model is instructed to return strictly formatted JSON outputs. A validation layer ensures consistency and attempts recovery in case of truncated responses.

PDF Processing and Data Extraction

DIJOB uses Apache PDFBox to extract textual content from uploaded CVs. The extracted text is converted into structured JSON before being sent to AI services.

Although PDFBox performs well for standard documents, image-based CVs may result in partial extraction. Future improvements include OCR-based preprocessing.

AI Modules Implementation

Resume Analysis Module

The Resume Analysis module evaluates CV quality using LLM-based reasoning. The system returns a structured JSON response including:

- Overall score (0–100)
- Structure analysis
- Strengths and weaknesses
- Missing sections
- ATS compatibility score
- Optimized professional summary
- The frontend renders this information in a dashboard with visual indicators.

Skill Matching Module

The Skill Matching module compares candidate profiles with job postings retrieved from the database.

For each job, the system generates:

- Compatibility score (0–100)
- Matched skills
- Missing skills
- Training recommendations

- Results are ranked and a global skill gap analysis is generated across all job listings.

Career Coaching Module

The Career Coach module generates a structured 11 section career development plan including:

- Career path progression
- Technical and soft skills roadmap
- Certifications and courses
- Portfolio project suggestions
- Interview preparation
- Salary estimation (FCFA)
- LinkedIn optimization
- The output is rendered as an interactive multi-tab dashboard.

Security Implementation

Security is enforced through AES encryption for password storage, HTTPS communication for API calls, and session management via sessionStorage.

All REST endpoints validate inputs before processing to prevent injection and malformed requests.

Frontend design and Implementation

The frontend is built using XHTML, HTML5, CSS, and JavaScript. Each functional module has a dedicated interface:

- Home page

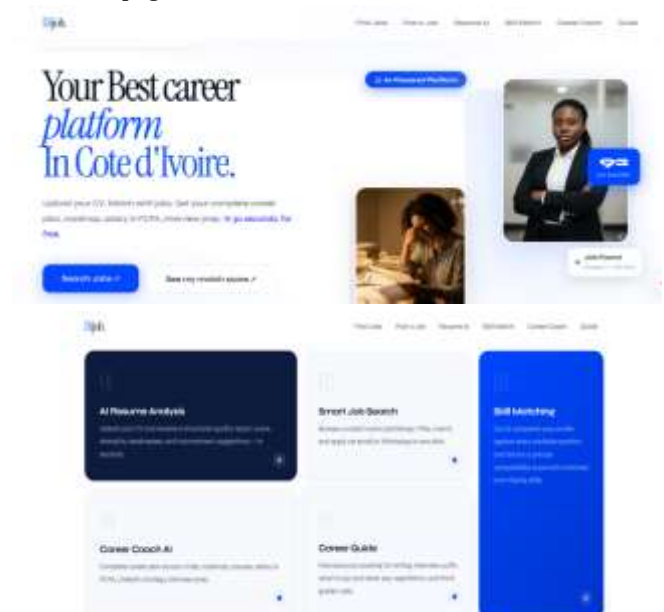


Figure 8: Home page

Authentication pages (login/register)

The login page allows registered users to authenticate using their username and password. The form performs real-time validation and displays an error message for invalid credentials. The registration page allows new users to create an account by selecting a role JobSeeker or Employer and completing the required fields.



Figure 9: Authentication pages

Job search interface

The Job Search page allows authenticated users to search available job listings manually using keyword and employment type filters, or to upload their CV for AI-assisted matching.



Figure 10: Job search Interface

Resume analysis dashboard

The Resume AI page allows authenticated job seekers to upload their CV in PDF format and receive a structured quality report. The report includes a score between 0 and 100, detected and missing sections, a list of strengths and weaknesses, and a professionally rewritten summary generated by the AI.



Figure 11: Resume Analysis

Skill matching interface

The Skill Matching page allows authenticated job seekers to upload their CV in PDF format and receive an AI-powered compatibility analysis against all active job listings.



Figure 12: Resume Analysis

Career coach dashboard

The Career Coach page delivers a complete personalized career development plan through a interactive tabbed interface. After uploading their CV, the user receives eleven modules including career path progression, skills to develop, a six-step roadmap, recommended courses, certifications, portfolio projects, interview preparation



Figure 13: Career Coach

Career guide module

The Career Guide is a comprehensive resource that includes six helpful sections on writing a resume, tips for acing an interview, the appropriate dress code for an interview, and much more.



