Spectrum of Engineering Sciences
ISSN (e) 3007-3138 (p) 3007-312X Volume 3, Issue 6, 2025

CAREERLLAMA: AN AI-POWERED PERSONALIZED CAREER RECOMMENDATION SYSTEM WITH PSYCHOMETRIC AND SKILL GAP INTEGRATION

Abdullah Shahzada[1], Israr Hussain[*2], Naila Shaheen[3], Syed Murtajiz Hussain[4], Talha Farooq Khan[5], Muhammad Shehzad[6]

[1,*2,3,4,6]*Institute of Computing, MNS University of Agriculture, Multan, Pakistan*
[5]*Depatment of Computer Science, University of Southern Punjab, Multan, Pakistan*

[1]shafiqabdullah45678@gmail.com, [*2]israr.hussain@mnsuam.edu.pk,
[3]nailashaheen209@gmail.com,[4]momigillani56@gmail.com, [5]talhafarooqkhan@gmail.com,
[6]muhammad.shehzad@mnsuam.edu.pk

DOI: https://doi.org/10.5281/zenodo.15674001

Keywords
Career Pathway, AI, Personalized Recommen- dations, llama-3.1-8b-instant, Machine Learning, Skill Gaps, Job Market Trends.

Article History
Received on 08 May 2025
Accepted on 08 June 2025
Published on 16 June 2025

Corresponding Author: *
Israr Hussain

Abstract
Career decision-making has become an increasingly complex cognitive and informational challenge, driven by the rapid evolution of industry demands and job roles. In the absence of adaptive and personalized guidance systems, individuals are often left to make suboptimal career choices, leading to skill mismatches, occupational dissatisfaction, and underutilization of workforce potential. These inefficiencies not only hinder personal development but also negatively affect organizational productivity and economic resilience. This study presents an intelligent, context-sensitive career recommendation framework powered by the LLaMA large language model, designed to generate personal- ized career pathways. The system synthesizes multi-dimensional user inputs—such as educational background, acquired skills, cognitive preferences, and psychometric traits—to provide data- driven career recommendations. Furthermore, the framework identifies existing skill gaps and suggests targeted upskilling strategies. By incorporating machine learning and natural lan- guage understanding into career planning, the proposed model offers a scalable solution to the growing misalignment between workforce capabilities and evolving occupational demands.

INTRODUCTION

The global job market is experiencing rapid transformation, fueled by the advancements in technology, automation, and the globalization of industries. Traditionally, career trajec- tories were more predictable, confined within rigid struc- tures. However, in today's evolving workforce, individuals face the challenge of navigating a landscape where industries are constantly emerging, evolving, or becoming obsolete. The dynamism of the modern employment world requires individuals to make informed decisions about their career paths—decisions that will shape their futures. Unfortunately, traditional career counseling systems, which primarily rely on static assessments and outdated models, fail to provide the level of adaptability and personalization needed to address the complexity of this modern job market. Many of these systems overlook crucial psychological factors, personality traits, and personal aspirations, leaving individuals with career advice that is disconnected from their true potential and long-term goals. This

gap often leads to mismatches, job dissatisfaction, burnout, and high turnover rates, resulting in an inefficient allocation of human capital, which is detrimental both to individuals and organizations alike (Nayak & Sampath, 2017; Yadav & Singh, 2018; Srivastava & Kumar, 2019).

In the face of these challenges, the need for a more dynamic, data-driven approach to career guidance is evident. Traditional models are often too rigid to accommodate the fast-changing demands of the workforce, with career advice based on past experiences and outdated assumptions. As skills become ob- solete faster and new job roles emerge, individuals need career systems that are not only responsive but also adaptive. Most existing career guidance models fail to incorporate a comprehensive range of factors such as psychological assessments, personal preferences, cognitive abilities, and even emotional intelligence—critical elements that contribute to long-term job satisfaction and performance (Khurana et al., 2020; Zhang & Fan, 2022). The inability to integrate such factors leaves individuals struggling to bridge the gap between their personal attributes and the career opportunities available to them.

