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AI-based career counsellor: An AI driven career advisor

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Abstract

Career decisions are some of the most complex decisions a person makes, and, unfortunately, young people are unprepared to make one of the most important decisions in life. This paper aims at designing a prototype of an artificial intelligence-based career counselling system specifically for the secondary level students. The system consists of an artificial intelligence-based service personalized on the basis of collected data.

The study emphasizes the need to develop technologically enhanced and easy-to-navigate platforms to provide better career information, especially for minority and rural area populations. Accordingly, the research seeks to integrate technological advances with regular career counselling approaches to help the students with the relevant tools that would enable them to attain desirable and successful careers.

AI can enhance career guidance systems by providing assessments that evaluate student's interests, skills, and personality traits. These assessments help identify suitable career paths based on individual profiles and aptitudes, enabling personalized guidance that resonates with each student's unique qualities. Traditional and manual procedures of career guidance as well as counselling require a lot of manpower and resources, while the automated process with the help of intelligent systems like AI has a great scope.

Keywords: Career Guidance; Counsellor; Artificial Intelligence; Advisor; Personalized

1. Introduction

One of the most puzzling choices that a person can encounter in their life, is choosing the right career, and, unfortunately, many young people are not equipped to address one of the most important choices in their lives. In today's dynamic and competitive environment, the importance of making informed career choices cannot be overstated. Yet, secondary school students often find themselves navigating this challenging landscape without adequate support systems. This lack of guidance not only hinders their ability to identify their strengths, interests, and aspirations but also affects their capacity to make well-informed career decisions that align with their unique talents and inclinations. The research and data are unanimous that people need to choose wisely considering their job will be a major influence on both quality of life and social prosperity [1].

New studies have brought to light new facts about young careers that the society did not know only few years ago. For example, 50% of respondents out of 100,000, who took part in the 33-country wide survey, noted that they had made incorrect career choices. If students make wrong career moves, they will fail to use their abilities fully and they will drain the resources in the field and so will the companies which, in the end, will drain the whole economy.

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Adolescents, who are in the age group of 16 to 18, do not often have the ability to exert their own will and make the correct career choice. There might be some who are not aware of the courses offered in a specific field or the major academic courses that would be suitable for them. Hence, there is a need for career counselling round the clock since it will be next to the students' onus, educational, as well as in the university circles, to figure out what course will lead to the best future of the students. Career counselling and guidance should be an essential part of school education, aiming to help students achieve a better academic performance, select the right career, and finally to find their potential to the highest.[2] Consequently, with the increase in the number of academic institutions and the variety of courses offered; The Recommendations by human counselling experts may be inadequate and insufficient to determine whether they are specific. The course will be tailored to the student. Since then, the traditional hands-on approach to career instruction has been followed and. Counselling is effective and ineffective. Some disadvantages of the traditional career guidance approach are listed below:

- The productivity, speed of reasoning and productivity of business specialists decreased due to the introduction of more learning Educational Studies.
- Lack or unavailability of full-time business strategy specialists making it difficult to meet the aspirations of a large number of people.
- Lack of career counsellor in all academic institutions.
- Limited availability of business specialists.

Thus, there is great potential to automate the career coaching and mentoring process and more to come. It's important. This will save not only effort and time but also professional counsellor, students. staff and faculty. Moreover, with the help of intelligent systems, automation can improve sustainability, increase reliability. Quick response, unemotional and firm results.[2]

Career counseling is a discipline which would benefit from increased amounts of assist, and an AI chat bot would assist in that regard due to 24/7 availability. We define profession counseling on this paper as services and sports supposed to assist individuals, to make instructional, education and occupational choices and to control their careers. An AI profession counselor would preferably be able to provide unique, automatic comments on numerous concerns to indicate locations for improvement. However, there are moral issues and gaps in human and AI profession counseling that need to be tested to ensure responsible and equitable use of these technology.

2. Literature survey

"Apna Hunar (AI & ML Career Guidance Tool) (2024)"

According to an article by the authors Mr. Satyam Pandey et.al [3], A comprehensive career guidance system is being developed for science stream students, including X, XII, and post XII students and degree-less individuals. The system uses machine learning concepts to create a Web Portal and Recommendation Engine. Students fill questionnaires to determine their personality, emotional intelligence, and intelligence, and a personality test on Google Forms is used to suggest appropriate career types. The system uses HTML/CSS/Python/Machine Learning for web portal interfaces. However, limitations include data collection limitations and complexity of personality tests.

"Use of Artificial Intelligence in Career Guidance: Perspectives of Secondary Guidance Counsellor (2014)"

The article by Jocelle B. Monreal et.al [4] explains how artificial intelligence (AI) can enhance career guidance services. The authors employed a systematic review and interviews with strategic consultants to review literature. They discovered that AI can enhance productivity among counselors and tenth-grade students via counseling programs. The article stresses the significance of intelligent tools and software for career guidance programs and the necessity of additional research. In order to effectively incorporate AI into career counseling, it is essential to overcome challenges like access to technology, internet connectivity, user acceptance, and data protection.

