



Advisely: AI-Powered Academic Advising Using Large Language Models (LLMs)

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Abstract

Academic advising is a crucial component of student success in higher education, providing guidance on course selection, program requirements, navigating institutional policies, and much more. It significantly influences students' academic performance, retention, and educational experience. However, current advising practices often face challenges such as limited accessibility, inconsistent information, miscommunication, and high administrative workloads. To address these challenges, this paper introduces Advisely, a web-based platform that employs GPT-4, a large language model, to facilitate academic advising. The system integrates the AI-powered chatbot with a comprehensive knowledge base covering academic policies, regulations, and institutional requirements. Advisely is designed to support students, academic advisors, and faculty by providing reliable, context-aware guidance on various topics, including course selection, program requirements, and policy interpretation. The platform's architecture features a decoupled front-end interface and back-end knowledge base, allowing institutions to update policies and rules without disrupting the user experience. This separation ensures scalability and flexibility, enabling each school to integrate its resources, regulations, and program-specific information. The paper discusses different use cases that illustrate Advisely's practical application, such as guiding students through course enrollment, clarifying graduation requirements, and aiding advisors in providing consistent advice. An initial evaluation assesses the system's performance regarding response accuracy and consistency. Findings suggest that Advisely significantly enhances the academic advising process, reducing administrative workload and improving access to information. Feedback from early users informs future development, aiming to expand functionality and refine the chatbot's capabilities for broader deployment.

Keywords: Academic Advising, Student Success, Large Language Models, GPT-4, Artificial Intelligence

1. Introduction

1.1 Background

Academic advising is a cornerstone of student success in higher education, serving as a vital support system for students navigating the complexities of their academic journeys. Effective advising improves academic performance, retention rates, and overall student satisfaction. However, traditional advising practices face significant challenges, including limited availability, inconsistent guidance, and high administrative workloads for advisors. The rise of Artificial Intelligence (AI) and Large Language Models (LLMs) presents an opportunity to address these issues by providing scalable, reliable, and personalized academic advising services.

Advisely, a chatbot powered by OpenAI's GPT-4o leverages state-of-the-art natural language processing to offer real-time, context-aware academic advising. By integrating a robust knowledge base that includes institutional policies, rules, and curriculum details, Advisely is designed to provide tailored assistance to students, advisors, and faculty. The chatbot utilizes a multi-tier architecture, ensuring separation of concerns across its user interface, database, and backend services. It enables seamless updates to the AI model and the knowledge base.

1.2 Motivation

Despite academic advising's critical role, many institutions struggle to provide students with adequate access to quality guidance due to resource constraints and growing student populations. This gap often leads to miscommunication, delays in decision-making, and, ultimately, a diminished student



experience. Existing advising solutions are either too generic or fail to integrate institutional-specific contexts, leaving room for innovation.

The motivation behind Advisely stems from these challenges and aims to provide a scalable, context-sensitive solution that enhances both the efficiency and accuracy of academic advising. By addressing common pain points such as accessibility, inconsistent advice, and limited personalization, Advisely has the potential to revolutionize the academic advising process. Furthermore, the system was designed with flexibility in mind, allowing institutions to adapt and scale their functionalities based on their unique needs.

1.3 Contributions

This paper introduces Advisely, a cutting-edge chatbot developed to transform the academic advising experience. The key contributions of this work are as follows:

1. **Development of a Multi-Tier Architecture:** A modular design separates the user interface, backend services, and integration with OpenAI's GPT-4o, ensuring system scalability, flexibility, and maintainability.
2. **Integration of Institution-Specific Knowledge Bases:** The chatbot is equipped to handle rules, policies, and curricula unique to each institution, providing students with personalized and accurate guidance.
3. **Implementation of a User-Centric Feedback Mechanism:** A survey conducted with students across diverse backgrounds provided valuable insights into the chatbot's usability, accuracy, and potential areas for improvement.
4. **Evaluation of Performance and Usability:** The system was evaluated for accuracy, response variability, and user satisfaction, yielding promising results that underscore its effectiveness and potential for broader adoption.