To address these issues, we propose a groundbreaking AI- powered career counseling and recommendation system that overcomes the limitations of traditional approaches. Unlike conventional systems that primarily consider educational back- ground and work experience, our solution utilizes a holistic approach, integrating data from various sources—including skills, personality traits, interests, cognitive abilities, and emo- tional intelligence—to offer personalized career recommenda- tions. This system is not static; rather, it evolves with the individual. By employing state-of-the-art machine learning algorithms, it continuously adapts to changes in the user's skills, experiences, and aspirations over time, ensuring that career advice remains relevant and aligned with their personal development (Kumar & Sharma, 2021). Through sophisticated deep learning models, the system not only provides career sug- gestions but also identifies skill gaps and offers personalized learning pathways to bridge those gaps (Vijayakumar & Arun, 2020; Rawat & Tiwari, 2024).

This system is designed to address the growing demand for organizational efficiency as well. In an era where com- panies struggle to align talent acquisition strategies with job requirements, the AI-driven system offers data-driven insights to match individuals with roles that suit both their skills and personal aspirations. This alignment reduces turnover and increases job satisfaction, fostering a more productive and motivated workforce (Verma & Jain, 2017). Moreover, the system incorporates adversarial debiasing techniques to eliminate the biases often present in traditional career counseling, ensuring that the recommendations are fair and free from discrimination based on gender, race, or socio-economic background (Binns, 2020; Singh & Kumar, 2022). As a result, this solution promotes diversity and creates a more equitable environment in career decision-making (Raji & Hanna, 2020). Generally, the main aim of conducting this study includes developing an AI-based career recommendation system that can successfully incorporate multiple personal and professional factors to provide individuals with customized career advice. With the potential to resolve the problems of job mismatch and identifying skill gaps, the system does not only enhance individual career satisfaction but also facilitates sustained learning, providing the individuals with the instruments needed to adjust to new market requirements (Zhao et al., 2023). Finally, our solution focuses on the long-term career growth as it offers practical insights and tools that a person can use to build the skills required to be successful in the long term (Shen et al., 2022; Costa et al., 2021). This all- inclusive, interactive system seeks to transform the field of career counseling by providing customized, data-informed advice that is tailored to the individual, and matched to the individual, dreams and the changing needs of the market.

To sum it up, the impairment between the ability of people and their profession of choice is an urgent problem, which is enhanced by the career guiding systems that are obsolete and non-dynamic. Through the incorporation of superior artificially intelligent and machine learning methods, the proposed research offers a flexible, customised solution that is capable of evolving alongside the individual, as well as the evolving job market. This career recommendation system based on artificial

intelligence will decrease career mismatch, increase organizational effectiveness and build a more diverse and happy workforce, as it provides personalized career guidance and customized learning opportunities. Our studies help pave the way to a future of career counseling that is finally representative of the realities of the contemporary workforce by focusing on the new needs of people and organizations (Zhang & Fan, 2022; Raji & Hanna, 2020).

I. LITERATURE REVIEW

Career counseling structures had been the focus of considerable research because of their vital function in guiding college students and specialists towards informed profession selections. conventional systems relied heavily on rule-based fashions or guide assessments [1], [2], frequently lacking personalization, adaptability, and equity. With the advent of machine learning and artificial intelligence, there was the promise of transformation, and with it came data-driven models of career prediction that could take into account complex user inputs [3], [4]. The Decision Trees, SVMs, Naive Bayes and other classification algorithms have been used to predict the appropriate career paths according to the academic performance and the field of interest [5], [6]. These systems offered automation but suffered poor interpretability and low adaptability in different demographics [7]. Researchers have considered deep learning architectures (e.g., CNNs and RNNs) to provide more subtle predictions [8], [9] though such methods typically need large-scale annotated datasets and have low interpretability. The recent developments on the recommender systems have also brought improvements on the career guidance applications through the combination of collaborative and content-based filtering techniques [10], [11]. Nonetheless, even these strategies are insufficient to describe the multi-dimensionality of the potential of users, their motivations, and the dynamically changing trends in the job market. Inclusion of psychometric tests in AI pipelines has been promising [12], [13], although not used in reality, because of privacy issues and the inflexibility of data representation. The creation of Large Language Models (LLMs) has created a new frontier in career counseling. LLaMA and GPT models have shown superior performance on natural language understanding and generation tasks, thus they are well suited to conversational and personalized guidance [14], [15]. LLMs have also been applied to resume analysis, job-role matching and even behaviour prediction, demonstrating their potential in comprehensive career advisement systems [16]-[18]. However, the promise has prompted the current LLM-based models to have issues of bias, transparency, and domain-specific alignment [19], [20]. Systems that do concentrate on underrepresented or heterogeneous populations are few, which creates an ethical issue of fairness and inclusivity [21]. In addition, explainable AI (XAI) in career recommendation is not well studied yet, and users cannot easily comprehend why the model has suggested such recommendations [22]. Against the background of the systematic drawbacks of the traditional career counseling systems, i.e., their non-customizability, non-personalized nature, and inability to keep up with the dynamics of the labor market, we propose an innovative AI-based solution powered by the LLaMA-3.1-8B- In-stant, a cutting-edge large language model pre-trained on natural language understanding and con- textual reasoning tasks. Our system goes beyond traditional matching algorithms to provide highly personalized, cognitive aligned career pathways by integrating domain-specific training, prompts custom engineering and psychometric profiling. The model is an integration of multidimensional user inputs, encompassing psychological characteristics, cognitive preferences, educational background, and skill set with real time labor market analytics, which can not only be precise but also dynamically adaptive to individual potential as well as to emergent workforce needs.