"Intelligent Career Guidance System Using Machine Learning (2022)"

Authors Ajay Dahanke et.al in their article [5] shows how students are in a dilemma after higher secondary education about their career options. The paper suggests an automated computer-based career guidance system relying on an interest-based objective test and high 12th-grade courses to suggest departments that are a good fit. Based on objective parameters, the system directs students to the right courses automatically, avoiding mistakes in career options. The

new framework applies the K-Nearest Neighbor and K-Means Clustering to categorize candidates' skill sets and forecast department fit. The system seeks to offer pragmatically sound advice for career decisions.

“Efficacy of Artificial Neural Network based Decision Support System for Career Counseling (2016)”

Jasjit S. Sodhi et.al in [6] discusses the use of an Artificial Neural Network (ANN) model in vocational decision-making as a way of predicting career paths of subjects based on their behavioral traits. Using a training set from the Differential Aptitude Test and support statistical analysis, the ANN model was tested against data coming from 100 tenth-grade students, which presented a classification agreement of around 91% with Discriminant Function Analysis. The findings suggest that though the ANN provides a robust framework for decision-making, underlying human factors like counselor bias, parental expectations, and individual interest may still intervene and distort the output, thereby revealing the power of ANNs in decision-making scenarios that are highly difficult even with traditional approaches.

“Research on the Design of an AI Career Path Recommendation System Based on MBTI from a Cross-Cultural Perspective (2024)”

Research on the Design of an AI Career Path Recommendation System by authors Yizhou Zhou et.al [7] suggests working on a project to develop an AI recommendation model that utilizes MBTI for culturally diverse career options. When considering a worldwide perspective, AI technologies like OpenAI's ChatGPT can be utilized as a personal career counseling tool, ultimately improving career planning. There is a high demand for the system application because it demonstrates how to overcome cultural barriers and offer useful recommendations. Some of those include the interpretation of MBTI scores and the challenge of maintaining worth. Upcoming research will concentrate on broadening the scope of use, improving user satisfaction, and increasing prediction accuracy.

“A Customized Artificial Intelligence Based Career Choice Recommender System for a Rural University (2023)”

Nosipho Mavuso et.al [8] explores how AI can help with career guidance and personalized job advice in South Africa. It collected data from university students in the Eastern Cape highlighting the need for tailored developed job assessment systems. The findings show that students want to take part in their career decisions because current systems don't grasp their circumstances. The research also points out how career referral programs can tackle university inequalities like poor career guidance, money problems, lack of support services, and low grades. The study suggests using a team approach to build a custom AI-powered system for job recommendations that works well. Yet, it looks at things from the students' point of view and misses input from key people who could shed light on students' backgrounds and traits.

“C3-IoC: A Career Guidance System for Assessing Student Skills using Machine Learning and Network Visualisation (2023)”

The findings of authors Adán José-García et.al [9] is about the disparity between graduates and the IT job market. Computer-assisted career guidance systems (CACGS) can assist students in getting jobs by giving them personalized assistance. The C3-IoC program includes three modules: extra knowledge of technical and non-technical skills, user skills exploration, and task function matching visualization modules. This solution based on AI evaluates job placement space according to student ability and offers insights into a market driven by uncertainty and unpredictability. The article presents the suggestion that C3-IoC systems should be as vital in new development as they are today, offering a tailored guide to education and training options, assisting counselors in navigating the rapidly expanding job market and travel business between IT and non-IT services.

“Artificial Intelligence based Career Development Web Counselling: A Review (2023)”

The significance of web-based career guidance for recently graduated secondary or primary school level students is the main theme of the research by authors Himanshu Mittal et.al [10]. It emphasizes the advantages of online business guidance to make suitable career choices. The paper also evaluates possible challenges in applying these web services and mentions the advantages of utilizing these services to search for a job. It highlights the importance of early career awareness and career guidance, as the career choice can be determined by the availability of jobs, accessibility, and knowledge about jobs across the world. The paper recommends that India should enhance the utilization of online platforms for career counseling so that students possess sufficient information to make the right decision regarding their careers. It calls for all students from all socioeconomic groups to be engaged in planning a comprehensive and sustainable career guidance framework.

