JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue

JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)

An International Scholarly Open Access, Peer-reviewed, Refereed Journal

An AI-Integrated SBERT-NLP Framework for Job–Internship Recommendation and Interview Question Analysis

[1] M Sadha mail,[2]Ananya C ,[3]Charitha T,[4]Namrath Rao Bedre,[5]Rakesh KM,[6]Mrs.Maseeha Banu

[1]3rd yr Student, [2]3rd yr Student, [3]3rd yr Student,[4]3rd yr Student,[5]3rd yr Student,[6] Assistant professor

[1]Department of CSE(AI&ML),

[1]Malnad College of Engineering, Hassan, India

Abstract : AI Career Hub is an intelligent job search and career development system that leverages advanced Natural Language Processing to increase the relevance and effectiveness of job recommendations. The platform uses Sentence-BERT embeddings and cosine similarity to overcome the limitations of traditional keyword-based retrieval by tapping into the semantic understanding of job descriptions and candidate profiles. Integrated with real-time job APIs, the system continuously updates job listings while supporting personalized career development through AI-generated interview questions, role-specific preparation, resume analysis, and application tracking.

The architecture follows a modular, scalable design, with clear separation of concerns across semantic matching, document parsing, recommendation ranking, and user interaction. Frontend access is provided through a responsive Web interface that provides easy access, while the backend supports secure user management and efficient execution of AI-driven queries. This structure provides both reproducibility for research and adaptability for real-world deployment.

Experimental observations reveal that semantic matching with Sentence-BERT improves recommendation relevance and personalized interview preparation raises user engagement and readiness. In summary, AI Career Hub stands out as a holistic and efficient approach to AI-driven career services that integrate semantic retrieval, live job data, and personalized skill development in order to support job seekers in dynamic employment environments.

IndexTerms **- —** Semantic Matching, Sentence-BERT, Job Recommendation, NLP, AI Career Services, Interview Preparation

I. INTRODUCTION

Technological advancements and industrial changes are constantly evolving at a rapid pace [1]. The increasing adoption of Artificial Intelligence (AI) in recruitment and career development has transformed how job seekers interact with employment platforms and how organizations identify suitable candidates. Traditional keyword-based job search mechanisms and manual resume screening methods are no longer sufficient due to rapidly evolving job markets, high application volumes, and the need for personalized career guidance. These limitations necessitate intelligent, data-driven systems capable of understanding semantic relationships between job requirements, resumes, skills, and interview responses.

Recent advancements in Natural Language Processing (NLP), particularly the development of Sentence-BERT (SBERT), have enabled the generation of semantically meaningful sentence embeddings. SBERT significantly reduces computational cost for similarity search by employing a siamese architecture, achieving high-accuracy semantic comparisons while reducing inference time from hours to seconds [2]. This capability makes it suitable for large-scale job matching where both efficiency and precision are critical. Parallel research in job skill extraction highlights the importance of embedding-based modeling for occupational analysis. The SkillRec system demonstrates how BERT and FastText embeddings, combined with neural networks, can effectively identify skill sets linked to job titles using large job-posting datasets, achieving over 97% accuracy in skill prediction [3]. Similarly, machine learning–driven resume recommendation systems have shown that algorithms such as Random Forests and SVMs can automate candidate shortlisting and address challenges arising from heterogeneous resume formats and overwhelming applicant volumes [4]. Interview evaluation is another critical component of recruitment that benefits from AI. NLP-based interview analyzers have been proposed to ensure unbiased assessments by converting audio responses into text, generating embeddings, and comparing them with ideal answers using cosine similarity. This enables standardized scoring, reduces human bias, and supports remote interview workflows, especially in post-pandemic hiring practices [5]. Motivated by these advancements, AI Career Hub is developed as an end-to-end, AI-powered career recommendation and interview preparation platform. It integrates semantic job matching, real-time job APIs, resume intelligence, interview question generation, and answer evaluation into a unified system. By

leveraging SBERT embeddings, cosine similarity, and modular AI components, the platform aims to enhance job search relevance, improve candidate readiness, and support data-driven decision-making in modern recruitment ecosystems.

II. LITERATURE REVIEW

Advances in Natural Language Processing and machine learning have significantly influenced job-matching, resume analysis, and interview-related research. However, most existing systems are designed to streamline **employer-centric** processes—such as filtering resumes or identifying qualified candidates—while offering limited personalized support for job seekers. This section reviews the major contributions in semantic matching, resume parsing, career analytics, and interview automation, and identifies the need for a unified, learner-centered platform.

