Career Bloom :- Career counseling and job recommendation system

Kania Alay
Department of Computer Applications PES University, Bengaluru, India
Email: alaykania@yahoo.com

Tamal Dey
Department of Computer Applications
PES University, Bengaluru, India
Email: tamal_dey@pes.edu

***Abstract*— Choosing the right career path is a challenging decision that requires proper guidance and awareness of available opportunities. Many individuals struggle to make informed choices due to a lack of structured career counseling. To address this issue, this system provides personalized career recommendations by analyzing user inputs such as education level, skills, and areas of interest. By utilizing a structured dataset, it predicts suitable career paths, helping users align their aspirations with industry demands. Additionally, the system offers job and course recommendations to support career growth, ensuring that users receive tailored guidance for their professional journey.**

This system offers several key functionalities to enhance career decision-making. Users can input their academic background, skills, and interests, after which the system generates career predictions tailored to their profile. Additionally, it provides job recommendations based on current industry trends and offers relevant course suggestions to help users upskill for their chosen career path. To improve user experience, the system features interactive visualizations that represent job market trends, making it easier for users to understand demand across different career domains. By integrating career guidance with data-driven insights, this platform serves as a valuable tool for students and professionals seeking a well-informed career trajectory.

I. Introduction

Choosing the right career path can be challenging for students and job seekers due to a lack of proper guidance and awareness about available opportunities. Many individuals struggle to find careers that align with their education, skills, and interests, often relying on generic advice that does not cater to their specific needs. Traditional career counselling methods can be time- consuming, expensive, and sometimes ineffective, leading to confusion and uncertainty in career decision-making and other major challenge is the difficulty in identifying suitable job opportunities or relevant courses. Without clear insights into job market trends, individuals often make uninformed career choices, which can result in dissatisfaction and career instability. The absence of personalized recommendations further limits their ability to explore the best possible career path. This project addresses these challenges by providing a structured and efficient career counselling system. Instead of relying on complex AI models, it uses a well-organized dataset to map users' education levels, skills, and interests to relevant career options. By taking user input, the system offers personalized career recommendations, making the decision-making process easier and more effective. In addition to career suggestions, the system provides job recommendations and course suggestions to help users enhance their skills and improve their employability. It also includes graphical job market insights, allowing users to visualize trends and make data-driven career decisions. With a user-friendly interface and structured approach, this career counselling system ensures accessibility, affordability, and accuracy, making career guidance more effective for individuals seeking clarity in their professional journey

This career counseling system is designed to provide academic-based career guidance, helping students make informed decisions about their future educational and professional paths. It specifically focuses on students from the 10th grade up to the undergraduate level, offering recommendations based on their education, skills, and interests. The system aims to guide users toward suitable career options and relevant courses but does not extend to job placement services. Instead, it provides insights into potential career opportunities and job market trends, allowing users to explore their options with a clear understanding of industry demands

The career counseling system operates solely on a predefined dataset, meaning its recommendations are limited to the information available within the dataset. It does not utilize machine learning models or dynamically update career suggestions based on real-time data. Additionally, the system is designed as a web-based platform, restricting its accessibility to devices with internet browsers. There is no dedicated mobile application support, which may limit convenience for users who prefer accessing career guidance on mobile devices

II Literature Survey

Mohamad Jawhar, Zeina Bitar, and Shadi Jawhar Publication int their article: AI-Powered Customized University and Career Guidance: This research presents an AI-driven system that offers personalized guidance by analyzing student profiles, skills, and market trends, providing tailored recommendations for universities, courses, and career paths. The main findings show that AI bridges the gap between education and career goals by delivering accurate, individualized suggestions based on personal data and real-time market insights. The system not only empowers students to make informed decisions about their future but also helps universities align their programs with student needs. Furthermore, it addresses workforce skill gaps by preparing individuals for high-demand industries, contributing to a more skilled and job-ready workforce [1].