Table 1 Key Findings through the above literature survey

Sr. No.	Ref. No.	Title	Authors	Key findings
1.	[3]	APNA_HUNAR (AI & ML CAREER GUIDANCE TOOL).	Ms. Harshita, Satyam Pandey, Anshu Tiwari, Rahul kumar	A comprehensive career guidance system for science stream students. It includes the Web Portal and the Recommendation Engine designed using ML. Recommendations were based on the IQ, the EQ, personality traits and interests.
2.	[4]	Use of Artificial Intelligence in Career Guidance: Perspectives of Secondary Guidance Counselor	Jocelle B. Monreal, Thelma Palaoag	Explores the use of AI in career guidance within public secondary schools in Legazpi City, Philippines. Sentiment analysis was performed to capture the respondents' insights and opinions. The findings revealed positive feedback from respondents regarding AI in career guidance.
3.	[5]	AN INTELLIGENT CAREER GUIDANCE SYSTEM USING MACHINE LEARNING	Ajay Dahanke, Nilesh Shinde, Anirudh Dhagate, Shaikh Huzaif, Prof. P. V. Nagare	computerized career counselling system employed to predict the appropriate department for a personal supported their skills assessed by an objective test.
4.	[6]	Efficacy of Artificial Neural Network based Decision Support System for Career Counseling	Jasjit S. Sodhi, Maitreyee Dutta and Naveen Aggarwal	AI model was implemented using Artificial Neural Network (ANN) in MATLAB for predicting vocational stream of pursuit using The Differential Aptitude Test (DAT) and Scientific Knowledge and Aptitude Test (SKAT)
5.	[7]	Research on the Design of an AI Career Path Recommendation System Based on MBTI from a Cross-Cultural Perspective	Yizhou Zhou, Yong Zhang, Sijia Yu, Naijie Liu	AI career path recommendation system based on the Myers-Briggs Type Indicator (MBTI), academic backgrounds, grades, and hobbies, in accordance with their personal and cultural backgrounds.
6.	[8]	A Customized Artificial Intelligence Based Career Choice Recommender System for a Rural University	Nosipho Mavuso, Darelle vanGreunen, Nobert Jere	Job assessment systems for a South African university student, particularly in rural areas. Tailor made and customized career guidance solutions with Artificial Intelligence (AI)
7.	[9]	C3-IoC: A Career Guidance System for Assessing Student Skills using Machine Learning and Network Visualisation.	Adán José-García, Alison Sneyd, Ana Melro, Anaïs Ollagnier, Georgina Tarling, Haiyang Zhang, Mark Stevenson, Richard Everson, Rudy Arthur	AI-based solution to help students explore career paths in IT according to their level of education, skills and prior experience. C3-IoC supports students in self-evaluating their skills and understanding how they relate to emerging IT jobs.
8.	[10]	Artificial Intelligence based Career Development Web Counseling: A Review	Devanshu, Gurkirat Gorki Sandhu, Himanshu Mittal, Kunal Prajapati, Sarabjit Kumar	Evaluates the effectiveness of online career counseling and the use of its services to provide counseling and support to students.

3. Limitations

3.1. Access to technology and internet connection are key limitations.

Uneven access to devices (computers, mobile phones) and stable internet connectivity poses a major hindrance, particularly in rural areas where digital infrastructure can be uneven. Such a digital divide prevents online learning, information access, and use of technology for opportunities, and widens inequalities.

3.2. Acceptability among users and data safety are crucial concerns

Implementation of new technologies or platforms needs the trust and adoption of users. Users may resist because of issues with data privacy, security breaches, and the misuse of personal data. Transparency, strong security systems, and managing user fears are necessary for proper implementation and large-scale acceptance.

3.3. Students lack maturity for career decisions after high school.

At the secondary level, students in Nagpur and other places tend to have poor exposure to various career options and poor self-insight and life exposure to make well-informed, long-term career decisions. Hasting them to make these decisions right after school certification is likely to result in decisions that might not be the best consideration of their changing interests and abilities.

3.4. Doubts arise about essential skills for chosen career paths.

There's fear that the existing education system may not prepare students with the particular skills required by their respective professions. This involves technical skills as well as essential soft skills such as critical thinking, problem-solving, and communication. A disconnect between study and industry requirements will stifle their future achievement.

3.5. Problem Statement

The educational landscape today is changing rapidly and students in secondary schools are now under increasing pressure to make career choices at a very early stage. Nevertheless, a lot of them do not have access to essential career guidance services, personal counseling or reliable aptitude tests especially those from poor backgrounds or remote areas. Consequently, students may lack information while making career choices and their potential ability may not match the profession they choose leading to job dissatisfaction.

For many students, traditional ways of offering career guidance are expensive due to human involvement and cannot be applied on large scale. Although there exist numerous aptitude tests as well as vocational guidance tools, most of them generalize on students with dissimilar qualities that may not relate with their real-life experiences.

The problem is how an AI-fueled platform can make personalized career counseling accessible to everybody regardless of where they live or come from. The platform should be able to provide individualized advice for all students at the high school level regardless of their location in the world or how wealthy they are.

