

Psychometric Analysis and Activity Based Assessment System for Career Guidance

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ABSTRACT: Choosing the right career path is one of the most critical decisions for students, yet many struggle due to a lack of proper guidance, self-awareness, and structured evaluation methods. This project presents a comprehensive Career Guidance System that leverages psychometric analysis and activity-based assessments to provide personalized career recommendations for school students. The system is designed to evaluate multiple aspects of a student's profile, including interests, aptitude, personality traits, and behavioral patterns. Psychometric tests are used to assess cognitive abilities and preferences, while activity-based tasks help in analyzing practical skills and real-time problem solving capabilities. The combination of these approaches ensures a more accurate and holistic evaluation compared to traditional career counseling methods. The application is developed as a full-stack web platform using modern technologies such as React for the frontend, Spring Boot for backend RESTful services, and MySQL for data management. The system follows a modular and scalable architecture, allowing efficient handling of multiple users and assessments simultaneously. Secure authentication and role-based access control are implemented to manage different user roles such as students and administrators

KEYWORDS: Psychometric Analysis, Career Guidance System, Large Language Models, Artificial Intelligence, Student Assessment, Decision Support System, Educational Technology

I. INTRODUCTION

The selection of an appropriate career path is a pivotal decision in a student's academic and professional journey, significantly influencing long-term personal and professional outcomes. Despite its importance, many students encounter substantial difficulty in identifying suitable career options due to limited self-awareness, lack of structured guidance, and inadequate exposure to diverse career opportunities. Traditional career counseling approaches predominantly rely on static questionnaires, manual evaluation, and generalized advice, which often fail to capture the unique capabilities, interests, and behavioral characteristics of individual students.

In recent years, advancements in artificial intelligence and data-driven technologies have enabled the development of intelligent systems capable of providing personalized recommendations. Psychometric analysis has emerged as a valuable method for assessing individual traits such as personality, aptitude, and interests. However, purely theoretical assessments may not fully represent a student's real-world abilities. Consequently, incorporating activity-based evaluation mechanisms allows for practical validation of skills, thereby enhancing the reliability and effectiveness of the assessment process.

This research proposes an intelligent career guidance system that integrates psychometric analysis, activity-based assessment, and Large Language Model (LLM) APIs to deliver personalized, context-aware, and explainable career recommendations. The system collects and processes student data through structured questionnaires and real-world activities, which are then transformed into meaningful inputs for LLM-based analysis. By leveraging the reasoning capabilities of LLMs, the system generates adaptive and insightful career suggestions tailored to individual profiles.

II. LITERATURE SURVEY

Recent advancements in career guidance systems have increasingly emphasized the integration of artificial intelligence and psychometric analysis to improve the accuracy and personalization of recommendations. Traditional career counseling methods, which rely on static questionnaires and manual evaluation, often fail to capture individual differences and lack scalability. To address these limitations, several studies have proposed AI-based career guidance systems that utilize machine learning techniques to analyze student data and predict suitable career paths with improved accuracy (Karthik S., Sobitha S., “AI-Based Career Counselling System,” 2025). Furthermore, the incorporation of psychometric profiling, including personality traits, interests, and cognitive abilities, has been shown to significantly enhance the reliability of career recommendations by providing deeper insights into individual behavior (Patil K., Mulla N., “AI-Powered Psychometric Based Career Counseling: A Novel Approach to Personalized Career Guidance,” 2025). In addition, research on computational psychometrics demonstrates that artificial intelligence can effectively evaluate emotional intelligence and behavioral patterns, thereby improving assessment precision (Wang W., “AI for Psychometrics: Validating Machine Learning Models in Emotional Intelligence Assessment,” 2023). Moreover, AI-based predictive models have been developed to analyze large-scale student data and align career paths with individual capabilities, enabling more informed and data-driven decision-making (AI-Based Predictive Model for Career Guidance, 2024). Recent developments in AI-driven platforms also highlight the importance of scalable and real-time recommendation systems that provide personalized guidance to users (AI Career Guidance Platform, 2025). Despite these advancements, existing systems often lack a unified framework that combines psychometric evaluation, activity-based validation, and advanced AI-driven reasoning. Therefore, there is a need for an integrated and intelligent system that enhances both the accuracy and interpretability of career guidance solutions.

