International Journal on Advanced Computer Theory and Engineering
ISSN: 2319 - 2526
Volume 15 Issue 2s (2026) | Pages: 1-6

Future Map: AI-Powered Personalized Learning and Career Path Platform

Prathamesh Rajendra Bhagwat[1], Omkar Santosh Chavhan[2], Pradnya Ajinath Gore[3], Nilesh A. Suryawanshi[4]

[1,2,3,4] Department of Artificial Intelligence and Data Science Engineering G.S.Moze College of Engineering Pune, Maharashtra, India
Email: bhagwatprathamesh2626@gmail.com, ochavhan02@gmail.com, gpradnya68@gmail.com, nileshsuryawanshipatil088@gmail.com

Peer Review Information

***Type**: Article*
***Received**: 13 February 2026*
***Revised**: 14 March 2026*
***Accepted**: 15 April 2026*
***Published**: 18 May 2026*

Abstract

Choosing the right career path isn't as straightforward as it used to be. With so many options and rapidly changing technologies, students often find themselves unsure about what direction to take. Traditional career guidance methods usually depend on fixed questionnaires and general suggestions, which don't always reflect an individual's actual interests, skills, or goals. This paper presents an AI-based career guidance system designed to offer more personalized and practical recommendations. Instead of relying on a single technique, the system combines machine learning, natural language processing, and recommendation methods to better understand user inputs such as interests, preferences, and skill levels. It includes features like career prediction, skill-gap identification, learning roadmap generation, and college recommendations. An interactive chat interface is also included to make the system easier to use and more engaging. The system is built using a modern full-stack approach that supports real-time interaction and scalable data handling. By bringing together multiple AI components into one framework, the goal is to provide more relevant and user-focused career guidance without making the system overly complex. The approach focuses on practicality, making it suitable for real-world use while still maintaining good accuracy and adaptability.

Keywords: Artificial Intelligence; Career Guidance System; Personalized Learning; Machine Learning; Natural Language Processing; Recommendation Systems

How to Cite This Article

Bhagwat, P., Chavhan, O., Gore, P., Suryawanshi, N., (2026). Future Map: AI-Powered Personalized Learning and Career Path Platform. *International Journal on Advanced Computer Theory and Engineering*, 15(2s), 1–6.

Introduction

Making career decisions has become increasingly complex in today's fast-changing world. Students are exposed to a wide range of career options, but often lack clear direction on how to choose the right path. The problem is not just the number of choices, but also the lack of personalized guidance that considers an individual's interests, skills, and long-term goals. As a result, many students end up feeling confused or make decisions based on limited or generic information. Traditional career guidance methods, such as manual counseling and basic aptitude tests, have been useful to some extent but come with clear limitations. These approaches are usually static and do not adapt as a student's preferences or abilities evolve over time. In many cases, they also fail to connect career suggestions with actual skill requirements or available learning resources. This creates a gap between what students are advised to pursue and what they actually need to do to achieve those goals.

With the growth of artificial intelligence, there is an opportunity to improve how career guidance systems work. Technologies such as machine learning and natural language processing allow systems to analyze user data more effectively and provide recommendations that are better aligned with individual needs. Modern systems are also capable of offering interactive experiences, making the guidance process more engaging and accessible. In this work, an AI-based personalized career guidance system is proposed to address these challenges. The system focuses on combining different technologies to provide more meaningful and adaptive recommendations. It not only suggests career paths but also helps users understand the skills they need and the steps required to achieve their goals. By integrating features such as career prediction, skill-gap analysis, and roadmap generation, the system aims to offer a more practical and user-centered approach to career planning. The main objective of this paper is to design and present a system that improves the overall effectiveness of career guidance while keeping the solution simple and scalable. The proposed approach focuses on usability and real-world application, ensuring that users can easily interact with the system and benefit from its recommendations without requiring technical expertise.

Literature review

Over the past few years, a number of AI-based systems have been developed to improve personalized learning and career guidance. Many of these systems rely on machine learning techniques to analyze user data and generate recommendations. For example, recommendation systems based on collaborative and content-based filtering have been widely used to suggest learning resources and career paths. These approaches help improve personalization, but they often depend heavily on the availability and quality of user data.

