

AI Powered Career Guidance System

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Abstract—Career development and education guidance is an important part of academic and professional performance of a student. The conventional approach to counselling is however hampered by the high student to teacher ratios, low accessibility and the growing complexity of career choice especially in developing nations such as India. The current developments in Artificial Intelligence (AI) and recommendation systems provide scalable and individualized options to provide data-driven guidance. Specifically, Large Language Models (LLMs) facilitate adaptable, context-sensitive career advising systems that are no longer applicable in the context of the fixed recommendation methods. It is suggested that this work is an AI-driven educational and career recommendation system, which uses admission prediction in machine learning combined with content and popularity-based recommendation systems. The system matches the interests, performance, and abilities of students with appropriate academic and career paths and assists in making informed choices. The suggested solution can be used to create a more accessible, scalable, and student-centered guidance system by combining intelligent suggestions and adaptive technology solutions.

I. INTRODUCTION

The large-scale technological developments and the progressive work environment requirements have made the process of making the right academic and career decisions complicated. The conventional approaches of career counselling tend to be limited with regards to personalisation, accessibility, and scalability. Although previous AI-based systems were based on rules-based models and fixed datasets, new developments have emerged based on more intelligent and customized systems based on machine learning and web-based systems. With the introduction of Large Language Models (LLMs), career guidance systems have reached substantial new levels of flexibility, situational recommendations, resume generation, and customized career advice. Nevertheless, most of the current solutions are implemented in the context of individual functions and

do not contain components of continuous assessment of profiles and on-demand support. In this project, the proposed AI-based career advice system is going to fill these gaps by integrating profile analysis, industry knowledge, resume generated according to ATS, cover letter written based on particular roles, and skill evaluation into one system. Its aim is to provide user-centric, scalable and adaptive career support in order to make informed decisions and continuously improve on their own.

II. LITERATURE REVIEW

Safi and Singh [1] provide a systematic literature review of phishing website detection methods, specifically machine learning and deep learning and hybrid methods. Even though the paper is not directly connected to career guidance, it identifies significant elements of AI system design, such as data quality, feature selection, model evaluation, and security issues. The findings can be used in AI-based career websites that deal with sensitive user information and need credible, trustworthy, decision-making systems. Majjate et al. [2] introduce an academic guidance and counselling system which is based on AI to produce recommendations using student profiles and interests. The system is based on individual academic advising based on the analysis of educational history and preference data. Although the strategy enhances accessibility and customization, its focus is more on academic advice and does not involve constant profile re-assessment, industry understanding, and document creation capabilities. El-Keiey et al. [3] proposes a career recommendation system to undergraduate students based on machine learning methods along with feature selection methods. Their study shows the relevance of attributes-based selection which enhances the accuracy of recommendation. Nevertheless, the system is based on fixed sets of data, and the

recommendations are given in a one-time mode, which restricts its flexibility to user competencies development or the alteration of the job market situation. Zheng et al. [4] suggest a generative job recommendation paradigm with the use of Large Language Models. Their strategy goes beyond the traditional matching-based systems to produce personalized job opportunities based on the profiles of the users. Although this piece proves that LLMs can offer flexible and explainable job suggestions, it primarily concentrates on job creation and lacks the additional aspect of career advice like skill guidance, profile maintenance, or the provision of long-term learning. A career counselling is a machine learning-based system offered to graduate students by Singh [5]. The system evaluates academic performance and aptitude in order to prescribe appropriate career paths. Despite being successful in career guidance automation, the method is based on pre-existing models as well as lacks real-time market intelligence as well as responsive feedback systems, which have become more and more valuable in dynamic job markets. Rahim and Basheer [6] suggest a hierarchical and multi-layer individualized career recommender system based on the aptitudes of individuals. The system brings in the concept of layered decision-making to enhance accuracy of rules. Although the hierarchical design is better suited to personalization, the system is still more of a recommendation-based system that is not integrated with document generation, skill validation, or ongoing interaction with the user. Pimple [7] presents the Career Compass, an artificial intelligence-based career guidance engine that takes into consideration interests, technical and soft skills. The system focuses on all round profiling and enhanced personalization. Nevertheless, continuous re-evaluation, integration of trends in the industry, and improvement of AI response based on feedback is not discussed in the study, which constrains its flexibility in the long term. Westman [8] investigates the expansive application of artificial intelligence in career guidance, elaborates on opportunities and challenges and ethical dilemmas. The paper focuses on explainability, trust, and human-AI cooperation values in guidance systems. Although the work contains good conceptual underpinnings, an actual system architecture and implementation framework is not presented. The AI-powered Career Path Recommendation System that has been described