III. METHODOLOGY

The proposed system follows a structured and multi-stage methodology designed to provide accurate, reliable, and personalized career recommendations by integrating psychometric evaluation, activity-based assessment, and Large Language Model (LLM)–driven analysis. The overall process is divided into sequential phases to ensure systematic data collection, analysis, and decision-making.

Initially, the system performs **data collection** through a set of carefully designed psychometric questionnaires. These questionnaires are structured to capture essential attributes such as student interests, personality traits, cognitive abilities, and preferences. The responses obtained form the foundational dataset for further analysis.

Following data collection, a **psychometric evaluation phase** is conducted, wherein the system analyses the responses to identify patterns related to aptitude, behavioral tendencies, and domain-specific inclinations. This stage enables the system to generate an initial profile of the student, reflecting their strengths and potential areas of interest.

To enhance the reliability of the assessment, the system incorporates an **activity-based evaluation phase**, where students are required to perform practical tasks such as logical reasoning exercises, analytical problem-solving, and scenario-based challenges. This phase validates the theoretical findings obtained from psychometric analysis by assessing real-world performance, thereby improving the overall accuracy of the system.

Subsequently, the processed data is transformed into structured inputs for the **LLM-based analysis phase**. In this stage, the system utilizes advanced Large Language Model APIs to interpret the student profile in a contextual and holistic manner. The input data is formatted as structured prompts that include psychometric scores, activity results, and behavioral insights. The LLM processes this information to identify meaningful relationships and generate intelligent inferences.

Finally, in the **career recommendation phase**, the system produces personalized and context-aware career suggestions along with explanatory insights. These recommendations are tailored to the individual profile of the student and are designed to assist in informed decision-making. The inclusion of explanation-based outputs enhances transparency and allows users to understand the reasoning behind each recommendation.