4. Methodology

4.1. System overview

In an increasingly complicated and dynamic labour market, there is a growing need for easily accessible and customized career guidance, which the Career Counselling AI project aims to address. This cutting-edge web application uses artificial intelligence, more especially the Google Gemini API, to provide users with actionable development plans and personalized career advice. The platform seeks to enable people at different stages of their professional lives to make knowledgeable decisions about their career paths by fusing cutting-edge AI analysis, straightforward career mapping, and well-established psychological assessment methodologies. The project's objectives, scope, system architecture, technical specifics, and operational aspects are all covered in detail in this documentation.

4.1.1. Key Characteristics

- User Account and Profile Management: A secure way to manage the user account where the user can register, log in, or manage their profile.
- IQ and EQ Assessments: Standardized questionnaires for IQ and Emotional Quotient (EQ) assessment.

- Interest Mapping: Using tools and potentially AI-generated questions for understanding the user's current and potential interests and preferences in different areas of work.
- AI-Driven Career Recommendations: Leveraging Google Gemini API to analyze the user's assessment and profile information to create personalized career recommendations by matching user attributes with potential careers based on a knowledge base, and analytic models.
- Detailed Test Results Report: Providing the user with a detailed report including the user's performance in each assessment - strengths, weaknesses, and insights from the user response.
- Career Path Mapping: Providing a visual representation of potential career paths (e.g., progression, related roles, skills needed), perhaps using an interactive chart or diagram.
- Resource Library: Hosting a selection of relevant career resources (e.g., articles, guides, links to educational materials, information about different industries and professions).
- Admin User Management Dashboard: An administrative portal for system administrators to manage user accounts, system performance, or potentially aggregate test data.