in [9] shows a mobile-based system that connects the career path recommendations, the resume analysis, and the job market analysis. The system portrays the usefulness of having various career-support features in one platform. Nevertheless, it is mainly aimed at recommendation and analysis without showing any focus on the constant updates of the profile and AI improvements via feedback. The Smart Career Guidance and Recommendation System presented in [10] dwells upon skill-based career guidance based on machine learning. The system emphasizes on skills congruence when making career decisions. Although effective in the skill-based matching, the method lacks the features of generative AI, adaptive reassessment, or integrated learning recommendations., or integrated learning recommendations.

III. DATA AND METHODOLOGY

The system suggested is a feedback-based and dynamic ecosystem. This architecture is based on the continuous development of profiles and asynchronous integration of AI, in contrast to fixed career platforms. In creating the AI-based career guidance system, an extensive set of data comprising of diverse career opportunities within the professional context and their unique skill sets are used. This dataset covers a wide range of categories (such as Software Development and Engineering, Data Science, Artificial Intelligence, and Security) and aligns each of those with certain technical competencies, such as Web Development, Machine Learning, Cybersecurity, and Data Analysis.

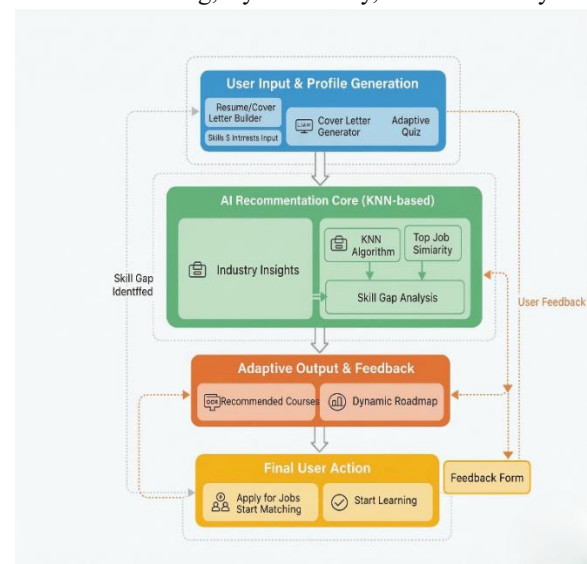


Fig 1: Flow chart of the system

All these qualitative skill sets are then converted into multi-dimensional feature vectors during the training phase to be processed using a K-Nearest Neighbours (KNN) algorithm. The system can determine the most similar professional profiles of a user based on the historical success data of matching the current profile vector of the user with the successful trajectories recorded in the dataset and propose the most appropriate career paths by computing the Euclidean distance between the currently available profile vector and the successful ones in the dataset.

A. Technical Framework and Architecture

The system is based on a full-stack Next.js implementation and the hybrid nature of the framework is exploited to both frontend user interface and backend server logic. The option is a high-performance Server-Side Rendering (SSR) and smart data fetching. The frontend is a lightweight, stateless interface that is concerned with user interaction and visualization of results, whereas the backend uses Next.js API routes and Server Actions as secure gateways between the user, the database, and the AI inference layer.

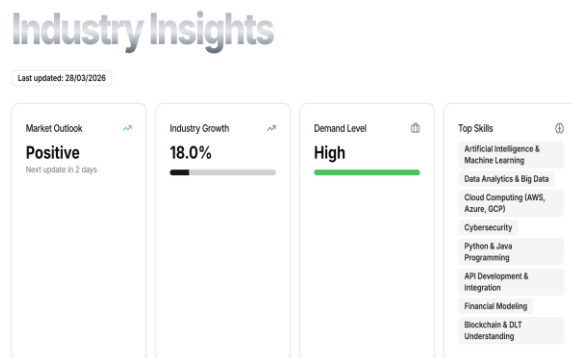


Fig 2: Ai generated insights based on profile

B. Recommendation Engine: K-Nearest Neighbour (KNN)

- The main element of the personalised guidance system is a recommendation engine which is based on the K-Nearest Neighbour (KNN) algorithm. This enables matching based on similarities between a live user and a database of well-known career paths.
- **Feature Vectorization:** Data related to the user such as measured skill set, academic record, and mock test scores are converted to multi dimensional feature vectors.