Figure 14: Career guide module

IX. RESULTS

The DIJOB platform was tested using real student CVs and job postings from the Ivorian job market.

The system successfully generates:

- Resume quality scores in real time
- Skill-job compatibility rankings
- Personalized career roadmaps
- Structured AI feedback in JSON format
- The homepage serves as the entry point to the platform and provides access to all core services.
- The Skill Matching module effectively ranks job opportunities based on CV compatibility, while the Career Coach module generates detailed personalized career plans.
- The Resume Analysis module provides structured feedback that helps users improve CV quality and ATS compatibility.
- The Job Search module supports both manual filtering and AI-assisted matching using CV uploads.
- The Career Guide provides static but structured professional guidance for students.

Overall, DIJOB demonstrates the ability to bridge the gap between academic training and labor market expectations by providing AI-driven, context-aware career guidance tailored to the Ivorian job market.

X. PERFORMANCE EVALUATION

Summary Report										
Name:	Summary Report									
Comments:	Write results to file / Read from file									
Filename:										
Label	# Samples	Average	Min	Max	Std. Dev	Error %	Throughput	Received Kbytes	Sent Kbytes	Avail. Bytes
Resume Ana...	2	32	10	55	22.50	0.00%	12.0/min	5.68	0.04	29160.0
TOTAL	2	32	10	55	22.50	0.00%	12.0/min	5.68	0.04	29160.0

Figure 17: Summary report of user 1 (Resume Analysis)

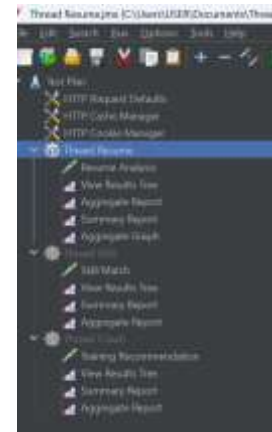


Figure 15: Workflow of Apache JMeter

Apache JMeter Workspace Configuration

I created a well-organized workspace in Apache JMeter to perform performance testing on the applications developed in Apache NetBeans. First, I configured the default interface using HTTP Request Defaults. I set the protocol to HTTP, the server name to localhost, and the port number to 8080, since all three services share the same connection parameters. Next, I created three Thread Groups, each renamed according to one of the three services: Resume Analysis, Skill Matching, and Training Recommendation. For each Thread Group, I added the following Listeners: Summary Report, View Results Tree, and Aggregate Report to display and analyze the test results. It is important to note that the Thread Group is where the virtual users are configured. To run the performance tests, I disabled the other two Thread Groups before

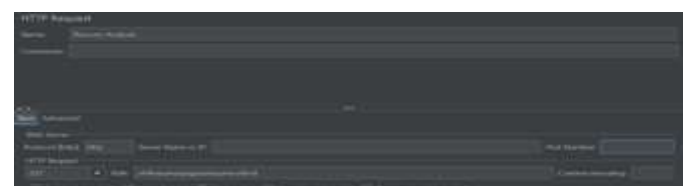


Figure 16: HTTP Default Resquest Interface

A. Resume Analysis

User = 1

Average time : 32ms

User = 5

Write results to file / Read from file											
Filename						Browse...		Log/Display Only: ☐ Errors ☐ Successes		Configure	
Label	# Samples	Average	Min	Max	Std. Dev.	Error %	Throughput	Received KB/sec	Sent KB/sec	Avg. Bytes	
Resume Ana...	5	12	7	26	6.95	0.00%	6.2/sec	176.77	1.23	29180.0	
TOTAL	5	12	7	26	6.95	0.00%	6.2/sec	176.77	1.23	29180.0	

Figure 18: Summary report of users 5(Resume Analysis)

Average time : 12 ms

User = 10

Write results to file / Read from file											
Filename						Browse...		Log/Display Only: ☐ Errors ☐ Successes		Configure	
Label	# Samples	Average	Min	Max	Std. Dev.	Error %	Throughput	Received KB/sec	Sent KB/sec	Avg. Bytes	
Resume Ana...	10	7	6	11	1.72	0.00%	11.0/sec	314.87	2.19	29180.0	
TOTAL	10	7	6	11	1.72	0.00%	11.0/sec	314.87	2.19	29180.0	

Figure 19: Summary report of user 10 (Resume Analysis)