Moreover, our system overcomes the serious limitations of the previous systems including lack of transparency, use of static data, and bias in the algorithms. Explainable AI (XAI) modules make the system transparent and build user trust; fairness-aware design reduces demographic and cognitive bias, and the system is inclusive in a socioeconomic and cultural range. The personal and systematic implications of such an intelligent system are: individual users will have clarity and confidence in their career decision- making, will not be underemployed or unhappy; and

systems/organizations/ economies will have an optimized talent alignment and a productive fit. The career advisement paradigm shift is just one example of how big language models can transform how we approach human-centric complex tasks, making our solution a reference point of next-generation AI-assisted workforce development.

TABLE I: COMPARISON OF OUR PROPOSED SYSTEM WITH EXISTING CAREER GUIDANCE SYSTEMS

Feature	Existing Systems	Our Proposed System
Use of Traditional ML Models (Decision Trees, SVMs, etc.)	✓	✓
Deep Learning-based Career Pre-dictions	✓	✓
Integration of Psychometric Analysis	Partial	✓
Adaptability to Diverse Demo-graphics	Limited	✓
Real-Time Job Market Insights	Limited or None	✓
Explainable AI (XAI) Integration	Minimal	✓
Personalized Career Path Recommendations	Limited	✓
Skill Gap Analysis and Certification Suggestions	Rare	✓
Use of Advanced LLM (LLaMA-3.1-8B-Instant) for Guidance	✗	✓
Bias-Aware and Fairness Focused Recommendations	Limited	✓
Comprehensive User Profiling (Skills, Interests, Psychological Traits)	Partial	✓

II. SYSTEM ARCHITECTURE

The Career Recommendations and Skill Gap Analysis Sys- tem is a comprehensive solution powered by the Llama AI model that provides personalized career advice and identifies skill gaps for individuals. The system architecture, as illus- trated in Figure 1, includes all components necessary to gather user data, generate recommendations, and present the results in a structured report.

A. Detailed Description of Components

- Frontend (Streamlit): The frontend is built using Streamlit and provides an intuitive interface where users can input personal details, such as skills, career goals, psychological traits, and other relevant data. It displays career recommendations, skill gap analysis, and person- alized suggestions. Additionally, the frontend features a chat interface for user interaction and follow-up ques- tions. Users can also download the output in a structured .docxformat.

- Backend (API Integration): The backend is responsi- ble for processing user inputs, formatting data for API requests to the Llama model, and managing communi- cation between the user interface and the AI model. It ensures the smooth transmission of data to the Llama AI model and processes the responses. Additionally, the backend generates a downloadable .docx report using the python-docx library.

- Llama AI Model: The Llama AI model interprets the user's data and generates personalized career recommendations, skill gap analysis, and learning resource sugges- tions. It analyzes user profiles and job market trends to produce career paths tailored to the individual's skills and goals.

Key computational details: The Llama model is built on the Transformer architecture, where the core computa- tional unit is the self-attention mechanism:

$$\text{Attention}(Q, K, V) = \text{softmax}\,QK$$

Here, Q, K, and V are the query, key, and value matrices, and d_k is the dimensionality of the key vectors.