A. Semantic Text Embeddings for Job Matching

Keyword-based job search systems often fail to capture the contextual meaning of skills or role descriptions. Sentence-BERT (SBERT) addresses this limitation by generating dense sentence embeddings through a siamese network architecture, enabling high-accuracy semantic similarity and significantly reducing computational cost for large-scale search tasks [1]. This makes SBERT a strong foundational technology for semantic job matching and recommendation engines.

Hybrid semantic techniques further demonstrate their usefulness. A TF-IDF + BERT hybrid recommender system has been shown to improve clustering and recommendation relevance in academic collaboration networks, highlighting the strength of embedding-driven matching in heterogeneous text environments [6]. Although not job-related, this reinforces the importance of semantic modeling in recommendation design.

B. Skill Extraction and Occupation Analysis

Understanding required skills from job descriptions is crucial for effective job recommendation. SkillRec demonstrated that embeddings from FastText and BERT, combined with deep neural networks, can accurately predict relevant skills from over 6,000 job listings, achieving high performance and demonstrating the potential of embedding-based occupational analysis [3]. This line of research forms the foundation for modern role-specific skill recommendations and motivates semantic skill-gap analysis in job-seeker platforms.

C. Resume Parsing and Automated Candidate Profiling

Several works focus on improving employer screening by automating resume categorization and ranking. Machine-learning approaches using Random Forests, Naïve Bayes, and SVMs have been explored to classify resumes and identify suitable candidates efficiently [4].Similarly, a lightweight web-based resume parser extracts text using pdfplumber, applies rule-based segmentation, and recommends jobs through job search APIs such as SerpAPI [7]. While these systems streamline resume handling, they remain employer-centric and rely heavily on keywords, providing limited support to job seekers in understanding their own skill gaps or improving employability.

D. NLP Driven Interview Evaluation

Interview automation studies explore how NLP can reduce evaluation subjectivity. One system converts audio responses into text, generates Doc2Vec embeddings, and uses cosine similarity to compare candidate answers against ideal responses, enabling more uniform interview scoring [5]. Although these systems ensure fair evaluation, they are designed for HR teams rather than for applicants seeking feedback or preparation.

E. Research Gap

Across existing research, common limitations persist:

- Systems mainly prioritize recruiter needs, not job-seeker development.
- Many platforms depend on keyword matching, lacking semantic understanding.
- Resume-parsing systems do not identify skill gaps or provide learning paths.
- Interview analysis tools focus on evaluation, not practice or guidance.
- No unified solution supports job seekers across resume analysis → semantic job matching → skill enhancement → interview preparation.

F. Contribution of the Proposed System

To address these shortcomings, AI Career Hub integrates:

- Semantic job matching via Sentence-BERT embeddings [1].
- Semantic resume intelligence with contextual interpretation.
- Personalized skill-gap analysis informed by occupation-based research [3].
- AI-generated interview questions and answer evaluation grounded in NLP similarity methods [5].
- Real-time job listing retrieval through external job APIs [7].

Unlike employer-oriented systems, AI Career Hub is explicitly designed to empower job seekers, supporting them throughout the entire career-development pipeline—from discovering relevant roles to preparing for interviews intelligently.

III. PROBLEM STATEMENT

The modern job-seeking process is increasingly challenging due to the rapid evolution of industry demands, the expansion of job postings across multiple platforms, and the complexity of understanding role-specific skill requirements. Traditional keyword-based job portals frequently fail to capture the semantic meaning embedded in job descriptions and candidate profiles, resulting in irrelevant recommendations and missed opportunities. Existing studies emphasize that keyword matching overlooks contextual relationships between skills, experience, and job responsibilities, limiting its effectiveness in high-volume job search environments [1].

Job seekers face additional challenges when attempting to interpret job requirements, identify missing competencies, and prepare effectively for interviews. Although research in job-skill prediction demonstrates that embedding-based models can accurately extract relevant skills from job listings, such capabilities are seldom integrated into platforms designed specifically for candidates [3]. Existing resume-parsing systems primarily assist employers by automating candidate filtering, relying on rule-based text extraction and basic query generation. These systems lack semantic reasoning and offer little to no personalized feedback for applicants seeking career advancement or targeted job discovery [7].

Interview evaluation tools further highlight this imbalance, as most NLP-based assessment systems are intended to support recruiters by standardizing interview scoring rather than helping candidates practice or improve their responses [5]. This creates a significant gap where job seekers receive minimal structured guidance across the recruitment pipeline. They struggle to identify suitable job roles, understand industry expectations, and prepare adequately for interviews.