2. Related work

Technology integration in education has gained significant traction recently, particularly with artificial intelligence (AI) and large language models (LLMs) such as ChatGPT. These technologies can potentially revolutionize educational practices by enhancing personalized learning experiences, improving student engagement, and providing academic support. This literature review aims to synthesize current research on using AI and LLMs in education, specifically focusing on their applications for academic advice through chatbots.

AI technologies, including chatbots, have been increasingly adopted in educational settings to facilitate learning and support students. Research indicates that AI chatbots can enhance students' self-efficacy, self-esteem, problem-solving skills, and critical thinking when integrated into educational systems [1]. The design and context of these chatbots play a crucial role in their effectiveness, suggesting that tailored implementations can yield better educational outcomes [1]. Furthermore, AI chatbots have been shown to improve students' learning experiences by providing immediate feedback and personalized learning pathways, which are essential for fostering autonomy and engagement in learning [2][3][4].

The ethical implications of using AI in education are also a significant concern. Studies highlight that while AI chatbots can provide valuable support, there is a risk of over-reliance on these tools, which may lead to diminished engagement and authentic learning experiences [5]. Educators are encouraged to balance leveraging AI technologies and maintaining human interaction in the learning process to ensure that students develop critical thinking and problem-solving skills [5][6]. Moreover, integrating AI in education raises questions about data privacy, algorithmic bias, and the potential for AI-mediated interactions to negatively impact student learning experience [6].

The role of AI chatbots in providing academic advice is particularly noteworthy. Chatbots can serve as virtual academic advisors, offering students guidance on course selection, study strategies, and resource availability. This is especially beneficial in higher education, where faculty members may be overwhelmed with teaching and research responsibilities, making it challenging to provide individualized support [7]. Research suggests that students have expressed a strong desire to integrate AI chatbots into their educational journeys, anticipating that these tools will positively impact their academic development [8]. Additionally, using chatbots for academic advice can alleviate some of the challenges students face, such as anxiety related to academic performance and decision-making [7][9].



The effectiveness of AI chatbots in providing academic advice is supported by various studies demonstrating their ability to enhance student engagement and learning outcomes. For example, AI chatbots have been shown to facilitate active learning by encouraging students to ask questions and seek clarification on complex topics [10][7]. Furthermore, chatbots can provide tailored feedback on assignments, helping students identify areas for improvement and fostering a growth mindset [11]. This personalized approach enhances the learning experience and empowers students to take ownership of their education [3][7].

Despite AI chatbots' promising educational potential, challenges remain in their implementation. Robust evaluation frameworks to assess the effectiveness of chatbots in educational contexts are critical [12]. Additionally, educators must have the necessary skills and knowledge to integrate AI technologies effectively into their teaching practices [13]. This includes understanding the limitations of AI chatbots and ensuring that they complement rather than replace traditional teaching methods [5].

The literature also emphasizes the importance of developing AI literacy among students to maximize the benefits of AI chatbots in education. Students must be able to evaluate the information provided by chatbots critically, discerning the relevance and reliability of the responses they receive [14]. This skill is particularly crucial in disciplines such as science and language education, where the accuracy of information can significantly impact learning outcomes [15]. By fostering AI literacy, educators can prepare students to navigate the complexities of AI technologies and utilize them effectively in their academic pursuits [3][14].

In conclusion, integrating AI and large language models in education presents opportunities and challenges. While AI chatbots have the potential to enhance personalized learning experiences and provide valuable academic advice, ethical considerations and the need for robust evaluation frameworks must be addressed. As educational institutions continue to explore AI technologies, it is essential to prioritize student engagement, critical thinking, and the development of AI literacy to ensure that these tools contribute positively to the learning environment.

3. Methodology

3.1 System Architecture and Design

The Advisely chatbot was designed using a multi-tier architecture, as shown in Figure 1, to ensure modularity, scalability, and ease of maintenance.