Another important area of development is the use of natural language processing in educational systems. Chatbots and virtual assistants are increasingly being used to provide real-time support and guidance. These systems make interaction easier and more accessible for users. However, they sometimes struggle with maintaining context over longer conversations and may not always provide highly accurate or personalized responses.

Recent studies have also explored the use of knowledge graphs and advanced AI models to improve recommendation accuracy. Knowledge graph-based systems focus on understanding relationships between skills, courses, and career options, which helps in providing more structured recommendations. Similarly, modern approaches using large language models aim to generate more flexible and adaptive responses. While these methods show promising results, they often come with increased complexity and computational requirements.

Despite these advancements, many existing systems still operate using a single approach and do not effectively combine multiple techniques. This limits their ability to provide fully personalized and adaptive career guidance. These limitations highlight the need for systems that integrate different methodologies in a balanced and practical manner, which motivates the development of the proposed system in this work.

Problem Statement

Choosing the right career path remains a challenging task for many students due to the lack of personalized and structured guidance. Most existing career guidance systems rely on static questionnaires or limited data analysis, which often results in generic recommendations that do not fully reflect an individual's interests, skills, and long-term goals. As a result, users may receive suggestions that are either too broad or not practically useful. Another key issue is that many systems do not provide a clear connection between career recommendations and the skills required to achieve them. While users may be informed about possible career options, they are often not guided on how to bridge the gap between their current abilities and the desired career path. This absence of skill-gap analysis and structured learning direction reduces the effectiveness of such systems.

In addition, most platforms operate using a single approach, such as basic recommendation logic or simple machine learning models, without integrating multiple techniques. This limits their ability to adapt to user behavior and provide more accurate, real-time recommendations.

Therefore, there is a need for a system that can combine different AI techniques to deliver personalized, practical, and adaptive career guidance in a more effective way.

Proposed System

The proposed system is an AI-based personalized career guidance platform designed to assist users in making informed career decisions based on their individual interests, skills, and preferences. Unlike traditional systems that rely on a single approach, this system combines multiple techniques to provide more relevant and practical recommendations. The main goal is to create a user-friendly solution that not only suggests career options but also guides users on how to achieve them. The system begins by collecting user input through an assessment process, which may include questionnaire responses, user profile data, and interactive chat-based inputs. This information is analyzed using a combination of machine learning and recommendation techniques to identify suitable career paths. The system also incorporates natural language processing to enable smooth interaction through a chatbot interface, allowing users to ask questions and receive guidance in a more conversational manner.

One of the key features of the proposed system is career prediction, where user data is evaluated to suggest potential career options that align with their profile. In addition to this, the system performs skill-gap analysis by comparing the user's current skills with the requirements of selected career paths. Based on this analysis, it generates a structured learning roadmap that helps users understand the steps needed to progress toward their goals. The system also includes a college recommendation module, which provides suggestions based on user preferences such as location, course, and other relevant factors. All these features are integrated into a single platform, ensuring that users receive a complete and connected experience rather than fragmented information from different sources. Overall,the proposed system focuses on combining multiple AI-driven components into a practical and scalable solution. It aims to improve the accuracy of recommendations, enhance user engagement through interactive features, and provide clear guidance that users can follow. The design emphasizes simplicity and usability, making it suitable for real-world application while still leveraging the benefits of modern AI technologies.