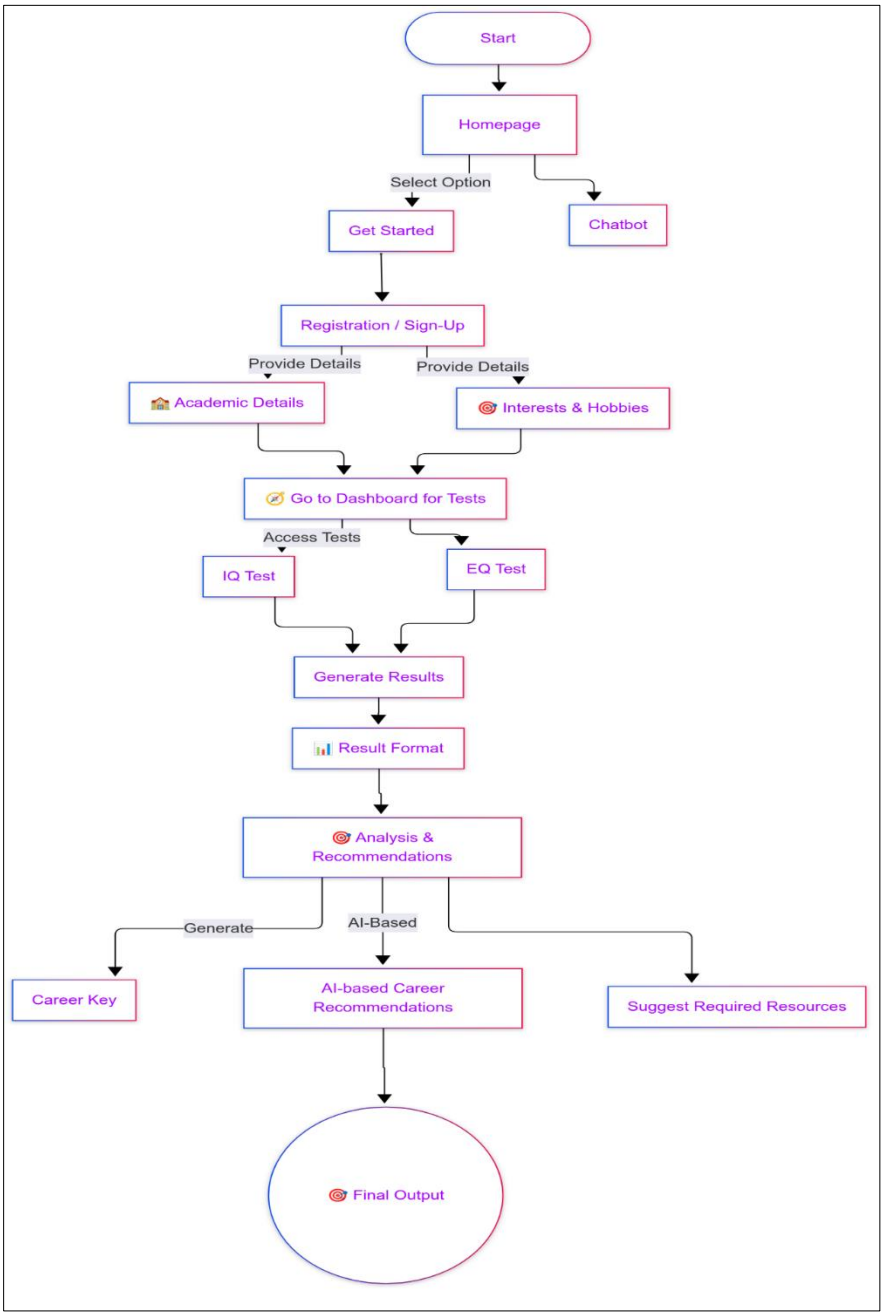

Figure 1 Flowchart for AI-based Career Counselling System

4.2. System Architecture

- Frontend (React SPA): The user interface is developed as a Single Page Application (SPA) with React, which supports a fluid experience with responsive design for easy and quick navigation and interactivity without the need for a complete page refresh.
- Backend (Firebase): Firebase, a Backend-as-a-Service (BaaS) by Google, is the anchor of the backend architecture, providing user authentication and identity management, data storage capabilities (Firestore), and server-less processing logic (Cloud Functions).
- AI Integrator (Google Gemini API): The Google Gemini API is integrated and used to provide intelligent features such as dynamically generating questions for testing and smart analyses of results into personalized career recommendations.
- Storage (Firebase Storage): Firebase Storage is used for storing user data of various shapes and sizes, such as end-user profile pictures (if the resource is developed), and potentially the resources within the resource library.

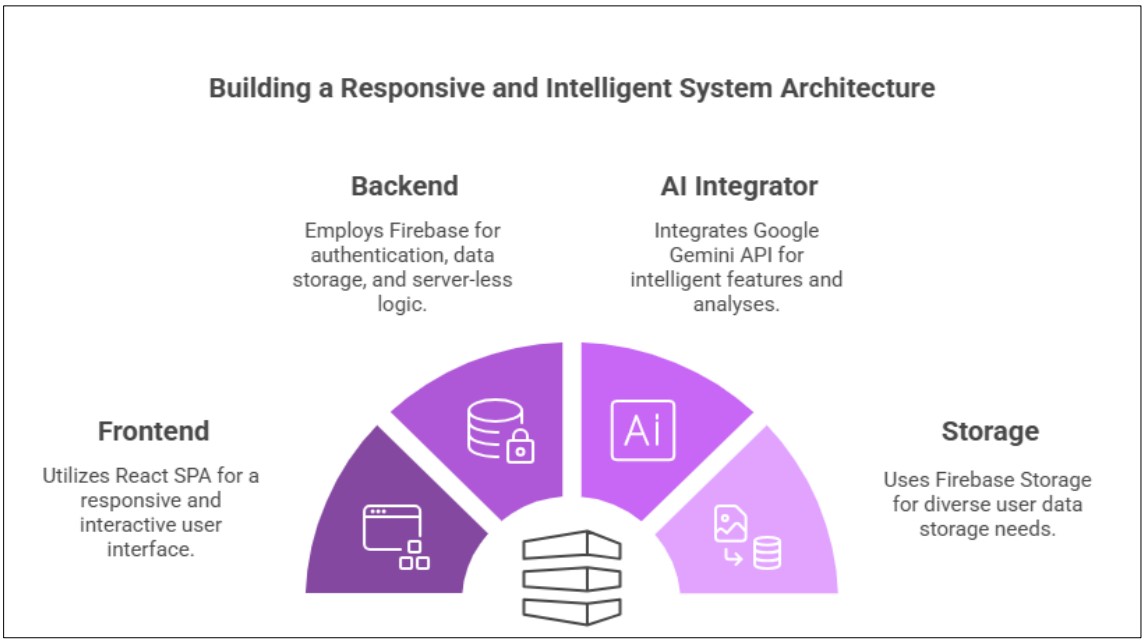

Figure 2 System Architecture

4.3. Components/Modules

The system is structured into several logical modules, each providing different functionality:

- Authentication Module: This module is responsible for the secure management of user identity. This module handles the user authentication lifecycle, including onboarding, login, session, and security issues
- Assessment Module: This module is responsible for administering and managing the various assessments available on the platform. This module will provide access to the IQ and EQ tests, the response user to questions, scoring the raw test data and initial score and the scoring based on preset algorithms the IQ and EQ tests were designed. The Gemini API could be involved here with potential dynamic/adaptive test question generation.
- Career Analysis Module: This has the intelligence core of the platform. It accepts the test results and user profile information as input. It will utilize the Google Gemini API to provide detailed and sophisticated analysis of the relationships between user attributes and a knowledge base of career paths, providing users with acceptable career recommendations, in-depth information about career options, and skill development recommendations.
- Admin Module: This module offers administrative features to enable administrative users to manage the system. It has properties that allow for user setup (e.g. creation, deletion, updates); oversite of overall test results and system usage and, perhaps even the ability to create analytics reports that provide insights to platform usage and user patterns.
- Resource Management Module: This module takes care of organizing the library of career resources and providing access to the library it contains; therefore, resources are easy to browse and access information related to career, educational material, and development tools. The administration controls the content of the library (e.g. add, update and delete the resources).