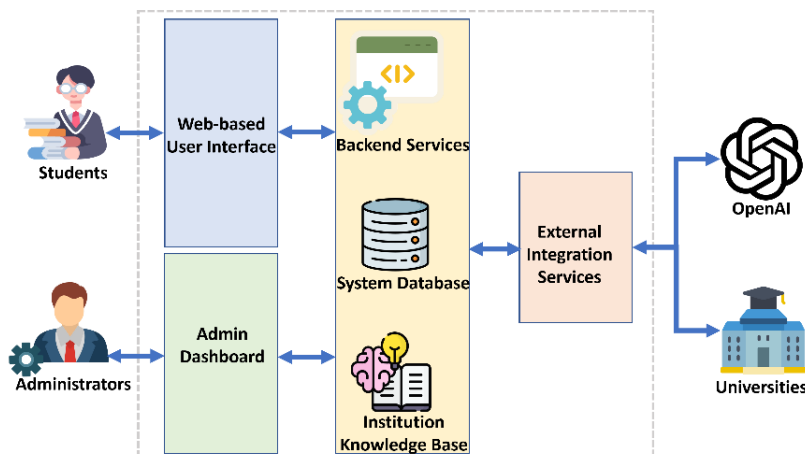


Fig 1. The System High-level Architecture Diagram.

User Interface Layer: This web-based interface allows students and faculty to interact with the chatbot seamlessly. The interface is intuitive, ensuring accessibility for students with varying levels of technical proficiency.

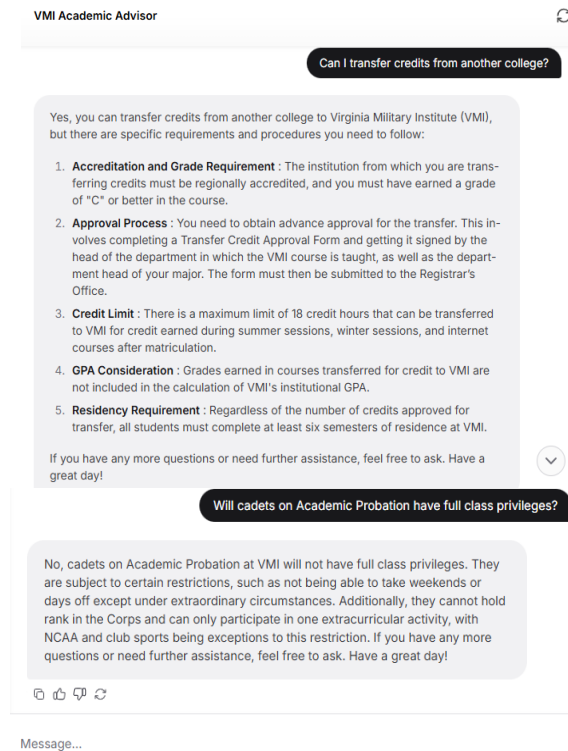


Fig.2. Sample Conversations between Students and Advisely.

Admin Dashboard: Admin users can monitor user interactions and usage analytics, including likes, dislikes, and user locations.

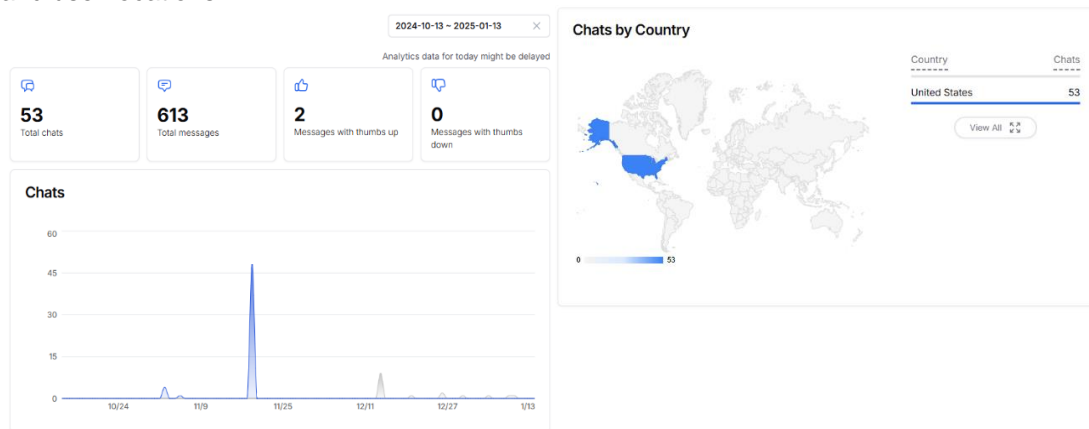


Fig.3. Admin User Dashboard Showing Usage, Interactions, and Location Analytics.