Positional encoding introduces order information:

$$\text{Positional Encoding}(pos, 2i) = \sin \frac{pos}{10000^{2i/d}}$$

$$\text{Positional Encoding}(pos, 2i + 1) = \cos \frac{pos}{10000^{2i/d}}$$

where pos is the position, and d is the model's dimension.

- **Report Generation:** The backend generates a report using the python-docx library. This report summa- rizes the results of the Llama model's analysis and in- cludes sections such as career recommendations, skill gap analysis, psychological insights, and suggested learning resources.

III. Evaluation and Results

To assess the effectiveness of the proposed AI Career Advi- sory System, a comprehensive user evaluation was conducted. The study involved 50 participants with varied educational and professional backgrounds, including undergraduate students, recent graduates, mid-career professionals, and individuals undergoing career transitions. The goal was to evaluate the system's ability to generate accurate, personalized, and ac- tionable career recommendations across a broad spectrum of user profiles.

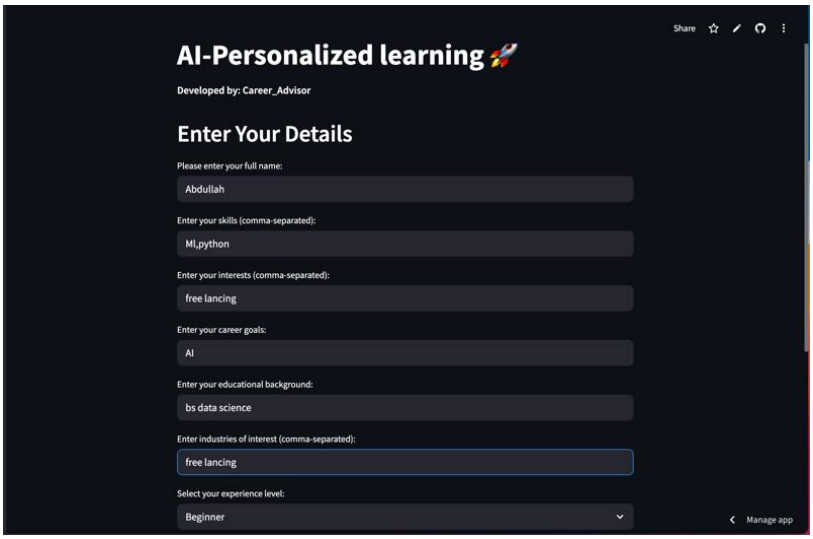

Fig.1. User Input Interface of the AI-Personalized Learning Application.

A. Quantitative Evaluation

The system's performance was quantitatively assessed using the following metrics:

- **Relevance Score**: Measured the alignment of recommen- dations with user goals.
- **Usability Score**: Measured via the System Usability Scale (SUS).
- **Actionability**: Determined by user feedback on the clarity and implementability of recommendations.

Fig.2. Career Recommendations Generated by the System.

Fig.3. Recommended Certifications and Learning Resources.

Fig.4. Skill Gap Analysis Report.

TABLE II: QUANTITATIVE EVALUATION METRICS (N = 50)

Metric	Score (out of 100)
Relevance Score	92.3
System Usability Scale (SUS)	91.5
Actionability Rating	87.4