System Design and Architecture

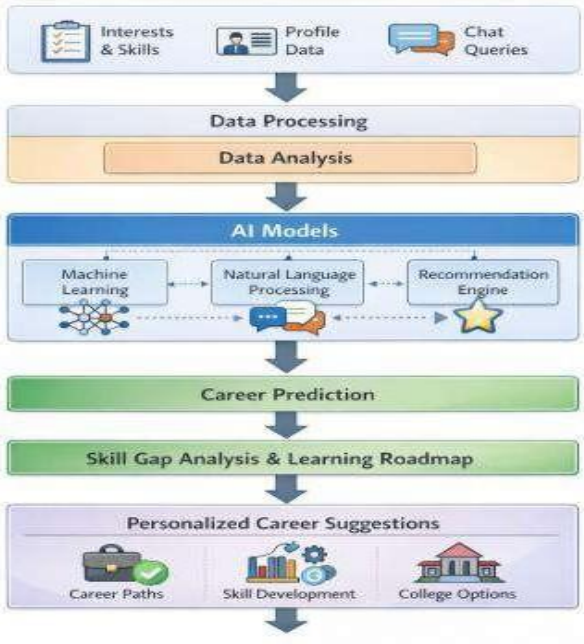

***Fig. 1**. System Architecture*

The system architecture of the proposed AI-based career guidance platform is designed to provide a smooth flow of information from user input to final recommendations. It follows a structured approach where different components work together to process data, analyze user behavior, and generate personalized outputs. The overall design focuses on simplicity, modularity, and ease of integration. The process begins with the user input layer, where information is collected through multiple sources such as assessment questionnaires, user profile details, and chat-based interactions. This input forms the foundation of the system, as it reflects the user's interests, skills, and preferences. The collected data is then passed to the data processing module, where it is cleaned, organized, and prepared for further analysis.

After preprocessing, the data is forwarded to the core AI module, which consists of machine learning models, natural language processing components, and a recommendation engine. These components work together to interpret user inputs, identify patterns, and generate meaningful insights. The machine learning models help in analyzing user behavior, while the NLP module enables conversational interaction through the chatbot. The recommendation engine combines these outputs to produce relevant career suggestions.

Based on this analysis, the system generates outputs such as career predictions, skill-gap analysis, and learning roadmaps. It also provides college recommendations based on user preferences and selected career paths. These outputs are presented in a structured and easy-to-understand format, allowing users to make informed decisions. Finally, the system includes a feedback mechanism that continuously updates recommendations based on user interactions and progress. This feedback loop helps in improving the system's adaptability over time and ensures that the guidance remains relevant. Overall, the architecture supports a balanced combination of different AI techniques while maintaining a practical and user-friendly design.

Methodology

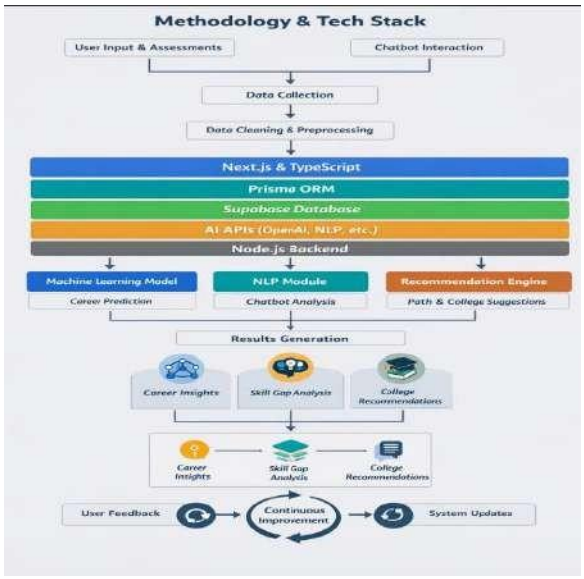

***Fig. 2**. Methodology of the system*

The methodology of the proposed system focuses on transforming user inputs into meaningful and personalized career recommendations through a structured and step-by-step process. The system begins by collecting data from users in the form of assessment responses, profile details, and chatbot interactions. This initial input helps in understanding the user's interests, current skills, and preferences in a more flexible way compared to traditional static forms. Once the data is collected, it goes through a preprocessing stage where it is cleaned and organized for further use. This step ensures that the information is consistent and suitable for analysis. The processed data is then handled by the core system, which is built using a modern web-based tech stack. The frontend, developed using Next.js and TypeScript, manages user interaction, while the backend, supported by Node.js, handles data processing and communication with external services. Prisma ORM is used to manage database operations, and Supabase is used for storing and retrieving user data efficiently.

The system integrates multiple AI components to perform different tasks. Machine learning techniques are used to analyze user data and support career prediction. Natural language processing is applied through chatbot interactions to understand user queries and provide relevant responses. In addition, a recommendation mechanism combines these outputs to suggest suitable career paths, learning resources, and college options based on the user profile. After processing, the system generates outputs such as career insights, skill-gap analysis, and structured learning roadmaps. These results are presented in a simple and understandable format so that users can easily follow the suggested path. The system also allows continuous interaction, where user feedback and updated inputs are used to refine future recommendations. Overall, the methodology follows a practical approach by combining data processing, AI-based analysis, and a scalable tech stack. The focus is on creating a system that is both effective and easy to use, ensuring that users receive guidance that is not only personalized but also actionable.