Backend and Database Layer: This layer manages system logic and stores institutional data, including academic rules, policies, and curriculum details. The database is populated with school-specific knowledge bases, ensuring context-sensitive responses tailored to each institution. This design allows Advisely to use a separate knowledge base tailored for each school/university.

External Integration Layer: This layer handles integration with OpenAI's GPT-4o, enabling natural language processing and response generation. The modular design allows upgrades to newer AI models without disrupting the system's core functionalities.

3.2 Data Collection

To evaluate the effectiveness of Advisely, we surveyed 47 first-year students in the computer science department. Participants interacted with the chatbot for 30 minutes and then completed a feedback survey, including quantitative and qualitative questions. The survey assessed several dimensions of the chatbot's performance, including Helpfulness, which is rated on a Likert scale ranging from



"Extremely helpful" to "Extremely unhelpful," Accuracy where participants evaluated the precision of the chatbot's responses, the likelihood of future use where students rated how likely they were to use the chatbot in the future. Finally, we collected suggestions for improvement using open-ended questions to gather feedback on desired features, additional advising topics, and other enhancements.

3.3 Data Analysis

The collected survey data was analyzed using a combination of quantitative and qualitative methods:

- Quantitative Analysis: Descriptive statistics, including mean scores and frequency distributions, were used to summarize feedback from Likert scale questions. Trends were identified to assess overall satisfaction, perceived accuracy, and likelihood of continued use.
- Qualitative Analysis: open-ended responses were categorized into themes such as accuracy, usability, additional features, and institution-specific functionality. Suggestions for improvement were analyzed to identify actionable recommendations for future system iterations.

3.4 Pilot Deployment and Evaluation

The system was deployed in a pilot study involving Virginia Military Institute (VMI) students. The pilot study aimed to test the chatbot's integration with the institution's unique policies and academic requirements. Participants were given access to a sample database of academic advising scenarios and encouraged to ask general and institution-specific questions. The performance of Advisely was assessed using the following key metrics:

- Response Accuracy: The proportion of responses rated as "Extremely accurate" or "Somewhat accurate" by participants.
- Usability: Student satisfaction scores derived from questions on the system's helpfulness, ease of use, and overall experience.
- Adoption Likelihood: Ratings on the likelihood of future use and peer recommendations.
- Error Analysis: Frequency and percentage of incorrect or irrelevant responses, as reported by participants.

4. Results and Findings

4.1 Quantitative Results

Advisely was evaluated using survey data collected from students who interacted with the chatbot. The results provide insights into the chatbot's performance in terms of accuracy, usability, and potential for future use.

A significant majority of participants (33 out of 47) rated Advisely as "Extremely helpful," while 10 rated it as "Somewhat helpful." Only a small portion (4 participants) selected "Neither helpful nor unhelpful," and no participants rated it negatively. These results highlight the perceived utility of the chatbot in academic advising.

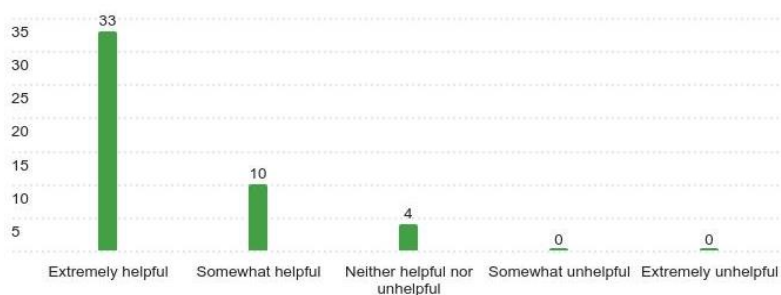


Fig.4. Students' Responses to the "How helpful was the Advisely Chatbot?" Question.