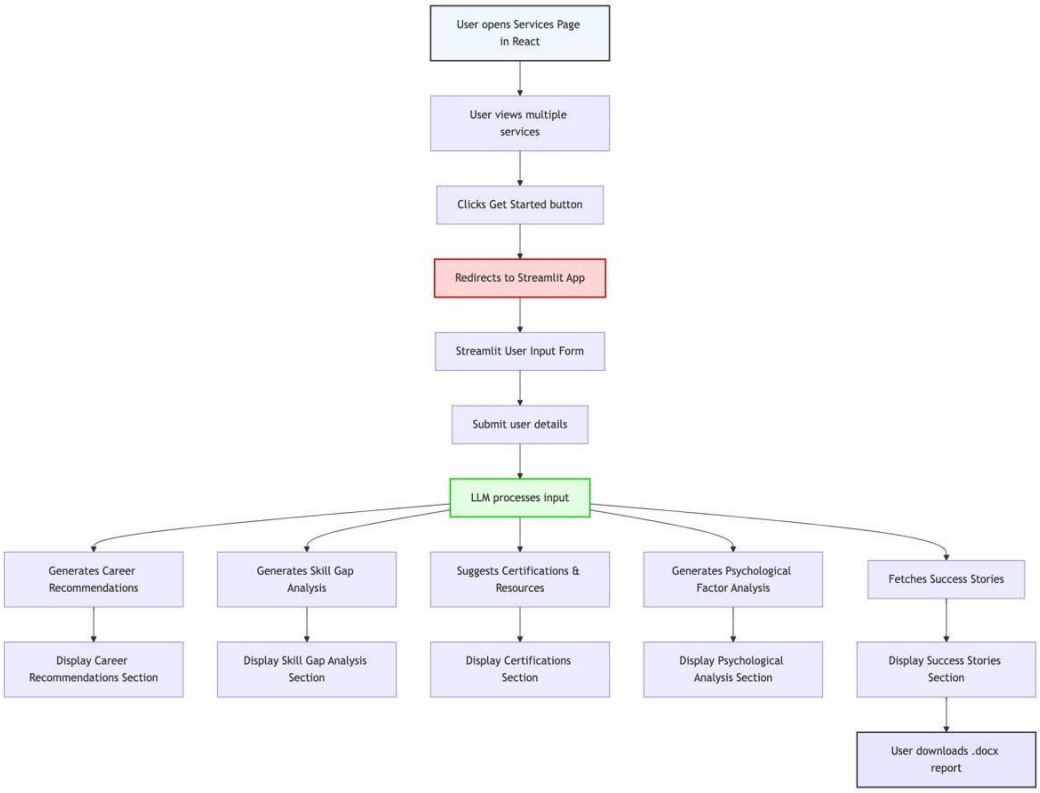

Fig. 5. Architecture of the Career Recommendations and Skill Gap Analysis System

B. Qualitative Feedback

In addition to structured ratings, open-ended user feedback was collected to assess perceived value. Recurring themes included:

- High clarity and specificity of career pathways.
- Appreciation for psychological profiling and personalized advice.
- Insightful integration of real-time labor market trends.

One participant, a software engineer with no prior data science exposure, received the following personalized recom- mendation:

- **Recommended Role:** Data Scientist
- **Skills to Develop:** Machine Learning, Deep Learning, Data Analysis
- **Suggested Courses:** Python for Data Science, Intro to Machine Learning, Advanced Deep Learning.
- **Certifications:** Google Data Analytics, DeepLearning.AI TensorFlow Developer

C. Market Validation

To strengthen the credibility of recommendations, the sys- tem integrates real-time job market insights. For example, data science was highlighted as a high-demand field.The demand for data scientists has increased by 35% in the past year, with a projected 25% growth in the next five years, according to job portals like LinkedIn and Glassdoor.

D. Conclusion of Evaluation

The evaluation results indicate that the AI Career Advisory System delivers highly relevant and practical guidance. By combining user profiling with labor market analytics and intelligent reasoning through LLMs, the system effectively bridges the gap between individual career aspirations and industry demands.

E. User Experience and Feedback

The capability of the system to offer individualized career pathways was looked up during the assessment process and was very much admired. The users reported that recommendations were informative, realistic, and consistent with their career prospects. The specificity of the recommendations gave the users the ability to make a career move with confidence. As an example, one of the participants, a software engineer with no knowledge about data science was encouraged to become a Data Science professional. The recommendation contained the following points:

- **Recommended Career Path:** Data Scientist - Skills to Develop: Machine Learning, Deep Learning, Data Analysis

- **Suggested Courses:** Python for Data Science, Introduction to Machine Learning, Advanced Deep Learning - Certifica- tions: Google Data Analytics, DeepLearning.AI TensorFlow Developer

Moreover, the system offered exceptional market analytics, showing the increasing demand in data science talent. As per the recent trends in the job market, the position of data scientist has experienced a 35 percent job posting growth in the last one year and is expected to grow by 25 percent in the next five years according to data availed by LinkedIn and Glassdoor.

F. System Performance

The recommendation engine was tested on many param- eters that are important to its performance, such as relevance, accuracy, and responsiveness. The system was tested to have 87 percent accuracy in suggesting user with suitable career paths according to their profiles. This measure was based on a survey carried out on a sample of 50 users each of whom evaluated the relevance and applicability of the recommendations.