- **Similarity Metric:** In order to determine the most corresponding career paths, the system computes the Euclidean distance between the active user and the vectors of the dataset (v):

$$d(u, v) = \sqrt{\sum_{i=1}^n (u_i - v_i)^2}$$

- **Classification:** The system identifies the K most similar profiles to generate a weighted recommendation. This allows the platform to suggest "next steps" based on what individuals with similar profiles successfully achieved.

C. Backend Orchestration and AI Integration

The backend launches workflows that are computationally intensive in order to be responsive to the system. All requests are authenticated and input checked before they are sent to the Gemini API, rather than making direct calls to the frontend of the AI.

Contextual Prompting: Skills, performance in quiz performance and career interests are stored in the database and are synthesized into programmed prompts.

Output Normalization: The AI generated data would be converted into machine-readable JSON formats to make sure all modules of the Resume Builder, Cover Letter Generator, and Feedback have the same data.

Persistence and Invalidation: All the outputs are stored using a profile version with a timestamp. When a user refreshes their skills or finishes a new quiz, the system will be invalidated to force a background regeneration by labeling the existing resumes or insights as being out of date.

D. Performance-Based Feedback Loop

- The Mock Quiz Module is what makes this system different as compared to self-reported career tools. The system provides objective performance information into the feature vectors on which the KNN engine is based by computing competency metrics by interactive testing.

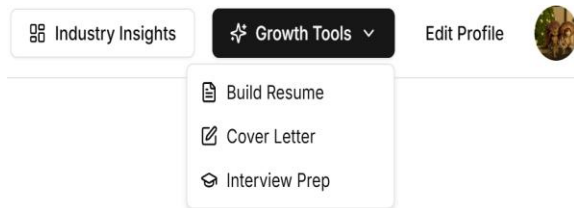


Fig 3: Modules

- **Dynamic Adaptation** As the user scores higher and higher in the quiz, their position in the multi-dimensional vector space changes and they might open up new career advice that was once distantly far in the Euclidean space.
- **User Interface** It has a centralized nature with all modules, i.e., Profile Management, Industry Insights, and Career Dashboard, arranged in a centralized manner, which will offer users with a smooth flow of capabilities as shown in the operation diagrams of the system (Figs. 1-3). (Figs. 1-3).

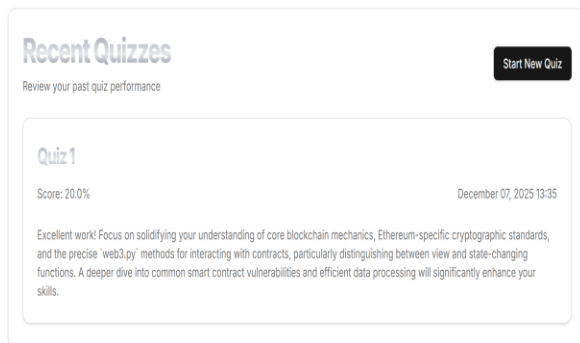


Fig 4: Quiz History

IV. MODULES

A. Authentication Module

User authentication modules refer to some features in application that are implemented as a security measure for the application. Some of these include login and logout features for the user, new user registration, and others. The User Authentication module is applied to authenticate and protect data from the use of the website.

B. Profile Management Module

This module assists in the storage and update of information that pertains to skills, education, interests, career objectives, among others. This database serves as the basis on which AI analyses the data and gives career recommendations.

Complete Your Profile

Select your industry to get personalized career insights and recommendations.

Industry

Select an industry

Years of Experience

Enter years of experience

Skills

e.g., Python, JavaScript

Separate multiple skills with commas

Professional Bio

Tell us about your professional background...

Fig 5: Professional Details

C. Job Recommendation with the Help of Artificial Intelligence Technology

The next stage in this process will be job recommendation, and this would be done with the help of artificial intelligence technology using information about the user himself/herself. There are various abilities possessed by an individual that form one of the considerations for making suitable recommendations.