Most participants (31 out of 47) rated the Chabot's responses as "Extremely accurate," with an additional 13 selecting "Somewhat accurate." Only 3 participants rated its responses as "Neither accurate nor inaccurate," and there were no reports of significant inaccuracies. This indicates strong confidence in the Chabot's ability to deliver reliable, context-aware responses.

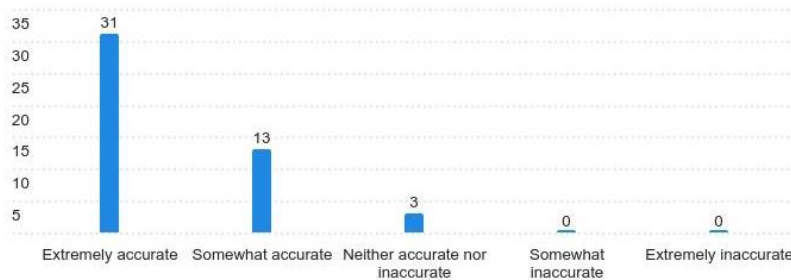


Fig.5. Students' Responses to the "How accurate were the Advisely 's Responses?" Question.

When asked about their likelihood of using Advisely in the future, 19 participants chose "Extremely likely," and 20 selected "Somewhat likely." This suggests a high potential for continued adoption, with only one participant expressing skepticism ("Somewhat unlikely"). Most participants indicated they were likely to recommend Advisely to their peers, with 22 selecting "Extremely likely" and 15 choosing "Somewhat likely."

This result underscores the Chabot's reputation for providing valuable academic support. The overall experience was rated on a scale from 1 (Bad) to 5 (Great). The majority (31 participants) rated their experience as a 5, with 12 giving a 4. Only a few participants rated their experience lower, affirming the Chabot's strong student satisfaction.

4.2 Qualitative Findings

Open-ended feedback provided additional insights into areas where Advisely excels and where improvements are needed.

Strengths

- Participants appreciated the chatbot's ability to provide quick and context-relevant answers. The chatbot's intuitive interface and ease of use were frequently highlighted as key advantages.

Areas for Improvement

- Suggestions included making responses less robotic and improving the variability of answers.
- Participants recommended adding features such as a course planner and visual aids (e.g., images in answers).
- Some students requested the ability to ask multiple questions consecutively and receive more nuanced responses tailored to individual academic situations.
- Other suggestions included adding FAQs, guidance on next semester's course planning, and instructions on navigating class schedules and year-specific events.

Error Analysis

- Participants reported no significant errors in the chatbot's responses. However, one student noted that Advisely could occasionally be tricked into answering off-topic queries. This feedback highlights the need for improved filtering mechanisms to ensure responses remain contextually appropriate.

4.3 Summary of Findings

Overall, the results demonstrate that Advisely successfully addresses many challenges associated with traditional academic advising, including accessibility, accuracy, and personalization. The overwhelmingly positive feedback on helpfulness, accuracy, and usability affirms the potential for widespread adoption. However, the qualitative feedback also highlights opportunities for enhancement, such as expanding features and refining the conversational tone. These findings provide a clear roadmap for future iterations of Advisely, emphasizing student-centric improvements that align with the needs and expectations of its audience.

5. Conclusion and Future Work

Advisely demonstrates significant potential in revolutionizing academic advising by using the capabilities of GPT-4 and a robust, institution-specific knowledge base. The system's easy-to-use Interface design, modular architecture, and high levels of accuracy and helpfulness—validated



through pilot deployment and user feedback—demonstrate its ability to enhance the academic experience. While early results are promising, this study highlights the importance of continued refinement and iteration to maintain the chatbot's relevance and effectiveness in diverse educational settings.

Our future work includes incorporating advanced features such as an AI-driven course planner and deploying Advisely in various institutions to test adaptability to different policies, curricula, and student demographics. Additionally, we aim to conduct a longitudinal study to evaluate the impact of Advisely on students' retention, performance, and satisfaction over extended periods.

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