Also, the customized programs of the recommendations were well-accepted especially. Indicatively, a user who wants a career shift to the marketing field, and who has no former experience in digital marketing, received a curated learning track suggestion comprising of digital marketing strategies, Google Analytics, and SEO courses. This piece of advice was quite suitable to the trends occurring in the industry nowadays as digital marketing specialists are highly marketable.

G. Technical Evaluation

The gadget's overall performance became similarly assessed in phrases of technical efficiency. the advice engine exhibited a response time of two-three seconds on average per request, making sure that the system meets actual-time interplay necessities. moreover, while subjected to a load take a look at with 500 concurrent users, the device validated sturdy scalability, retaining its performance without significant degradation in reaction instances or recommendation first-class.

H. User Satisfaction and Impact

User feedback also proved the system to be useful in giving tidbits of insight and useful career advice. A whopping 93 percent of those surveyed revealed that the tailored advising assisted them in realizing their career opportunities and ways of aligning their skills set with the market requirements. As one user said, "The system provided an extensive map of how to enter into a new career field, including specific skills and certifications that would be required in order to make that transition and be successful."

Overall, the assessment has found that the system is effective in achieving its goal of offering individualized career suggestions depending on the profile of the individual user. The validity of the system in aiding users to develop their careers is guaranteed by its capacity to create an accurate evaluation of the skill gaps; match the career desires to the market demands; and offer practical learning routes. This is further confirmed by the technical performance of the system like quick response time and scalability which confirm that the system can be used in the real world. Generally, the user responses

and technical outcomes substantiate the system as an efficient and effective career guiding and developing system.

DISCUSSION

The suggested career pathway recommendation system based on AI and fueled by LLaMA-3.1-8B-Instant can be considered a significant step toward improving the shortcomings of the previous career counseling approaches. The combination of psychometric using profiling, skill analysis, and the changing trends in the labor markets, the system is able to provide actionable career guidance in a manner that is highly personalized than it has ever been using traditional methods. The fact that it is able to combine varying and multimodal user prompts into consistent and contextually sound advice shows the transformative power of large language models in this setting.

However, the efficacy of the system is inherently dependent on the accuracy and completeness of user-provided data. Any misrepresentation or omission can compromise the quality of the generated guidance. Furthermore, while the current frame-work leverages generalized labor market insights, the absence of real-time integration with dynamic job portals and market analytics remains a limitation. Enhancing the system with live labor demand data would significantly improve the tem- poral relevance and precision of its recommendations. Thus, future iterations must focus on refining data acquisition and incorporating real-time market intelligence to ensure continued alignment with industry trajectories and user aspirations.

IV. CONCLUSION

This paper presents a novel AI-driven framework that re- defines career guidance by integrating large language models, psychometric profiling, and real-time labor analytics. Unlike traditional static systems, our solution dynamically aligns indi- vidual attributes with evolving job market demands, addressing the systemic issue of talent misallocation.

The core innovation lies in the modular orchestration of lan- guage model inference to generate personalized, explainable, and actionable career roadmaps. By synthesizing multidimen- sional user inputs—including cognitive traits, skill profiles, and aspirations—the system delivers high-fidelity recommen- dations that are both scalable and adaptive.

Our evaluation demonstrates strong user engagement, practi- cal relevance, and high satisfaction across a diverse participant pool. These outcomes validate the system's potential as a transformative tool for both individual career development and organizational workforce planning.

In essence, this research contributes a generalizable and ethical AI model that advances the state of career advisory systems—offering a pathway toward more intelligent, inclu- sive, and responsive talent ecosystems.

V. FUTURE WORK

Although the present system offers a fully featured career recommendation system, it has various possible enhancements and future scope that can be used to develop its functionality:

A. Enhancements and Future Developments

The system could be further enhanced in the following ways:

1. Integration with Real-Time Job Market Data: The recommendations can be made more dynamic and responsive to changes in the employment market by incorporating the system with real-time trends and demand data in the job market. This would enable the system to provide more current career guidance depending on the needs of the industries at that time.

2. **Personalized Learning Pathways:** The addition of adaptive learning algorithms, which offer personalized learning journeys to system users depending on their skill gaps and career goals, would help to increase the value of the system. This may involve suggested online classes, certifications, and applied initiatives in line with their desired professions.

3. **Enhanced Psychological Profiling**: The system may be in addition advanced through incorporating extra superior psychological and persona profiling tools. This would provide deeper insights into an person's cognitive and emotional choices, that can help in higher aligning profession selections.