PROCESS FLOW DIAGRAM AI-Based Career Guidance System

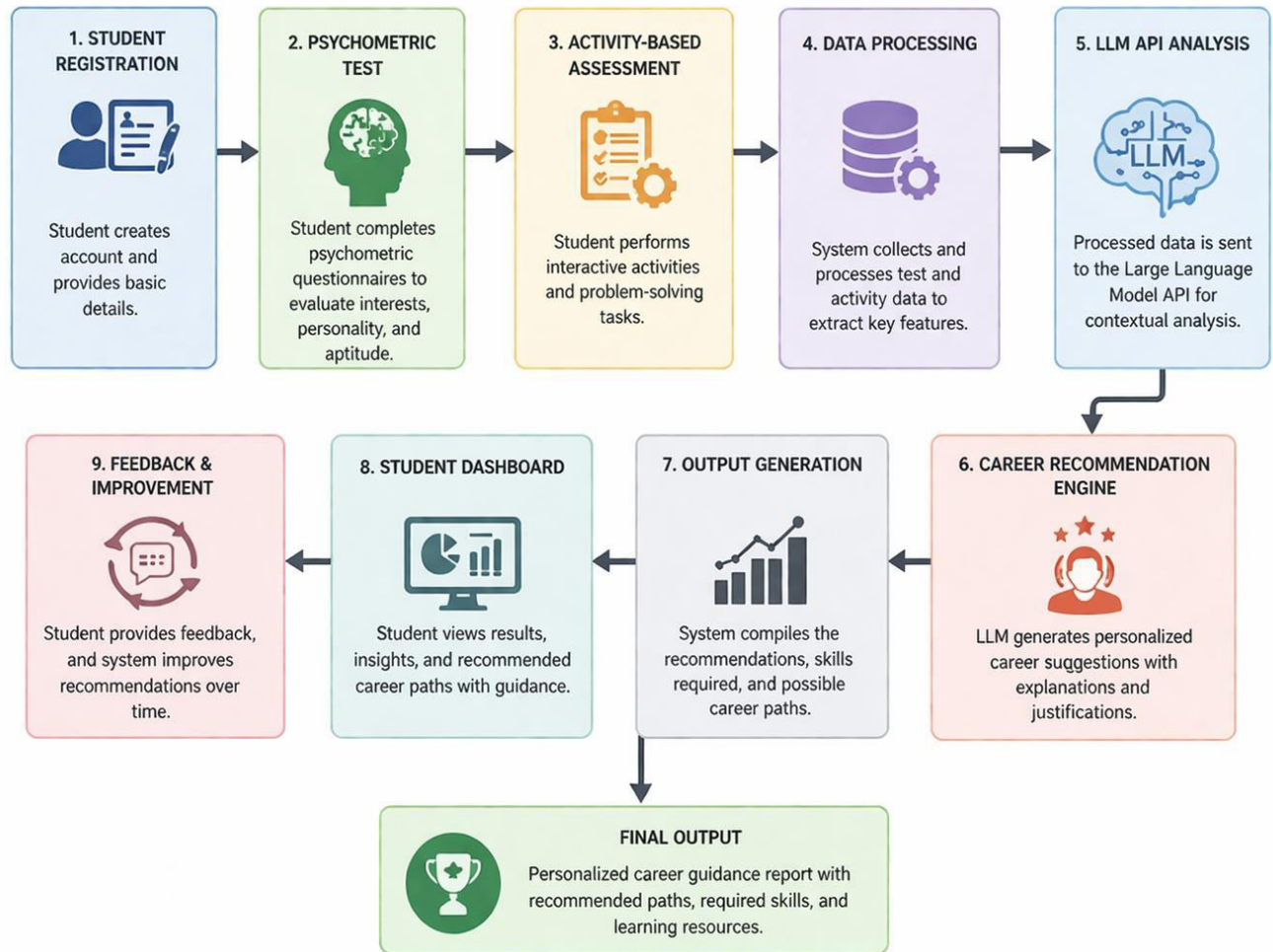


Fig.1 Process Flow Diagram of the System

IV. EXPERIMENTAL RESULTS

The proposed system was implemented and evaluated to demonstrate its effectiveness in delivering personalized career recommendations. The experimental results highlight the functionality of various system modules through user interface snapshots and system outputs.

4.1 Login Page

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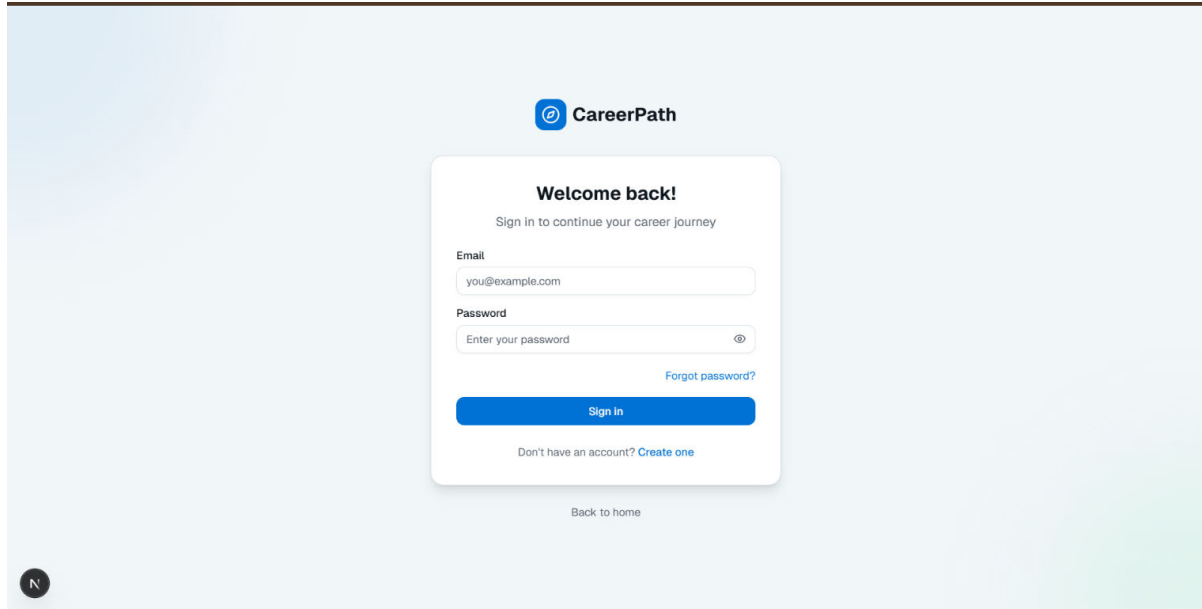


Fig.2 User Login Interface

4.2 Student Dashboard

The student dashboard provides a centralized interface where users can access all functionalities related to their career assessment process. It displays available tests, activity modules, and previous results. The dashboard is designed to offer a clear and structured view of the student's progress, ensuring ease of interaction and efficient navigation throughout the system.