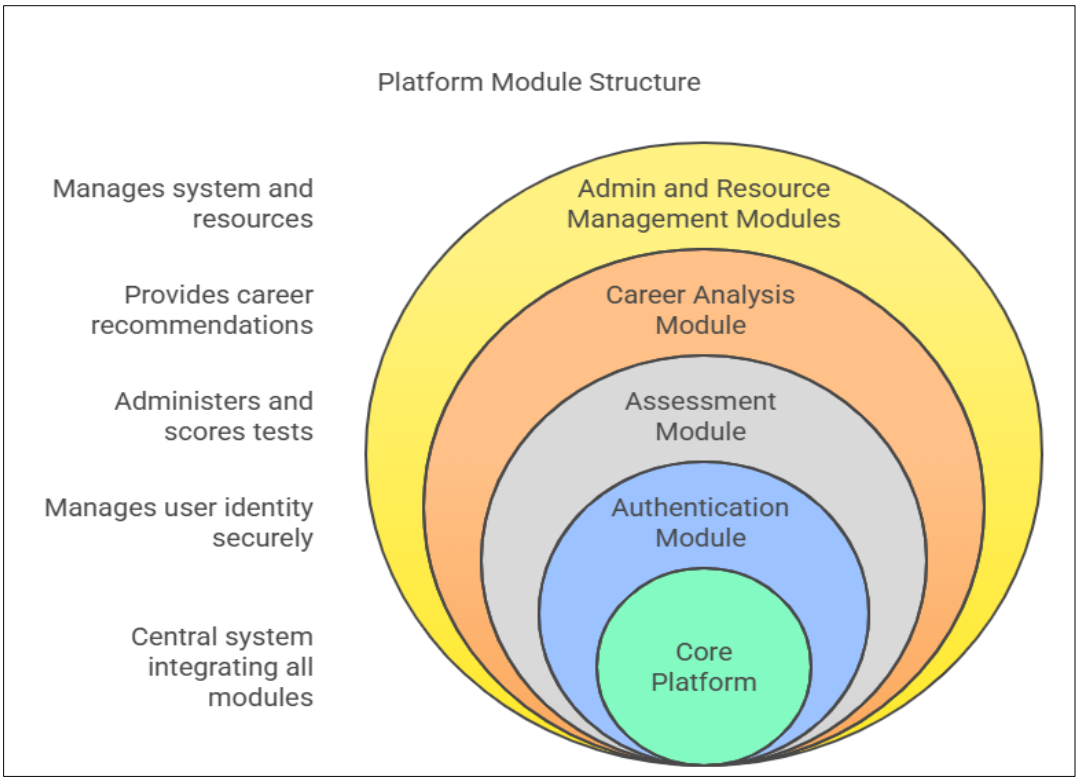

Figure 3 Platform Module Structure

5. Results and Discussions

The below result shows the interface of the system featuring the headline as "Discover Your Ideal Career Path With AI", followed by a brief description of how the AI analyses various personal traits to recommend tailored career options. There are two prominent buttons: "Get Started Free" and a disabled "Ask AI Assistant" button. A small "Admin Portal" link is also visible. To the right a chatbot icon is present in the bottom-right corner.

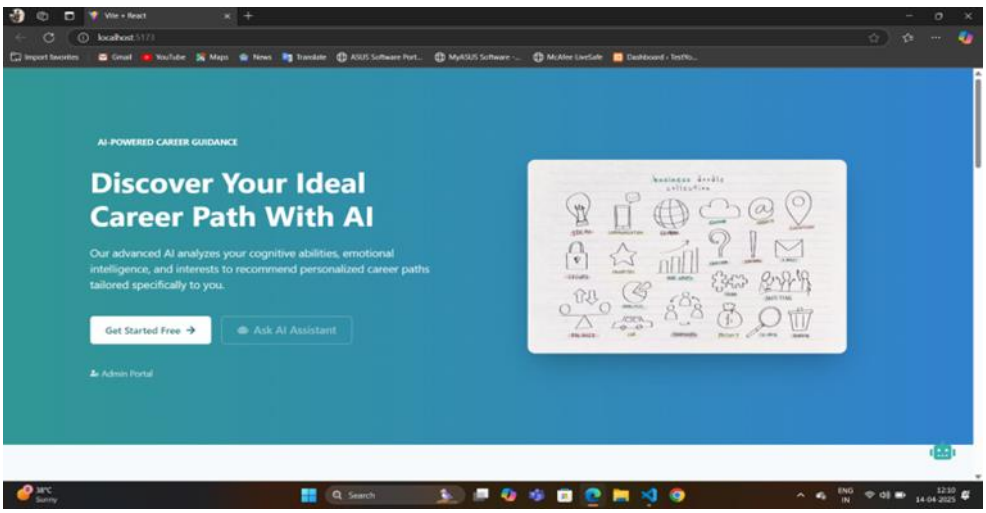

Figure 4 Homepage of the AI-based career counselling system

- The given screenshot shows the sign-up page of the platform. It contains a registration form where the user's full name, email address, and password are requested, with a "Sign Up & Continue" button. The left panel emphasizes the purpose of the platform, welcoming users to join for tailored career exploration.