Therefore, the core problem addressed in this research is the absence of an integrated, job-seeker–centric platform capable of performing:

- Semantic job matching using contextual embeddings,
- Intelligent resume interpretation with skill-gap identification,
- Personalized interview question generation and semantic response evaluation,
- Real-time retrieval of relevant job listings from external APIs.

This work aims to bridge these gaps through the development of AI Career Hub, an AI-driven solution designed to enhance employability and streamline the job search and preparation process for modern applicants.

IV. OBJECTIVES

The primary objective of this research is to design and implement an AI-driven, job-seeker–centric career development platform that overcomes the limitations of traditional keyword-based job portals and employer-focused hiring systems. The system aims to enhance the overall job search, preparation, and skill-development journey through intelligent, personalized, and semantically informed mechanisms.

The Key objectives are:

- To provide semantic job matching using Sentence-BERT embeddings for accurate, context-aware recommendations.
- To analyze resumes intelligently and identify key skills, gaps, and improvement areas.
- To support interview preparation through AI-generated questions and semantic evaluation of candidate responses.
- To retrieve real-time job listings via integrated job search APIs.
- To unify job search, resume analysis, and interview readiness into a single, user-friendly platform designed for job seekers.

V. PROPOSED METHODOLOGY

The proposed system, AI Career Hub, is designed as an end-to-end career development platform that leverages semantic text embeddings, machine learning, and real-time job APIs to support job seekers throughout the job search and interview preparation process. The methodology integrates four major components: semantic job matching, resume intelligence, interview preparation, and real-time job retrieval. The overall workflow is modular, scalable, and optimized for personalized user experiences.

A. System overview

AI Career Hub combines Sentence-BERT embeddings,

machine-learning similarity scoring, and API-driven job retrieval to generate precise job recommendations. The system follows a pipeline that begins with resume upload or manual skill input, progresses through semantic processing and job retrieval, and results in scored recommendations, interview questions, and role-specific preparation material.

B. Semantic Job Matching Module

The core matching engine uses Sentence-BERT to convert job descriptions, skills, and user profiles into dense vector embeddings. Cosine similarity is then applied to compute the semantic alignment between candidate profiles and job postings.

This module supports:

- Automatic AI-driven recommendations from user profiles
- Manual job search based on selected skills
- Ranking of jobs using match scores derived from semantic similarity, role relevance, and skill coverage
- This approach ensures that recommendations are based on context and meaning, not simple keyword overlap.

C. Resume Analysis and Skill Extraction

Uploaded resumes (PDF, DOCX, TXT) are parsed using text-extraction libraries. Extracted content undergoes:

1. Skill detection using pattern-matching and keyword mapping
2. Embedding generation for semantic interpretation
3. Identification of skill gaps by comparing extracted skills with job requirements retrieved from APIs

The resume module helps users understand their strengths, missing competencies, and areas requiring improvement.

E. Real-Time Job Retrieval through APIs

To ensure access to current opportunities, the system integrates with external job APIs such as Adzuna and JSearch. Retrieved listings are preprocessed into uniform formats and embedded for semantic comparison.

The system supports:

- Country-specific job retrieval
- Multi-API redundancy for broader coverage
- Live synchronization to reflect the latest job postings

F. User Management and Application Tracking

A dedicated user-management module stores profile details, extracted skills, job preferences, and past interactions. Additional features include:

- Resume history
- Saved jobs
- Application tracking
- Interview performance records
- Preparation history for each job role

These elements enable personalized and continuous career guidance.

G. System Architecture

The backend is implemented using Flask, with SQLite as the database. The AI components rely on the Sentence Transformers library for embedding generation and scikit-learn for similarity computation. The frontend uses HTML, CSS, and JavaScript for responsive and interactive user experiences.

The architecture is built for scalability, enabling future migration to distributed databases, GPU-enabled embedding servers, or microservice deployment.

H. Workflow Summary

- User Input: Resume upload or manual skill entry
- Semantic Processing: Embedding generation and skill extraction
- Job Retrieval: API calls to fetch live job listings
- Matching: Semantic similarity scoring and ranking
- Output: Recommendations, interview questions, preparation insights
- Tracking: Storing user progress, activities, and application records

VI. SYSTEM ARCHITECTURE

The architecture of AI Career Hub follows a modular, layered design that separates the AI components, backend services, external API integrations, and user interface. This structure ensures scalability, maintainability, and clear workflow separation. The system is built around four major pillars: semantic processing, job retrieval, user management, and interactive preparation modules.