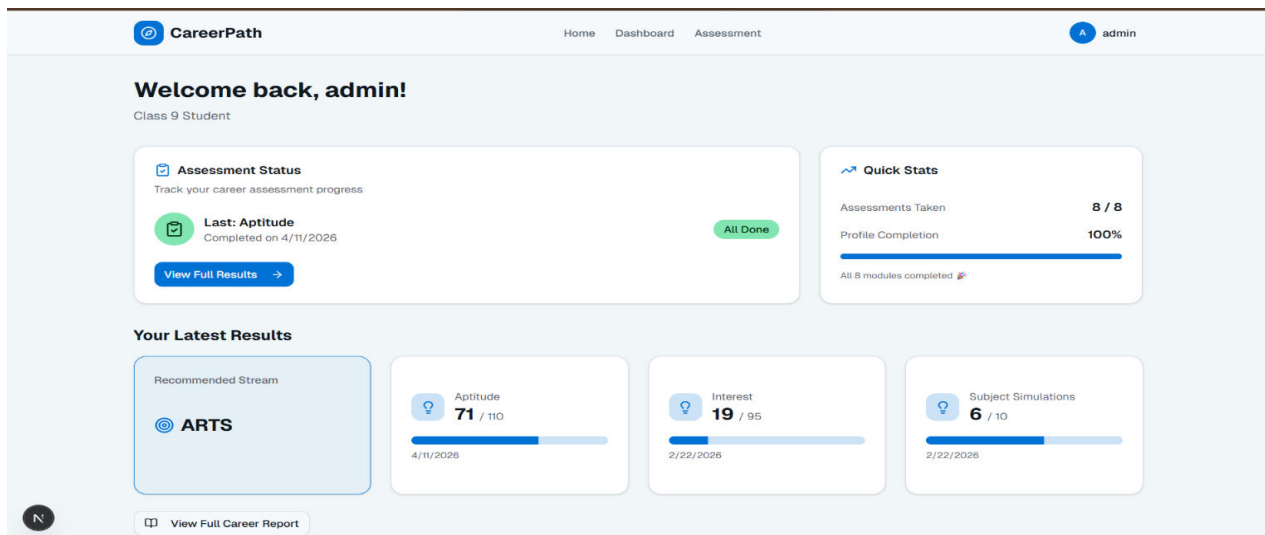


Fig.3 Student Dashboard Interface

4.3 Assessment Page

The assessment page enables students to participate in psychometric evaluations by answering structured questionnaires. The questions are designed to assess personality traits, interests, and cognitive abilities. The interface ensures smooth interaction and real-time response recording. This module forms the foundation for generating accurate and meaningful career recommendations.