Average time : 7ms

User = 100

Label	# Samples	Average	Min	Max	Std. Dev.	Error %	Throughput	Received KB/sec	Sent KB/sec	Avg. Bytes	
Resume Ana...	100	8	5	28	4.22	0.00%	100.4/sec	2861.05	19.90	29180.0	
TOTAL	100	8	5	28	4.22	0.00%	100.4/sec	2861.05	19.90	29180.0	

Figure 20: Summary report of user 100 (Resume Analysis)

Average time : 8ms

Conclusion 1:

The overall performance evaluation demonstrates that the Resume Analysis protocol scales efficiently as the number of concurrent users increases. Throughout all experiments (1, 5, 10, and 100 users), the system maintained a 0% error rate, indicating excellent reliability and robustness. Although network traffic increased significantly with higher concurrency, the average response time remained consistently

low (between 7 ms and 32 ms), while throughput improved substantially from 12 requests per minute for a single user to over 100 requests per second for one hundred concurrent users. Overall, these results confirm that the proposed Resume Analysis protocol is capable of supporting a large number of simultaneous users while maintaining fast response times, stable throughput, and reliable service quality, making it suitable for deployment in real-world academic and employment support environments.

B. Skill Matching

User = 1

Label	# Samples	Average	Min	Max	Std. Dev.	Error %	Throughput	Received KB/sec	Sent KB/sec	Avg. Bytes	
Skill Match	1	17	17	17	0.00	0.00%	58.8/sec	1837.60	11.89	31989.0	
TOTAL	1	17	17	17	0.00	0.00%	58.8/sec	1837.60	11.89	31989.0	

Figure 21: Summary report of user 1 (Skill Matching)

Average time : 17ms

User = 5

Label	# Samples	Average	Min	Max	Std. Dev.	Error %	Throughput	Received KB/sec	Sent KB/sec	Avg. Bytes	
Skill Match	5	7	6	11	1.85	0.00%	6.2/sec	193.55	1.25	31989.0	
TOTAL	5	7	6	11	1.85	0.00%	6.2/sec	193.55	1.25	31989.0	

Figure 22: Summary report of user 5 (Skill Matching)

Average time : 7ms

User = 10

Label	# Samples	Average	Min	Max	Std. Dev.	Error %	Throughput	Received KB/sec	Sent KB/sec	Avg. Bytes
Skill Match	10	8	5	19	3.91	0.00%	11.1/sec	345.95	2.24	31989.0
TOTAL	10	8	5	19	3.91	0.00%	11.1/sec	345.95	2.24	31989.0

Figure 23: Summary report of user 10 (Skill Matching)

Average time : 8ms

User = 100

Label	# Samples	Average	Min	Max	Std. Dev.	Error %	Throughput	Received KB/sec	Sent KB/sec	Avg. Bytes
Skill Match	100	7	4	21	2.92	0.00%	100.1/sec	3127.05	20.24	31989.0
TOTAL	100	7	4	21	2.92	0.00%	100.1/sec	3127.05	20.24	31989.0

Figure 24: Summary report of user 100 (Skill matching)

Average time : 7ms

Conclusion 2 :

The performance evaluation of the Skill Matching protocol demonstrates that DIJOB efficiently supports increasing numbers of concurrent users. Across all experiments (1, 5, 10, and 100 users), the application maintained a 0% error rate, indicating excellent reliability and robustness. The average response times remained consistently low, varying between 7 ms and 17 ms, even under heavy workloads. Although the number of simultaneous users increased substantially, the

protocol continued to deliver rapid responses while maintaining stable execution. Overall, these results confirm that the Skill Matching protocol scales effectively under concurrent workloads. The efficient management of server resources, combined with the Jakarta EE architecture and REST-based implementation, enables DIJOB to provide fast, reliable, and consistent AI-powered skill compatibility analysis for a large number of users simultaneously

C. Training Recommendation

User = 1

Label	# Samples	Average	Min	Max	Std. Dev.	Error %	Throughput	Received KB/sec	Sent KB/sec	Avg. Bytes
Training Rec...	1	12	12	12	0.00	0.00%	83.3/sec	6309.41	16.68	77530.0
TOTAL	1	12	12	12	0.00	0.00%	83.3/sec	6309.41	16.68	77530.0

Figure 25: Summary report of user 1 (Training Recommendation)

Average time : 12 ms

User = 5

Label	# Samples	Average	Min	Max	Std. Dev.	Error %	Throughput	Received KB/sec	Sent KB/sec	Avg. Bytes
Training Rec...	5	9	6	14	3.19	0.00%	6.2/sec	469.10	1.24	77530.0
TOTAL	5	9	6	14	3.19	0.00%	6.2/sec	469.10	1.24	77530.0