Arshad T K and Arjun A in their article VocaVisionary: A Career Guidance Chatbot: This research introduces an AI-powered chatbot that provides personalized career guidance

by utilizing natural language processing (NLP) to interact with users, analyze their profiles, and suggest suitable career paths and skill-development resources. The main findings highlight how the chatbot effusively employs NLP and AI algorithms to engage users, assess their interests and skills, and offer tailored career recommendations in an interface and accessible manner. The system enhances accessibility to career guidance, empowering users to make informed decisions while reducing reliance on traditional counselling methods. Additionally, it promotes self-paced, user-friendly exploration of career options, offering a modern approach to career counselling [2]

Rishabh Thakur, Deepak Singh and Upendra Pratap Singh in their article A Personalized Resume Analysis and Job Recommendations System This research presents an AI-driven system that analyses resumes to extract key details such as skills, experience, and education. Using this data, the system offers personalized job recommendations and highlights skill gaps to help users improve their career prospects. The main findings demonstrate that AI efficiently processes resumes to identify strengths, weaknesses, and opportunities, resulting in more accurate job matches and targeted upskilling suggestions. The system enhances the job search process by connecting users with relevant opportunities while promoting skill development, ultimately ensuring candidates are better prepared for the job market [3].

EHSAN AKHTARKAVAN and SAEED ASHRAFI in their article Efficient Resume-Based Re-Education for Career Recommendation Systems: This research explores the use of AI to analyze resumes and identify skill gaps, providing re-education recommendations to enhance employability. The system suggests courses, certifications, or career shifts based on its analysis of resumes. The main findings reveal that AI-based resume analysis effectively identifies areas for improvement and offers targeted re-education strategies, helping individuals stay competitive in ever-changing job markets. The system aids job seekers in bridging skill gaps, supports career transitions, and ensures alignment with evolving industry demands, contributing to the development of a more prepared and adaptable workforce. [4].

III METHODOLOGY

A. Importing Libraries and Loading Dataset

The initial phase involves importing crucial Python libraries essential for our career counseling system. We utilize pandas for data manipulation and analysis of our career dataset, NumPy for numerical computations of academic scores, and sk-learn for implementing cosine similarity in career matching. The system loads the primary dataset ('Project_dataset.csv') which contains comprehensive information about various careers, academic requirements, skill sets, and job opportunities. During this stage, we perform immediate validation to ensure the dataset is loaded correctly, checking for proper data structure and format integrity. If any issues arise during data loading, the system captures and displays appropriate error messages to maintain data quality from the start

B. Data Preprocessing and Column Organization

In the preprocessing phase, we focus on standardizing and organizing our dataset columns for consistent analysis. The academic data columns are structured to handle both 10th and 12th- grade marks across different subjects (Mathematics, Science, English, etc.). We standardize the degree and specialization fields to ensure uniform formatting across all entries. The skills and interests columns are preprocessed to maintain consistency in terminology and categorization. This step is crucial as it establishes the foundation for accurate career matching and recommendations. The system verifies column naming conventions and data formats to prevent any inconsistencies that could affect the analysis

C. Identifying Target Features and Handling Missing Values

This critical stage involves identifying and validating the key features necessary for career prediction. We focus on academic performance metrics (subject-wise marks), skill requirements (technical and soft skills), and career path indicators. The system performs a thorough check for missing values across all crucial columns, ensuring data completeness for accurate predictions. For academic records, we verify the presence of all required subject marks. In the skills section, we ensure proper categorization and completeness of skill sets. The system generates reports on data quality issues, including the count of null values and inconsistencies, allowing for immediate addressing of any data gaps

D. Summary Statistics of Key Metrics

The final analytical step involves generating comprehensive statistical insights about our dataset. We calculate and analyze the distribution of academic performances across different subjects to understand performance patterns. The system examines frequency distribution of various skills and their correlation with different career paths. We analyze career path distributions to ensure balanced recommendations. This includes calculating mean, standard deviation, and range of academic requirements for different careers, understanding skill requirement patterns, and analyzing job market trends. These statistics provide valuable insights for fine-tuning the career recommendation algorithm and ensuring users.

Ⅳ. Design and Modeling

A. High level diagram

Presentation Layer: This layer is the user-facing part of the system, providing the interface through which users interact. It consists of the User Interface (UI), which could be a website, mobile app, or other platform. Two types of users interact with this layer: System Users (likely students or alumni) and Admins, each having different access privileges and functionalities. The UI facilitates the exchange of information between the user and the underlying system

Business Layer: This layer represents the core logic of the application. It acts as an intermediary between the Presentation Layer and the Service Layer. It handles the routing of user requests and enforces business rules. In this diagram, the Business Layer distinguishes between actions initiated by System Users and Admins, directing them to the appropriate services.