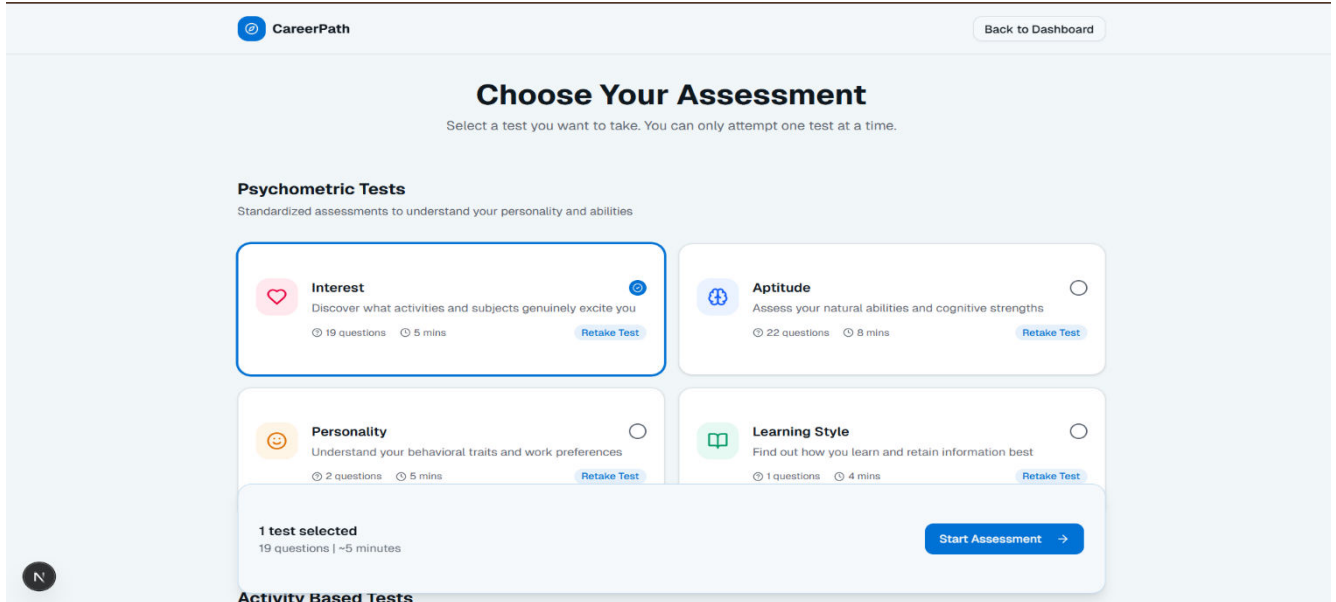


Fig.4 Psychometric Assessment Interface

4.4 Admin Dashboard

The admin dashboard allows administrators to manage the system efficiently. It provides functionalities such as creating and updating assessment questions, monitoring student performance, and managing user data. The interface is designed to ensure ease of control and effective system management, enabling dynamic updates and scalability.

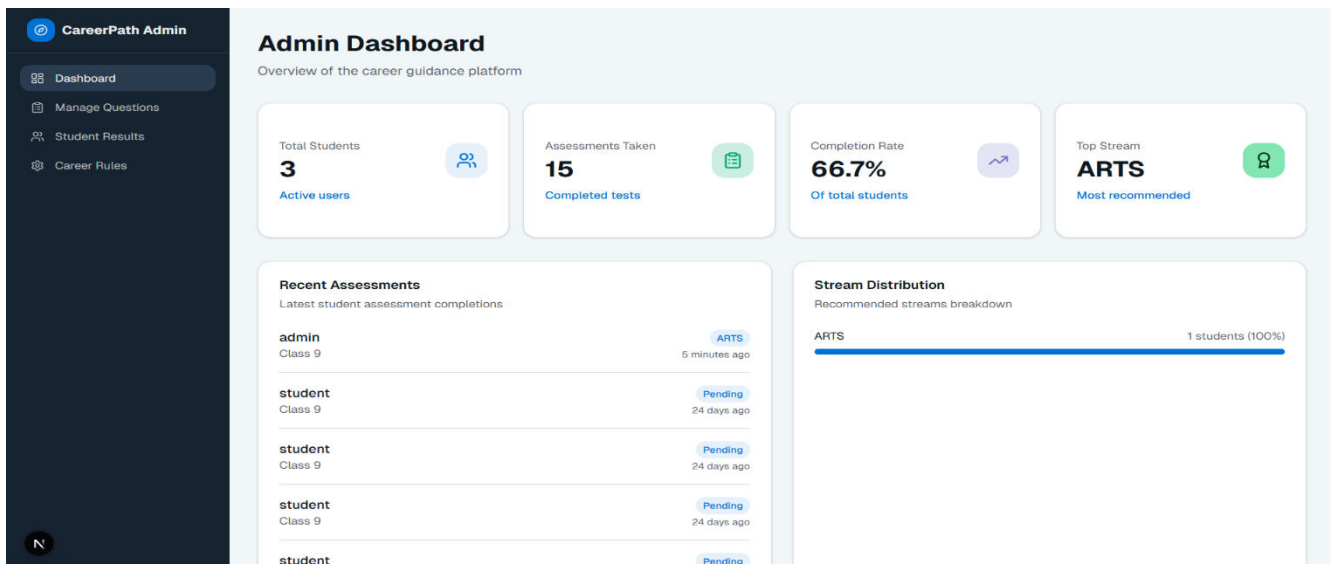


Fig.5 Admin Dashboard Interface

4.5 Career Recommendation Report

The career recommendation report represents the final output of the system. Based on psychometric analysis, activity-based evaluation, and LLM-driven insights, the system generates personalized career suggestions along with explanatory reasoning. The report provides multiple career options aligned with the student’s profile, thereby assisting in informed decision-making.