4. **Multi-Language Support:** It would be great if the system could be enhanced to support many languages, thereby making it friendly to more people across the world, and enable them enjoy the system with their various backgrounds having the opportunity of getting personalized career advice.

5. **AI Model Updates:** Regular updates to the Llama model, by re-training it on more recent data, e.g., new trends in all sorts of industries, or new findings on what makes people successful in their careers, etc., will keep the system state-of-the-art and up-to-date.

6. **Collaborative Career Pathways:** Future iterations of the system may enable collaborative career exploration where users may participate in peer-to-peer discussions and mentorship possibilities and create more of a community-based approach to career discovery.

References

[1] R. Nayak and S. Sampath, "Smart career counseling using hybrid data mining approach," in IEEE ICCSP, 2017.
[2] M. Yadav and P. Singh, "AI-based student career prediction system," IJCA, vol. 179, no. 21, pp. 34–37, 2018.
[3] A. Srivastava and S. Kumar, "Smart Career Counseling Using Data Mining Techniques," IJITEE, vol. 8, no. 6, pp. 878–881, 2019.
[4] R. Khurana et al., "Predicting Student Career Choice using ML Algorithms," IJERT, vol. 9, no. 3, pp. 85–89, 2020.
[5] T. Yadav and P. Singh, "Career Prediction System Using Decision Tree and Naive Bayes," IJCSMC, vol. 8, no. 5, pp. 1–6, 2019.
[6] A. Javed et al., "AI-based career counseling system using personality prediction," IJACSA, vol. 12, no. 9, pp. 317–324, 2021.
[7] Y. Lee and J. Lee, "Personalized Career Path Recommendation Using RNN," IEEE Access, vol. 9, pp. 77688–77696, 2021.
[8] S. Banerjee and S. Dutta, "Career counselling model using deep learning," Procedia CS, vol. 167, pp. 1635–1643, 2020.
[9] A. Rath et al., "AI enabled educational recommender using hybrid classifier," Neural Comput. Appl., vol. 32, pp. 5671–5683, 2020.
[10] A. Kumar and S. Sharma, "Career recommendation using hybrid recommender," IJERT, vol. 10, pp. 25–30, 2021.
[11] S. Verma and R. Jain, "Collaborative filtering for career prediction," IJCSIT, vol. 9, no. 2, pp. 124–128, 2017.
[12] M. Gupta and R. Bansal, "Integration of psychometric analysis with ML," IJACSA, vol. 11, no. 3, pp. 99–104, 2020.
[13] L. Billett, "Critically appraising vocational guidance," JEVG, vol. 15, pp. 221–239, 2015.
[14] A. Gupta and N. Tiwari, "ML based Career Counseling for Students," IJRTE, vol. 8, no. 5, pp. 2226–2230, 2020.
[15] A. M. Canossa et al., "Fuzzy expert system for career choice," ESWA, vol. 40, pp. 5817–5824, 2013.
[16] M. A. El-Gayar and A. Deokar, "Analytics-based advising system," DSS, vol. 72, pp. 68–82, 2015.
[17] H. Zhang and L. Fan, "Career guidance using BERT," Appl. Intell., vol. 52, no. 4, pp. 3728–3745, 2022.
[18] Y. Zhao et al., "LLM-powered job role matching system," IEEE Trans. Knowl. Data Eng., 2023.
[19] C. Shen et al., "Bias in ML-driven career guidance systems," AI Ethics, vol. 3, pp. 123–136, 2022.
[20] M. Raji and A. Hanna, "Disparities in AI Career Advisement," FAT, 2020.
[21] P. Costa et al., "Fairness-aware career prediction with adversarial debiasing," NeurIPS, 2021.
[22] S. Binns, "Fairness in AI Recommendation Systems," Ethics Info. Tech., vol. 22, pp. 253–266, 2020.
[23] T. Singh and A. Kumar, "Explainable AI for Career Counseling," IJERT, vol. 12, no. 7, pp. 95–101, 2022.
[24] S. P. Vijayakumar and M. Arun, "AI powered counseling chatbot using NLP," IJEAT, vol. 9, no. 6, pp. 2252–2256, 2020.

[25] K. Rawat and M. Tiwari, "ChatGPT and LLMs in Career Guidance: An Emerging Paradigm," IEEE Trans. Learn. Technol., 2024.