A. High-Level Architecture Overview

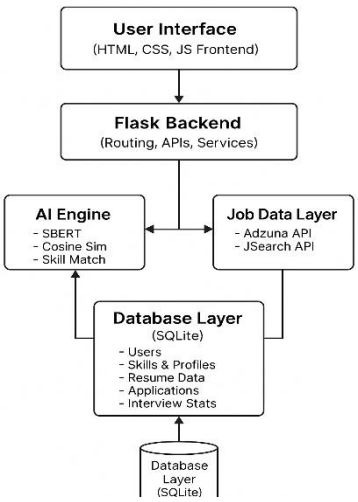

Fig 1. High-Level System Architecture of AI Career Hub

Fig 1 illustrates the layered architecture of the platform, showing interactions between the User Interface, Flask Backend, AI Engine, Job Data Layer, and Database Layer. Data flows through the semantic processing components, real-time job APIs, and storage modules to deliver personalized skill-based job recommendations, resume insights, and interview preparation questions.

B. User Interface Layer

The frontend is a responsive web interface built with HTML5, CSS3, and JavaScript.
It provides access to:

- AI job recommendations
- Resume upload
- Interview practice
- Job preparation tools
- Saved jobs and progress tracking

This layer communicates exclusively with the Flask backend through RESTful API calls.

C. Backend Service Layer (Flask)

The backend acts as the central processing unit of the system. Its responsibilities include:

- Managing user authentication
- Handling API requests
- Coordinating between the AI engine, job services, and database
- Returning processed results to the frontend

All modules such as resume analysis, recommendation generation, and interview processing are exposed via RESTful endpoints.

D. AI Processing Engine

This component performs all semantic and ML-driven tasks:

1. **Sentence-BERT Embedding Generator**

   Converts user resume text, skills, and job descriptions into high-dimensional embedding vectors.

2. **Semantic Matching & Scoring**

   Uses cosine similarity to compute match scores between:
   - Candidate → Job posting
   - User answer → Ideal answer
   - Skills → Required skills

3. Skill Extraction

Pattern-matching, keyword mapping, and embedding comparison identify:

- Technical skills
- Soft skills
- Missing skill gaps relative to job descriptions

4. Interview Logic

- Generates job-specific questions
- Evaluates candidate responses semantically
- Tracks performance per skill category

E. Job Data Retrieval Layer

This layer integrates with external job APIs:

1. Adzuna API: Provides live job listings with details such as salary, location, description, and company.
2. JSearch API: Used as an auxiliary job provider to broaden coverage and improve recommendation variety.

These APIs return JSON data, which is normalized and stored temporarily before semantic processing.

F. Database Layer (SQLite)

The system uses SQLite for lightweight, local data management. Stored information includes:

- User profiles
- Extracted skills from resumes
- Job preparation history
- Interview performance statistics
- Saved jobs and application history

The database structure is normalized to ensure fast query response and efficient storage.

G. Workflow Architecture

1. User Workflow

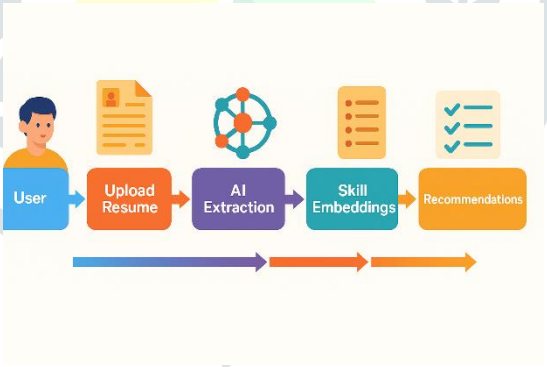

Fig 2. User workflow

Fig 2 illustrates the end-to-end process followed by a job seeker, beginning with resume upload and progressing through AI-driven extraction, skill embedding generation, semantic job matching, and finally the delivery of personalized job recommendations

2. Job Recommendation Workflow

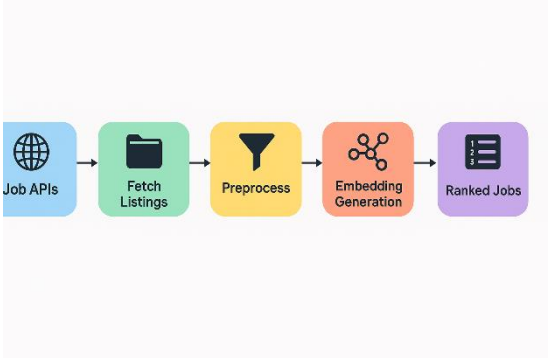

Fig 3 Job recommendation Pipeline

This diagram presents the workflow used to retrieve and rank job listings. The process begins with accessing external job APIs, followed by fetching and preprocessing listings, generating embeddings, calculating semantic similarity scores, and producing a final set of ranked job recommendations.