Figure 26: Summary report of user 5 (Training Recommendation)

Average time : 9ms

User = 10

Label	# Samples	Average	Min	Max	Std. Dev.	Error %	Throughput	Received KB/sec	Sent KB/sec	Avg. Bytes
Training Rec...	10	7	6	12	1.79	0.00%	11.0/sec	835.68	2.21	77530.0
TOTAL	10	7	6	12	1.79	0.00%	11.0/sec	835.68	2.21	77530.0

Figure 27: Summary report of user 10 (Training Recommendation)

Average time : 7ms

User = 100

Label	# Samples	Average	Min	Max	Std. Dev.	Error %	Throughput	Received KB/sec	Sent KB/sec	Avg. Bytes
Training Rec...	100	6	4	21	2.40	0.00%	99.9/sec	7563.73	20.00	77530.0
TOTAL	100	6	4	21	2.40	0.00%	99.9/sec	7563.73	20.00	77530.0

Figure 28: Summary report of user 100 (Training Recommendation)

Average time : **6ms**

Conclusion 3 : The Apache JMeter results demonstrate that the Training Recommendation service provides excellent performance under different workloads. The average response time was 12 ms for 1 user, 9 ms for 5 users, 7 ms for 10 users, and 6 ms for 100 simultaneous users. Despite the increase in the number of concurrent users, the application maintained very low response times and processed all requests successfully with a 0% error rate. These results indicate that the application is fast, reliable, and scalable. The consistently low average response

times show that the system can efficiently handle concurrent users without any noticeable performance degradation. Therefore, the Training Recommendation service is capable of supporting at least 100 simultaneous users while maintaining excellent responsiveness and stability.

XI. USER FEEDBACK ON THE QUALITY OF DIJOB

Users	Role	Comments
Jean Yves	Computer Science Student	I really like your application and the way you integrated Artificial Intelligence. It addresses a real problem faced by students and job seekers.
Brandon	Computer Science Student	This is a useful application for everyone. I suggest adding an AI-powered CV generator. I would be willing to pay for such a service.
Nehemie	New student at University	This application would really help me find internships more easily. I also like how the AI features assist users throughout the platform.
Tata Sita	Employer at Emploi Jeunes Ci	Congratulations. I particularly like the Skill Matching feature. It is intelligent and innovative. With further improvements, I believe this application could be presented to Emploi Jeunes Côte d'Ivoire
Ketsia	Acturial Student	The interface, colors, and profile picture design are attractive, and the login process is simple. I suggest adding a dashboard where recruiters and students can track their applications and activities.
Marius	Friend	This is a valuable application for the employment sector. You could include links to training platforms through partnerships and create user profiles. The interface is attractive, and the login process is fast and easy.
Rahmann	Computer Science	This application will be very useful for students and job seekers in Côte d'Ivoire. I recommend improving the existing services by adding an AI CV generator, a personalized career coach, and a real-time chat feature. In the future, it could be offered as a Software as a Service (SaaS) platform
Marie Noemie	Friend	This is a very useful application for students. I recommend creating personalized profiles for both students and recruiters to improve the user experience

XII. CONCLUSION

This paper presented DIJOB , an AI-powered web-based career development platform designed to improve job readiness and employability for students and graduates in Côte d'Ivoire. In a context where youth unemployment is strongly influenced by skills mismatch, limited career guidance, and poorly optimized résumés, DIJOB offers a structured and intelligent alternative to traditional advisory systems.

The proposed AI Job Readiness Framework, implemented through three core protocols Skills Matching, Résumé

Improvement, and Training Proposal enables automated evaluation of candidate profiles, identification of skill gaps, and delivery of personalized career recommendations. By combining these protocols within a unified system, DIJOB goes beyond simple job matching to provide end-to-end career support.

Implemented using Jakarta EE 10, GlassFish 7, MySQL 8, and the Groq API, the platform demonstrates the feasibility of integrating large language models into full-stack systems to deliver real-time, actionable employability insights. The working prototype confirms the practical value of AI in

improving alignment between job seekers and employer expectations.

Overall, DIJOB provides both a functional system and a conceptual foundation for AI-driven employability solutions in Côte d'Ivoire. Future work may focus on scaling the platform, improving model performance with real user data, and expanding its integration with institutional and national employment services.

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