Service Layer: This layer contains the specific functionalities offered by the system. For System Users, it includes services like User Authentication & Profile Management, Career Path Prediction, Job Recommendation, Course Suggestion, Visualization of Job Prospects, and Feedback Submission. For Admins, it provides services such as Admin Authentication and Management, User Data Management, Career and Job Market Data Management, API Integration Management, and Feedback Analysis & System Updates. Each service performs a specific task related to career development, job searching, or system administration.

Data Service Layer: This layer is responsible for data persistence and retrieval. In this architecture, MongoDB is used as the database. This layer interacts with the Service Layer to store and retrieve data related to users, career information, job market trends, and other relevant data required by the application. MongoDB, being a NoSQL database, offers flexibility in handling various data structures

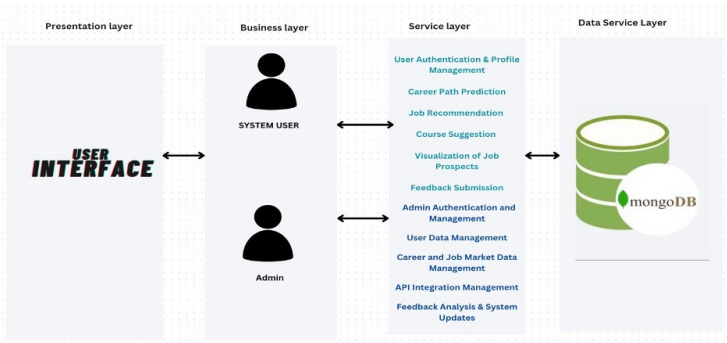

Figure 1. Architecture Diagram

V. Results

The Career recommendation page provides appropriate career choices according to the User's skills ,interest and academic performance. The page also suggest view more details Button to get enhance details of recommended career and Job Insights button for job details

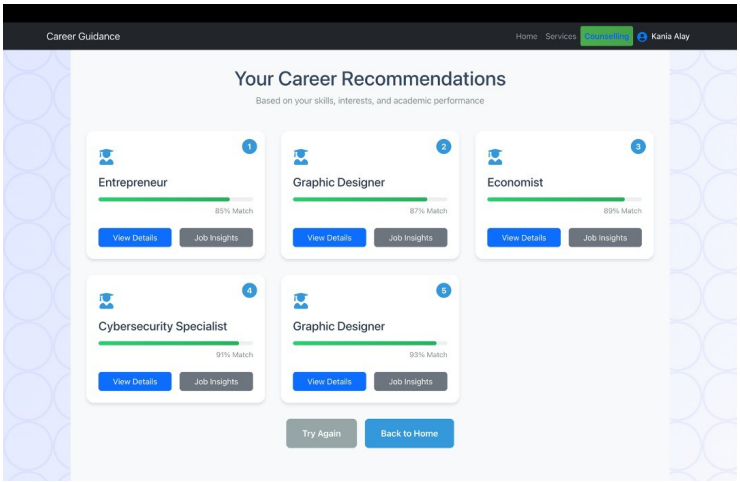

Figure 2. Career predicted page

Users can view the suggested courses from YouTube to get more clarity of the Recommended career means user can watch videos and get to know what is The Prerequisites required for their suggested career.

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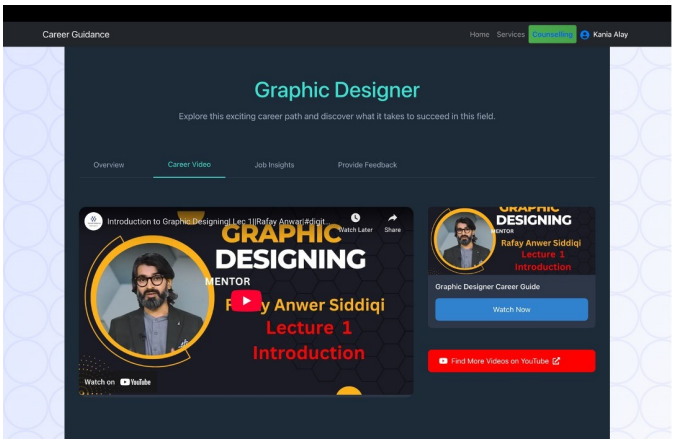
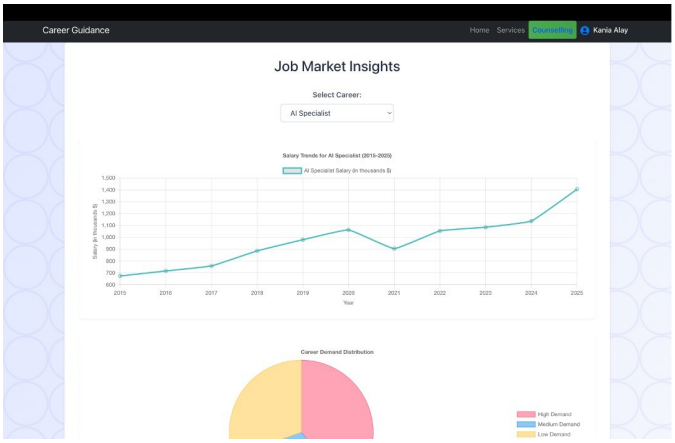