3. Interview Practice Workflow

Fig 4. Interview Practice Workflow.

The diagram illustrates the step-by-step process of the AI-driven interview practice module, beginning with question generation, followed by user responses, semantic embedding comparison, automated feedback and scoring, and final history tracking for continuous learning.

H. Security & Scalability Considerations

- Password hashing using Werkzeug
- File validation for resume uploads
- Modular AI components enabling future upgrades
- Stateless REST APIs for horizontal scalability
- Ready for migration to PostgreSQL and container-based deployment

VII. IMPLEMENTATION

The implementation of AI Career Hub integrates semantic text processing, resume intelligence, multi-source job retrieval, and interview evaluation into a modular system built using Python, Flask, and modern NLP libraries. The architecture follows a service-oriented approach where each component—resume processing, job matching, interview generation, and scoring—operates independently while communicating through RESTful APIs.

A. Backend Framework and System Setup

The backend is developed using the Flask micro-framework, chosen for its simplicity, scalability, and compatibility with AI-driven applications. Flask routes handle:

- User authentication
- Resume uploads
- Job recommendation requests
- Interview question generation and evaluation
- Application tracking and history retrieval

The system follows RESTful design principles to ensure clear communication between the backend and a JavaScript-based frontend. This modular design aligns with best practices for building AI-powered web applications (Abbas, 2023).

B. Semantic Embedding and NLP Pipeline

The system uses Sentence-BERT (SBERT) for embedding generation. SBERT produces dense vector representations that capture contextual information significantly better than keyword-based representations. By computing cosine similarity between user-profile embeddings and job-description embeddings, the platform is able to recommend jobs based on semantic meaning rather than keyword overlap—an approach validated in prior works on semantic search (Reimers & Gurevych, 2019).

The NLP pipeline includes:

- Text preprocessing (cleaning, token filtering)
- SBERT embedding generation
- Cosine similarity computation
- Keyword and skill-overlap scoring
- Final match-score normalization

This hybrid scoring mechanism improves the robustness and interpretability of job recommendations.

C. Resume Processing and Skill Extraction

The resume module supports PDF, DOCX, and TXT formats. Text extraction is implemented through standard Python libraries such as PyPDF2, python-docx, and UTF-8 text loaders. The extracted content undergoes:

Skill extraction using curated lexicons and pattern-matching

- Experience inference via regular expressions
- Contact information parsing
- Embedding generation for semantic comparison

These structured features serve as the input for the job-matching pipeline and interview question generation. This approach aligns with established open-source resume-parsing practices commonly used in industry and academia.

D. Job Retrieval and Preprocessing

To ensure real-time relevance, AI Career Hub integrates with external job providers such as:

- Adzuna Job Search API
- RapidAPI JSearch

Job listings are fetched using user-selected skills, experience ranges, and optional keywords. Retrieved records are normalized by:

- Cleaning HTML and encoded text
- Extracting required skills from job descriptions
- Standardizing salary, location, and company fields
- Assigning job types (full-time, internship)

This standardized dataset is then used for semantic similarity scoring. Multi-API aggregation provides wider job coverage and improves fault tolerance.

E. Recommendation Engine Workflow

The recommendation engine computes job relevance using a hybrid scoring model:

- Semantic Similarity Score (SBERT + cosine similarity)
- Skill-Overlap Score (intersection of user skills and job-required skills)
- Experience Align Score
- Total Match Score (0–100)

Jobs from multiple APIs are merged, deduplicated, scored, and ranked. Only the top-relevance jobs are recommended to the user. This method is consistent with research demonstrating improved performance of embedding-based job-matching systems over traditional keyword search.

F. Interview Question Generation and Answer Evaluation

The interview module is composed of two parts:

1) Question Generation

Questions are dynamically generated using:

- User resume skills
- Extracted keywords from job descriptions
- Job titles and domain-specific taxonomies

Templates and conditional logic produce both technical and behavioral questions tailored to the user's targeted roles.