Implementation

The implementation of the proposed system is based on a modern full-stack web architecture that focuses on scalability, responsiveness, and ease of integration. The frontend of the system is developed using Next.js along with TypeScript, which helps in building a structured and interactive user interface. This layer is responsible for handling user interactions such as form inputs, assessments, and chatbot communication, ensuring a smooth and responsive experience. On the backend side, the system uses Node.js to manage server-side operations and handle communication between different components. The backend is responsible for processing user inputs, coordinating with AI services, and managing the overall logic of the application. Prisma ORM is used to simplify database interactions, allowing efficient handling of queries and structured data management.

For data storage, Supabase is used as the primary database solution. It enables secure storage of user profiles, assessment results, and system outputs while supporting real-time updates. This ensures that the system can efficiently retrieve and update data as users interact with different features of the platform. The AI functionality of the system is integrated through external APIs, which are used for tasks such as natural language understanding, chatbot responses, and content generation. These APIs allow the system to process user queries and generate meaningful outputs without requiring complex in-house model training. The integration is handled in a way that ensures smooth communication between the frontend, backend, and AI services. Overall, the implementation follows a modular approach where each component performs a specific role while remaining connected within a unified system. This structure makes the platform easier to maintain, scalable for future enhancements, and suitable for real-world deployment.

Results and Discussion

***Fig. 3**. Landing Page of the System*

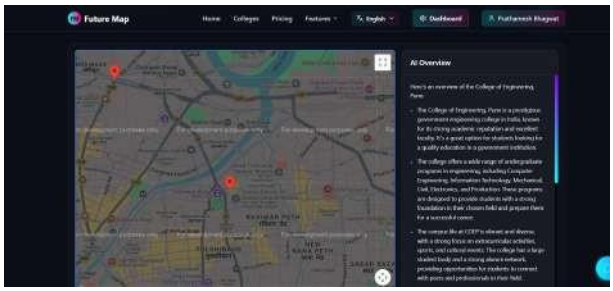

***Fig. 4**. College recommendation and overview*

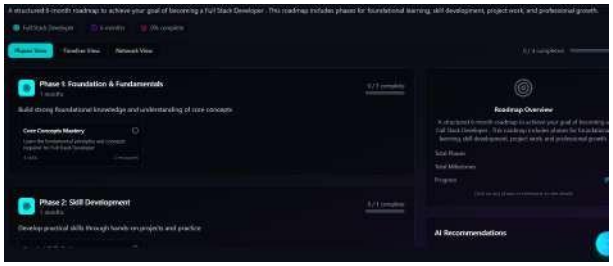

***Fig. 5**. Roadmap generation tool overview*

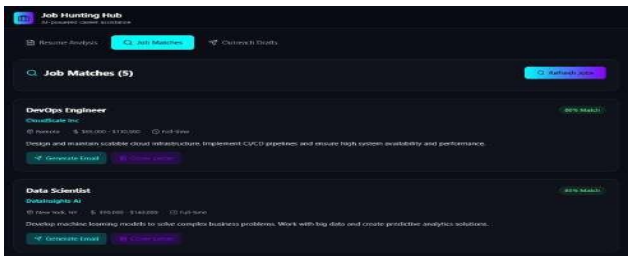

***Fig. 6**. Resume analysis and Job recommendation*

The developed system was able to generate personalized career recommendations based on user inputs such as interests, skills, and preferences. The integration of multiple components, including machine learning, natural language processing, and recommendation logic, helped in producing outputs that were more aligned with individual user profiles. The chatbot interface also enabled users to interact with the system in a more flexible way, making the overall experience more engaging compared to traditional form-based systems. The system successfully provided key outputs such as career predictions, skill-gap analysis, and structured learning roadmaps. These features allowed users to not only identify suitable career options but also understand the steps required to move toward those goals. The inclusion of college recommendations further supported decision-making by connecting career choices with relevant educational opportunities. From a technical perspective, the use of a modern full-stack architecture ensured smooth interaction between different components. The system was able to handle user data efficiently, and the integration of AI APIs allowed real-time processing of queries and responses. The modular design also made it easier to manage different functionalities without affecting overall performance.