Figure 3. Sugested career page

The user will access this feature which contains the job information of the predicted careers. It contains last 10 years of Job data with graph Visualization



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VI. Future Enhancements

To enhance the functionality and user experience of the career counseling platform, several advanced features can be integrated. Firstly, **AI-powered career recommendations** can be introduced by leveraging machine learning models to deliver personalized and accurate suggestions based on users' profiles, educational backgrounds, and current career trends. This ensures that students receive guidance tailored to their unique strengths and interests.**Role-based access control** can be implemented to define more granular roles such as counsellor, student, and super-admin. This will help manage access to different features and improve overall security. To enhance communication and user engagement, **automated email notifications** can be sent for important events like user registration, feedback submission, or when new career recommendations become available.

Adding a **real-time chat feature** will allow students to interact directly with career counsellors for immediate support and guidance. Furthermore, an **analytics dashboard** for administrators can be developed to visualize user engagement, popular career choices, and feedback trends, aiding in better decision-making and improvements. The platform can also be made more comprehensive by enabling **document uploads**, allowing users to submit resumes, certificates, or other relevant materials for in-depth analysis during counseling. A **mobile application** for Android and iOS will significantly boost accessibility and convenience, encouraging more students to use the platform. To reach a wider audience, **multi-language support** should be included, catering to users from diverse linguistic backgrounds. Integration with **external APIs** such as LinkedIn, job portals, or educational platforms can further enrich the user experience by providing real-world opportunities and resources. Lastly, implementing **feedback moderation and reporting tools** will ensure the platform remains safe and respectful, giving admins control over inappropriate content and allowing users to report issues easily.

VIII. Conclusion

The career counseling application represents a significant step forward in empowering individuals to make informed and confident career decisions. By integrating dynamic data visualizations, real-world job insights, and personalized feedback mechanisms, the platform bridges the gap between career aspirations and actionable opportunities. Users are not only able to explore a wide range of career paths, but also gain a deeper understanding of salary trends, job demand, and the skills required to succeed in their chosen fields. The intuitive and modern user interface ensures that navigating the app is both engaging and accessible, catering to users from diverse backgrounds and experience levels. Features such as interactive job insights, direct links to reputable job portals, and a structured feedback system foster a holistic approach to career guidance. This comprehensive support helps users align their interests and strengths with real-world opportunities, ultimately enhancing their career satisfaction and long-term success. Overall, the project demonstrates the power of combining technology, data, and user-centric design to address the evolving needs of career seekers. By providing reliable information and actionable insights, the app not only guides users toward suitable career paths but also inspires them to take proactive steps in shaping their professional futures. This project lays a strong foundation for further innovation in the field of career counseling and lifelong learning.

REFERENCES

[1] Mohamad Jawhar, Zeina Bitar Shadi Jawhar , 2023 AI-Powered Customized University and Career Guidance Publication:IEEE https://ieeexplore.ieee.org/document/10564423

[2] Arshad T K and Arjun A ,2024 VocaVisionary: A Career Guidance Chatbot Publication: IEEE Xplore https://ieeexplore.ieee.org/document/10690595

[3] RishabhThakur, Deepak Singh and Upendra Pratap Singh ,2023 A Personalized Resume Analysis and Job Recommendations System Publication: IEEE Xplore https://ieeexplore.ieee.org/document/10560126

[4] EHSAN AKHTARKAVAN and SAEED ASHRAFI,2023 Efficient Resume-Based Re-Education for Career Recommendation Systems Publication: IEEE Xplore https://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=10305073