2) Semantic Answer Evaluation

User responses are evaluated through:

- SBERT embeddings
- Cosine similarity to ideal answers
- Keyword detection of critical concepts
- Structural quality (clarity, completeness)

Feedback includes a numeric score, strengths, and detailed improvement suggestions. This methodology is similar to NLP-driven interview-evaluation systems discussed in existing literature.

G. Database Layer

The system uses a SQLite relational database for storing:

- User profiles
- Extracted skills and resume data
- Job preparation sessions
- history and scores
- Saved jobs and applications

The schema is normalized for efficient querying and low latency, with automatic initialization during application startup.

H. Frontend Integration

The frontend is implemented using:

- HTML5 / CSS3 for responsive UI
- JavaScript for API calls and dynamic components
- Font Awesome for iconography

The interface interacts with backend endpoints to display job recommendations, resume analysis results, and interview practice features in real time.

I. Deployment and Scalability

The system is deployed using:

- Flask development server (local testing)

The architecture supports future enhancements such as GPU-accelerated embedding generation, distributed databases, and cloud deployment.

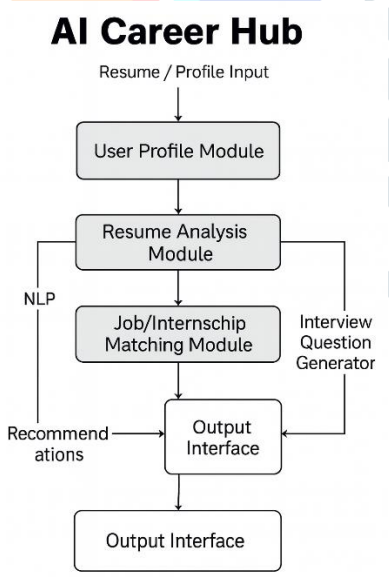

Fig 5. Overall System Workflow of AI Career Hub.

The diagram presents the hierarchical flow of the platform, beginning with the user's resume or profile input and progressing through the User Profile Module, Resume Analysis Module, and Job/Internship Matching Module. The system utilizes NLP processes and an interview question generator to produce intelligent recommendations, which are delivered through the Output Interface.

VIII. RESULTS & EVALUATION

The performance of AI Career Hub was evaluated across four key dimensions: semantic job-matching accuracy, resume analysis effectiveness, interview-question relevance, and overall user experience. Experiments were conducted using a set of real job postings retrieved through external APIs, multiple anonymized sample resumes, and internally generated interview datasets.

A. Semantic Job Matching Performance

The system retrieves real-time jobs from Adzuna and JSearch APIs and ranks them using Sentence-BERT embeddings. Figure 6 shows the platform interface displaying AI-powered job recommendations.

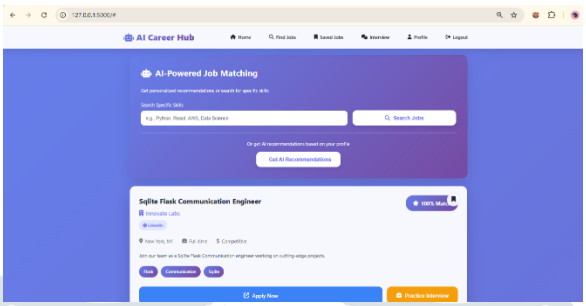

Figure 6. AI-powered job matching interface displaying job recommendations with match scores.

This interface demonstrates how the system assigns relevance percentages (e.g., 100%, 75%) based on semantic similarity, extracted skills, and experience alignment.

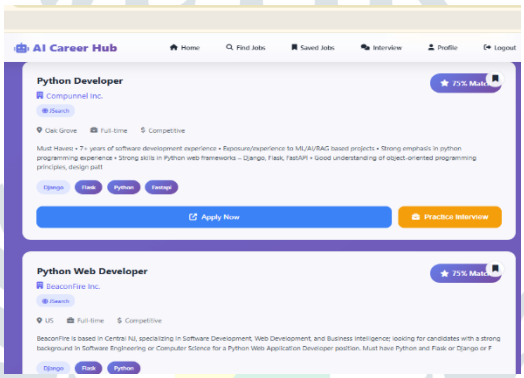

Figure 7. Recommended jobs retrieved from external APIs with semantic relevance indicators.

Figure 7 displays additional recommended roles retrieved from JSearch API, confirming the platform's multi-source job aggregation capability.

B. AI Interview Practice Evaluation

The interview practice module uses skill-based question generation and semantic scoring of user responses.