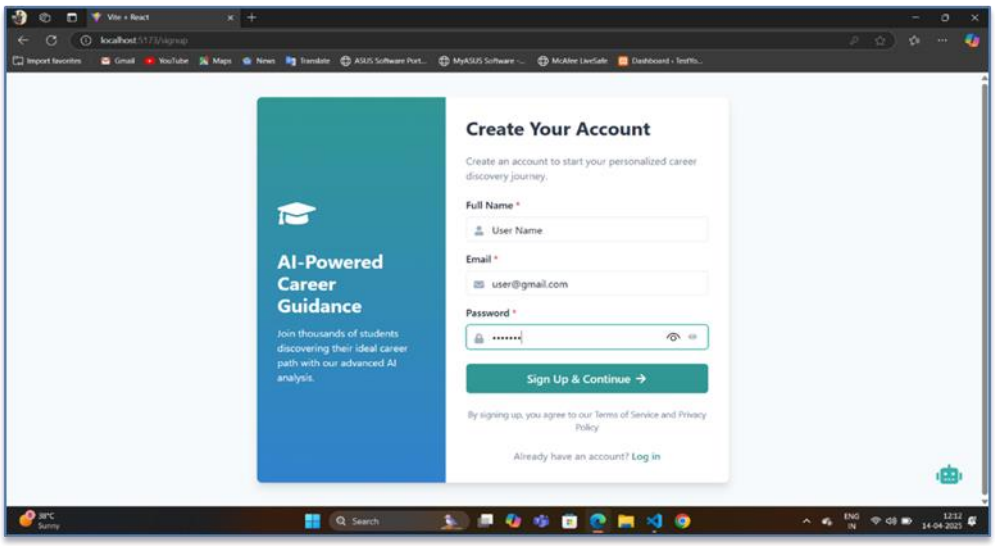

Figure 5 User registration and sign up page

The screenshot depicts the “Academic Details” part of the website. It asks users to input their 10th and 12th-grade marks under the “Academic Scores” tab, with a progress bar showing a multi-step form. Navigation tabs for "Higher Education" and "Interests & Hobbies" are also present, indicating future steps.

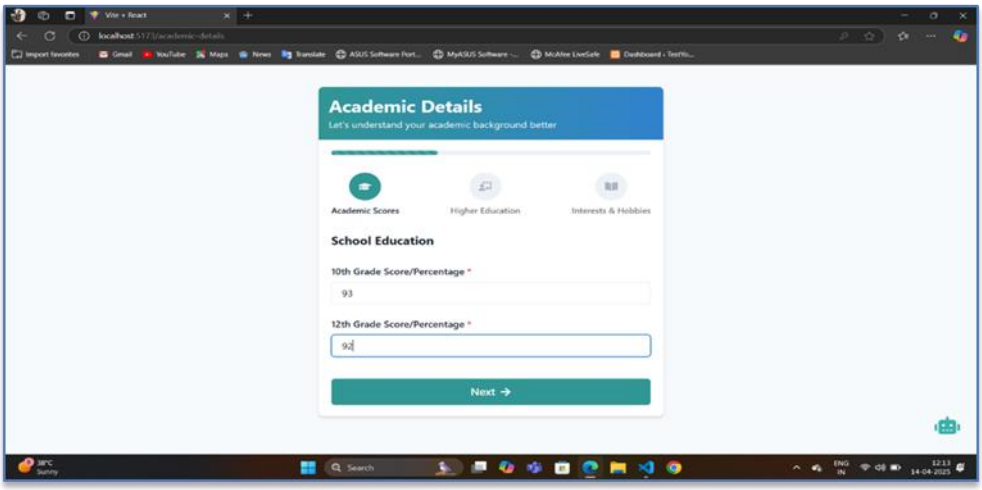

Figure 6 User Information entry

- The below result shows the dashboard page of the platform. It asks the user to take IQ and EQ tests so as to get career suggestions based on their profile. The page also includes access to an AI Career Assistant along with spaces for assessment, results, and resources.