However, some limitations were observed during implementation. The quality of recommendations depends on the accuracy of user input, and incomplete or inconsistent data may affect the results. Additionally, the system relies on external AI services, which may introduce dependency on API performance and cost. Despite these challenges, the system demonstrates a practical approach to improving career guidance by combining multiple techniques in a single platform. Overall, the results indicate that integrating different AI methods within a unified system can improve the relevance and usability of career guidance solutions. While there is scope for further refinement, the current implementation provides a solid foundation for developing more adaptive and user-focused systems in the future.

Conclusion and Future Work

This paper presented an AI-based career guidance system designed to provide more personalized and structured support for users exploring career options. The system combines multiple techniques, including machine learning, natural language processing, and recommendation methods, to analyze user inputs and generate relevant suggestions. By focusing on features such as career prediction, skill-gap analysis, and roadmap generation, the system aims to make career planning clearer and more actionable for users. The implementation demonstrates that integrating different components into a single platform can improve the overall usability of career guidance systems. The inclusion of a chatbot interface and college recommendation module further enhances the user experience by making the system more interactive and informative. At the same time, the design remains simple and practical, making it suitable for real-world use without requiring complex infrastructure. However, the current system has certain limitations, such as dependency on user-provided data and external AI services, which can affect the consistency of results. The recommendations may also vary based on the quality and completeness of user input. These factors indicate that while the system is functional, there is scope for further improvement.

In future work, the system can be enhanced by improving data handling and incorporating more structured datasets related to skills and career trends. Basic evaluation methods can be added to measure the accuracy and usefulness of recommendations. The system can also be expanded to support more career domains and include better filtering options for users. Additionally, efforts can be made to improve the clarity of recommendations so that users can better understand the reasoning behind them. These improvements can help make the system more reliable and useful over time while maintaining its simplicity.

References

1. S. Hu and X. Wang, “FOKE: A Personalized and Explainable Education Framework Integrating Foundation Models, Knowledge Graphs, and Prompt Engineering,” arXiv:2405.03734, 2024.
2. J. Bobadilla, F. Ortega, A. Hernando, and A. Gutiérrez, “Recommender Systems Survey,” Knowledge-Based Systems, vol. 46, pp. 109–132, 2013.
3. M. Zhong and R. Ding, “Design of a Personalized Recommendation System for Learning Resources Based on Collaborative Filtering,” International Journal of Circuits, Systems and Signal Processing, vol. 16, pp. 122–131, 2022.
4. J. Devlin, M.-W. Chang, K. Lee, and K. Toutanova, “BERT: Pre-training of Deep Bidirectional Transformers for Language Understanding,” arXiv:1810.04805, 2019.
5. H. Abu-Rasheed, M. Dornhöfer, C. Weber, G. Kismihók, U. Buchmann, and M. Fathi, “Building Contextual Knowledge Graphs for Personalized Learning Recommendations Using Text Mining and Semantic Graph Completion,” in Proc. IEEE ICALT, 2023.
6. Baillifard, M. Gabella, P. B. Lavenex, and C. S. Martarelli, “Implementing Learning Principles with a Personal AI Tutor: A Case Study,” arXiv:2309.13060, 2023.
7. Pandey, A., & Srivastava, G. (2020). Cloud-assisted adaptive e-learning framework using machine learning techniques. *Education and Information Technologies, 25*(5), 3501–3525
8. Chen, L., Zhang, Y., & Wilson, C. (2021). NLP-based intelligent career recommendation framework using semantic analysis. *Expert Systems with Applications, 168*, 114324.
9. Siemens, G., & Long, P. (2017). Penetrating the fog: Analytics in learning and education. *EDUCAUSE Review, 46*(5), 30–40.
10. Romero, C., & Ventura, S. (2020). Educational data mining and learning analytics: An updated survey. *Wiley Interdisciplinary Reviews: Data Mining and Knowledge Discovery, 10*(3), e1355.