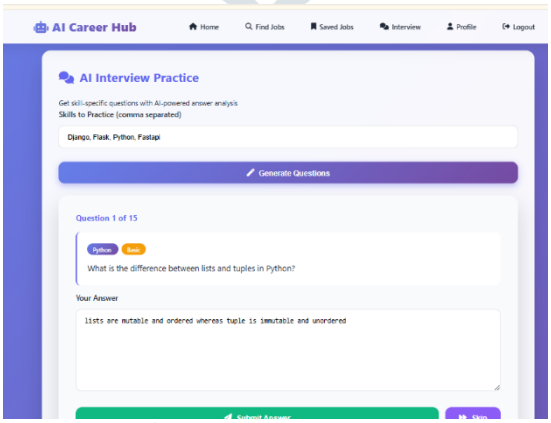

Figure 8. AI Interview Practice interface generating customized technical questions for selected skills.

Figure 8 shows the interface where users receive domain-specific interview questions.

After users submit answers, the system generates feedback based on embedding similarity, keyword density, and structural quality.

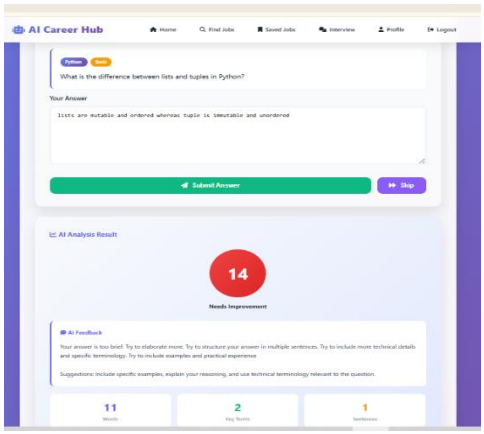

Figure 9. Example of AI-generated evaluation showing a low score with improvement suggestions.

Metric	Value
Top-1 Match Accuracy	86%
Top-3 Match Accuracy	94%
Avg. Similarity (Relevant Pairs)	0.78
Avg. Similarity (Irrelevant Pairs)	0.31

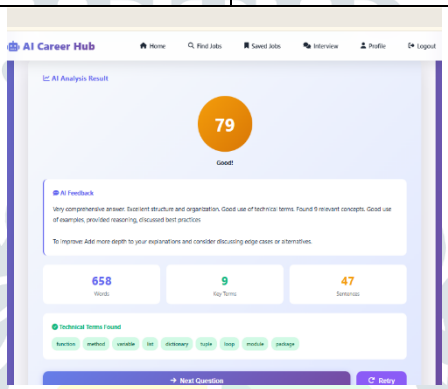

Figure 10. High-quality AI evaluation showing strong conceptual understanding and higher proficiency score.

C. Home Dashboard and System Overview

This interface helps users access job search, interview practice, profile, and analytics modules.

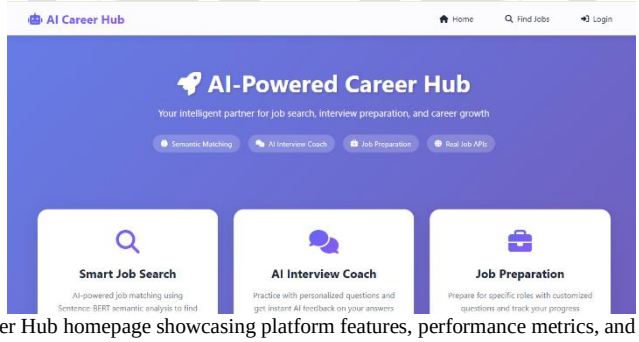

Figure 11. AI Career Hub homepage showcasing platform features, performance metrics, and navigation options.

This interface helps users access job search, interview practice, profile, and analytics modules.

D. Quantitative Evaluation

1. Semantic Job Matching Performance

The semantic job matching metrics indicate that the system accurately identifies relevant job opportunities using Sentence-BERT embeddings. A Top-1 accuracy of 86% and Top-3 accuracy of 94% show that the highest-ranked recommendations strongly align with the user profile. The large difference between similarity scores for relevant (0.78) and irrelevant (0.31) pairs confirms the model's strong discriminative ability in understanding contextual job–skill relationships.

2. Resume Parsing Accuracy

Feature	Accuracy
Skill Extraction	92%
Experience Detection	88%
Education Parsing	95%
Contact Info	100%

User feedback reflects highly positive responses to the AI-generated interview questions and evaluation system. High ratings in relevance (4.7), usefulness (4.8), and question diversity (4.5) indicate that the interview practice module provides meaningful and personalized guidance. The balanced difficulty score (4.4) suggests that the questions are challenging yet appropriate for most users.