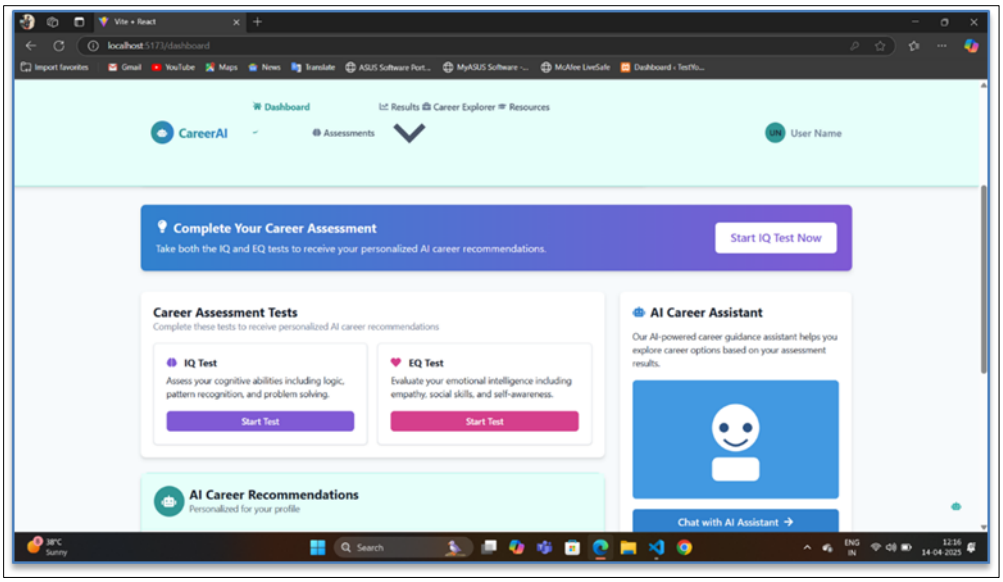

Figure 7 Dashboard page

- The below result illustrates the "Career Explorer" section of the platform. It includes a search function to search for career paths and lists AI-generated personalized career recommendations based on the test results of the user.

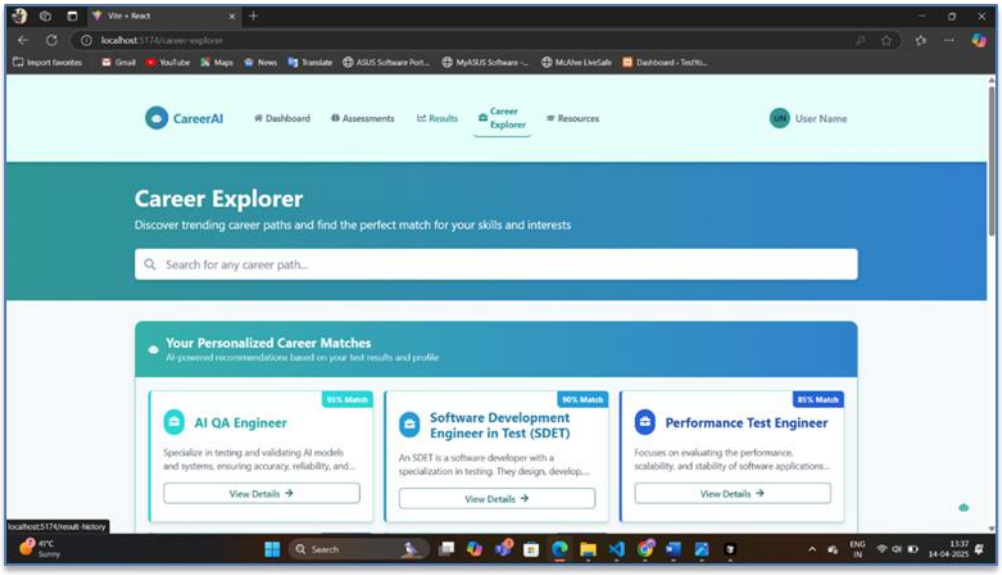

Figure 8 Career explorer page with suggested careers for the user

6. Conclusion

The career counselling system represents a significant advancement in leveraging technology to support individuals in making informed career decisions. By combining personalized IQ and EQ assessments with tailored career recommendations, the system provides a comprehensive tool that is accessible, cost-effective, and scalable. It democratizes career counselling, making it available to a broader audience, including those who may not have access to traditional career guidance resources.

However, while the career counselling system offers numerous benefits, such as convenience, personalized insights, and data-driven recommendations, it also has limitations. The lack of a human touch, potential biases in data, and reliance

on the quality of user input can affect the accuracy and effectiveness of the guidance provided. To mitigate these drawbacks, continuous updates, algorithm improvements, and a focus on ethical AI practices are essential.

In conclusion, the career counselling system is a valuable tool that can significantly enhance the career planning process, especially when used in conjunction with traditional career counselling methods. It empowers users to explore their strengths, understand their potential, and make well-informed decisions about their futures. By continually evolving and adapting to user needs and technological advancements, the chatbot can become an integral part of modern career development strategies, helping individuals navigate the complexities of the ever-changing job market.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

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