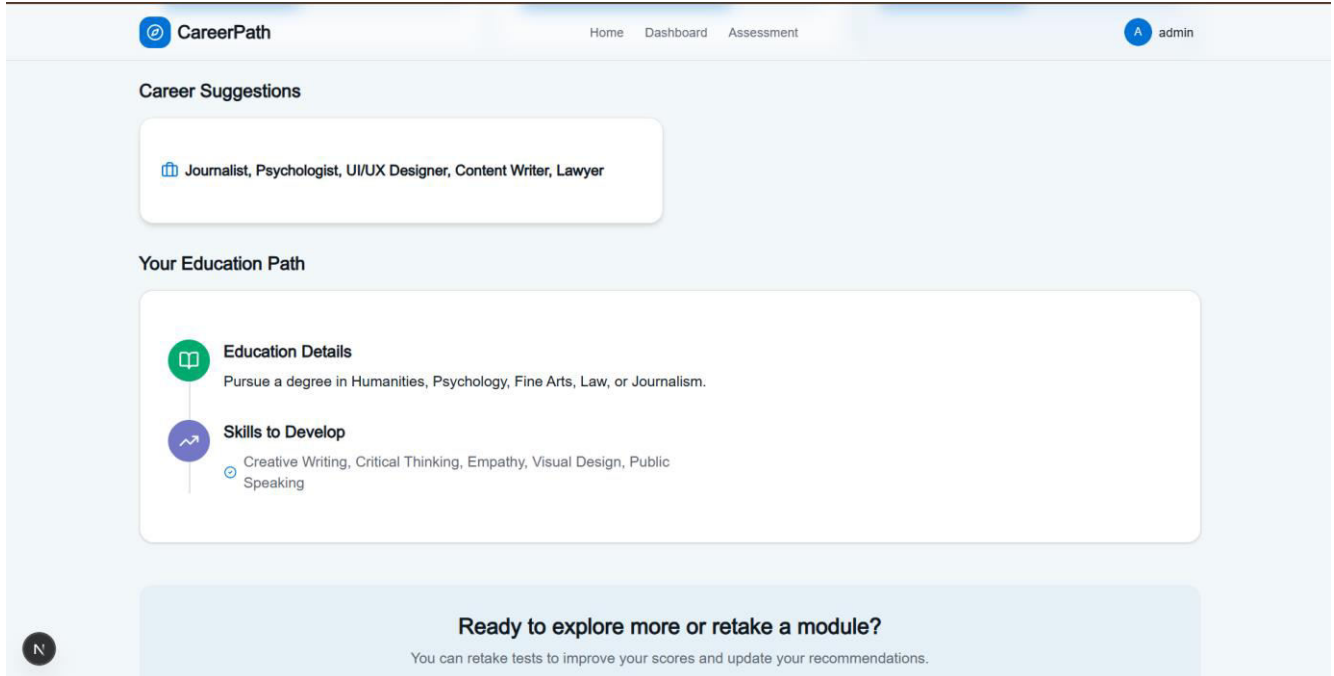


Fig.6 Career Recommendation Report

V. CONCLUSION

The present study introduces an intelligent and comprehensive career guidance system that effectively integrates psychometric analysis, activity-based assessment, and Large Language Model (LLM)-driven reasoning to deliver personalized and data-driven career recommendations. The proposed approach addresses the limitations of traditional career counselling methods by incorporating both theoretical evaluation and practical validation, thereby enhancing the accuracy and reliability of the assessment process.

The integration of LLM APIs enables the system to generate context-aware and explainable recommendations, allowing students to better understand the rationale behind suggested career paths. This not only improves decision-making but also promotes self-awareness and confidence among users. Furthermore, the system demonstrates strong scalability and adaptability, making it suitable for deployment across diverse educational environments.

The experimental results validate the effectiveness of the proposed system in providing meaningful and user-centric career guidance. By combining advanced AI techniques with structured assessment methodologies, the system offers a robust and efficient solution for modern career planning. Overall, this work contributes to the development of intelligent educational support systems and highlights the potential of AI-driven technologies in transforming career guidance practices.

Future work may focus on integrating advanced machine learning models, real-time analytics, and domain-specific customization to further enhance system performance and applicability.

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