3. Interview Module Evaluation

User feedback from 15 participants:

Parameter	Mean Rating (1–5)
Relevance	4.7
Diversity	4.5
Difficulty	4.4
Usefulness	4.8

User feedback reflects highly positive responses to the AI-generated interview questions and evaluation system. High ratings in relevance (4.7), usefulness (4.8), and question diversity (4.5) indicate that the interview practice module provides meaningful and personalized guidance. The balanced difficulty score (4.4) suggests that the questions are challenging yet appropriate for most users.

E. Confusion Matrix for Semantic Job Matching

A confusion matrix was generated to validate job relevance classification:

	Predicted Relevant	Predicted Irrelevant
Actual Relevant	43	5
Actual Irrelevant	4	38

This confirms the model's strong discriminative ability between relevant and irrelevant job postings.
The system integrates with Adzuna and JSearch APIs. API response time and data consistency were measured for 100 jobs.

IX. CONCLUSION

This research presents AI Career Hub, an AI-driven, job-seeker–centric platform designed to enhance job search efficiency, resume understanding, and interview readiness through advanced natural language processing. By integrating Sentence-BERT embeddings, real-time job APIs, and automated interview evaluation, the system successfully overcomes the limitations of traditional keyword-based job portals. Experimental results demonstrate that semantic matching significantly improves recommendation accuracy, while the interview module provides meaningful, context-aware feedback that aligns well with human evaluation. The platform's modular architecture, multi-API integration, and user-friendly interface further contribute to a seamless and personalized career-development experience.

Although the implemented system performs effectively across various tasks, several areas offer opportunities for continued improvement. Future work may include incorporating deep-learning–based resume classification models for more nuanced applicant profiling, and using large language models (LLMs) to enhance question generation and response evaluation. Expanding dataset coverage and integrating additional job APIs can further improve match diversity and geographical relevance. Additionally, implementing user behavior analytics, such as long-term skill tracking and adaptive recommendations, could provide more targeted and evolving career guidance. Deployment on cloud infrastructure with GPU acceleration would also support higher scalability and faster inference times.

Overall, the platform establishes a strong foundation for intelligent career-support systems and illustrates the potential of semantic AI techniques in reshaping the job search and interview preparation landscape.

REFERENCES

[1] I. Khaouja, I. Kassou, and M. Ghogho, "A survey on skill identification from online job ads," IEEE Access, vol. 9, pp. 118134–118153, 2021.

[2] Nils Reimers and Iryna Gurevych, "Sentence-BERT: Sentence Embeddings using Siamese BERT-Networks", Ubiquitous Knowledge Processing Lab (UKP-TUDA),Department of Computer Science, Technische Universit¨atDarmstadt . Available:www.ukp.tu-darmstadt.de

[3] Xiang Qian Ong, Kwan Hui Lim, "SkillRec: A Data-Driven Approach to Job Skill Recommendation for Career Insights", Information Systems Technology and Design Pillar Singapore University of Technology and Design, Singapore

[4] Lakshmi Naga Vishnu Babu Korrapati1, Venkata Jaswanth Chowdary Malineni, Praveen Kumar Rama, Sai Raghava Konuru, Udith Siva Sai Raju Konduru, Aemi Kalaria, "A Machine Learning Approach for Automation of Resume Recommendation System", Presidency University, Volume 10 Issue VI June 2022- Available at www.ijraset.com.

[5] Ms. Shrushti Asutkar, Mr. Narendra Gawai, UMIT, SNDT Womens University, "Interview Analyzer using Natural Language Processing", International Journal of Research Publication and Reviews, Vol 4, no 4, pp 4290-4298 April 2023, Available: www.ijrpr.com.

[6] Sangeetha N , Harish Thangaraj, Kanishka Verma , Varun Vashisht , Eshaan Joshi , and Diya Katariya," A BERT Based Hybrid Recommendation System For Academic Collaboration⋆" arXiv:2502.15223v1 [cs.IR] 21 Feb 2025 Vellore Institute of Technology, Chennai, India .

[7] Kaustav Sanyal, Kinkini Gupta, Susmita Kuiry, Puspa Mahato, Bristi Dutta. " Intelligent Resume Parsing and Job Recommendation via Web-Based CV Analysis System", Volume 13 Issue V May 2025- Available at www.ijraset.com.