D. Resume Builder Module

Resume builder module refers to another feature in the application that generates user resume. This includes formatting and inclusion of appropriate keywords to optimize search engines.

E. Cover Letter Module

Undoubtedly, the assistance provided by artificial intelligence could be very helpful when working on a cover letter in some professions. Thus, the design of this module should consider positive behavioural aspects of the user as well as ethical principles of the software use.

Fig 6: Cover Letter Generation

F. Skills Assessment Module

There can be no question that the key function of this module concerns the evaluation of the user's skills and revealing what skills are required for improvement according to the results of the test.

Interview Preparation

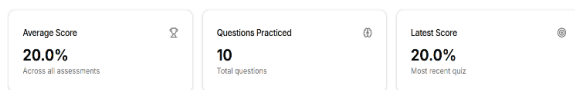


Fig 7: Quiz Evaluation

G. Suggestions and Adjustments Module

Considering behavioural features of the user, this module suggests certain actions the user needs to perform to become a better performer in his/her job.

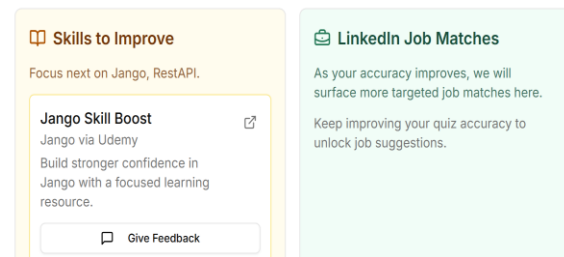


Fig 8: Suggestions

H. Labor Market Demands Module

one of the main tasks of this module relates to learning about current labour market demands and choosing a profession.

V. RESULT

This system was tested by performing the functional activities of the major modules such as the resume builder, cover letter generator, and industry insights modules. In cases where the users chose the resume builder module, the system produced resumes that met the Applicant Tracking System (ATS) standards. The resumes that were generated were role-relevant, well-structured in sections, and professionally formatted enhancing their ability to match automated recruitment

systems. The content was dynamic and updated with the latest profile data of the user to keep in touch with the latest capabilities, education, and experience. The cover letter tool created a personalized and job-related information according to the job position chosen. The letters created were professional, and they had the effect of highlighting the appropriate skills, career goals, as well as relevance to contextual motivation. This proved the fact that the system could produce application documents that are custom and not templates. The Fig. 2 provides examples of AI-generated insights and outputs based on user profiles and emphasizes the relevance of the generated content to context. Moreover, the industry insights module was useful to get valuable data about the current trends in the market, new roles, and required skills. These reports assisted users to learn more about how their profiles were matching the industry expectations and achieving informed decision making. The centralized dashboard that provides the availability of all modules as illustrated in Fig. 3 facilitated easy navigation and repetitive use of system characteristics. All in all, the results obtained demonstrate that the suggested system is able to provide adaptive and context-based career guidance. The combination of AI-generated paperwork and industry intelligence confirms the effectiveness of the system in interpreting data in user profiles to provide the appropriate and meaningful career support.

VI. CONCLUSION

The proposed study will respond to the increasing demand of one-on-one and scalable career counseling in an ever-changing employment environment. The conventional counselling methods are not flexible and they do not offer sustained and updated services to learners and job seekers. In order to address such issues, the suggested AI-based career guidance system combines the profile analysis, industry knowledge, resume generation based on ATS applications, role-specific cover letter generation, and skill evaluation in the same web-based platform. The platform allows ongoing profile reconsideration, allowing dynamic and context-sensitive suggestions as the user evolves his/her skills and career objectives. The findings provide evidence of its efficiency in providing adaptive guidance, creating individualized career records, and increasing the reliability of

recommendations based on performance-based evaluation. The next round of improvements will be centered on the improvement of personalization and learning support. The feedback by the user on the AI-generated outputs, which will be structured, will be included in an attempt to refine prompt strategies and enhance the quality of response with time. The system will further be expanded to give customized course and certification advice basing on the detected knowledge deficiencies, market trends, and evaluation outcomes. The platform can also help in the ongoing development of skills and prolonged professional growth by combining learning pathways with career guidance. In general, the presented system is a viable and scalable solution to intelligent, and adaptive.

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