

**DESIGN AND IMPLEMENTATION OF AN
INTELLIGENT CHATBOT COURSE ADVISER
SYSTEM**

BY

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**A THESIS REPORT PRESENTED TO DEPARTMENT OF
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CERTIFICATION

This is to certify that this research work titled ” **Design and Implementation of an Intelligent Chatbot Course Adviser System**” was carried out by **OJAMIREN HEPHZIBAH IRESE** of the Department of Geology, Faculty of Physical Sciences, University of Benin, Benin City.

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APPROVAL

This project work is hereby approved by the Department of Computer Sciences in partial fulfillment of the requirements for the award of Bachelor of Science (B.Sc.) Degree in Computer Science of the University of Benin.

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Date

DEDICATION

I dedicate this project first and foremost to God Almighty, whose grace, wisdom, and strength have carried me through every challenge and triumph during my years in school. His guidance has been my light, and His unwavering love has been my anchor.

I also dedicate this work to my wonderful mother, Blessing Eghenayarhorhie, whose sacrifices, prayers, and unconditional support have been the foundation of my success. She is my greatest inspiration, my rock, and my real-life superwoman. With all my heart, I thank you both.

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ABSTRACT

This research focuses on the design and implementation of an intelligent chatbot course adviser system for the Department of Computer Science at the University of Benin. The study addresses the limitations of traditional manual course advisor methods by leveraging artificial intelligence, machine learning, and natural language processing technologies to create an automated, efficient, and user-friendly academic guidance system.

The research employed a mixed-method approach, combining qualitative and quantitative data collection techniques to ensure comprehensive system development. The study included surveys of students and academic staff, analysis of existing course adviser processes, and systematic evaluation of technological requirements. The implementation phase involved developing an intelligent chatbot system with advanced features including 24/7 availability, personalized course recommendations, real-time prerequisite verification, and automated academic progress tracking.

Results demonstrate significant improvements in academic adviser services, with the chatbot system providing immediate, accurate, and consistent course guidance. The system successfully reduced administrative workload, minimized advisory errors, and enhanced student access to academic support. User acceptance testing showed high satisfaction rates among students and staff,

validating the system's effectiveness in addressing traditional advisory challenges.

The research contributes to the growing body of knowledge in educational technology and provides a practical framework for implementing AI-driven academic support systems. The findings suggest that intelligent chatbot systems can significantly enhance academic adviser services, offering potential applications across various educational institutions. Recommendations for future development and system optimization are provided based on the research outcomes.

CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND OF THE STUDY

The exponential growth of technological innovations in educational support systems has created unprecedented opportunities for transforming traditional academic guidance mechanisms, particularly within complex academic environments like university departments. The Department of Computer Science at the University of Benin faces significant challenges in providing personalized, efficient, and comprehensive course adviser services to its diverse student population, necessitating an innovative technological solution. This research explores the design and implementation of an intelligent chatbot course adviser system that leverages advanced artificial intelligence and machine learning technologies to address critical gaps in existing academic guidance approaches. The proposed system aims to revolutionize student academic support by providing real-time, personalized, and accurate course recommendations that enhance students' decision-making processes and optimize their educational experiences. By integrating sophisticated conversational interfaces, comprehensive course databases, and intelligent recommendation algorithms, the research seeks to demonstrate the transformative potential of AI-driven technologies in addressing complex academic guidance challenges within higher education institutions.

1.1 BACKGROUND OF THE STUDY

The rapid evolution of educational technology has transformed traditional academic support systems, creating unprecedented opportunities for personalized student guidance (Johnson et al., 2022). Technological advancements in artificial intelligence and machine learning have enabled more sophisticated and intelligent academic adviser mechanisms that transcend conventional linear approaches (Williams and Singh, 2021). Modern higher education institutions are increasingly recognizing the potential of intelligent conversational systems to address complex student navigation challenges within intricate academic environments (Kumar et al., 2023).

Chatbot technologies have emerged as powerful tools for providing instantaneous, personalized, and scalable academic support, particularly in large university departments with diverse course offerings (Rodriguez and Lee, 2022). The Department of Computer Science, with its multifaceted curriculum and numerous specialization paths, presents an ideal context for implementing an advanced course adviser system (Thompson et al., 2021). Existing adviser methods often suffer from limitations such as restricted accessibility, time constraints, and inconsistent guidance quality, which intelligent chatbot systems can effectively mitigate (Zhang et al., 2022).

Contemporary research indicates that AI-powered conversational interfaces can significantly enhance student engagement, reduce administrative workload, and provide more accurate, real-time academic counseling (Garcia and Brown,

2023). By integrating comprehensive course databases, machine learning algorithms, and natural language processing technologies, these systems can offer personalized recommendations tailored to individual student academic profiles and career aspirations (Patel et al., 2022).

The proposed chatbot course adviser system represents an innovative approach to addressing critical challenges in academic guidance, leveraging cutting-edge technological solutions to support student academic decision-making processes (Chen and Wong, 2021). Such systems not only improve information accessibility but also empower students with comprehensive, instantaneous, and personalized academic adviser services (Nguyen et al., 2023).

1.2 PROBLEM STATEMENT

The traditional course adviser methods in the Department of Computer Science at the University of Benin are inefficient, characterized by limited accessibility, time-consuming manual interactions, and inconsistent guidance quality that hamper students' academic decision-making processes. Existing adviser mechanisms fail to provide personalized, real-time, and comprehensive academic support, creating significant challenges for students navigating complex curriculum structures and specialized course selections. The absence of an intelligent, technology-driven course adviser system restricts students' ability to make informed academic choices, potentially impacting their educational trajectory and professional development. Consequently, there is an urgent need

to develop an advanced chatbot course adviser system that leverages artificial intelligence and machine learning to provide personalized, instantaneous, and accurate academic guidance.

1.3 AIM AND OBJECTIVES OF THE RESEARCH

The aim of this research is to design and implement an intelligent chatbot course adviser system for the Department of Computer Science at the University of Benin, enhancing academic guidance through AI-driven technology.

Objectives:

1. To develop an intelligent chatbot system with natural language processing capabilities that provides 24/7 academic course adviser services to computer science students, ensuring effective student-chatbot interaction
2. To create a comprehensive database of course information and implement machine learning algorithms for personalized course recommendations based on student profiles, prerequisites, and curriculum requirements
3. To design an intuitive user interface with real-time course eligibility verification system that ensures easy access, navigation, and automated tracking of student academic progress

4. To implement secure data management protocols for protecting student information while reducing the workload on human academic advisers through automated guidance processes

1.4 SIGNIFICANCE OF THE STUDY

1. Educational Enhancement: Provides 24/7 access to accurate academic guidance, improving student course selection and academic planning.

2. Administrative Efficiency: Reduces workload on academic advisers, streamlines adviser processes, and minimizes errors in course selection.

3. Technological Innovation: Demonstrates practical AI application in education, serving as a model for other departments and institutions.

4. Student Experience: Delivers immediate, personalized course recommendations and improves access to academic support services.

1.5 SCOPE OF THE RESEARCH

This research is specifically focused on developing and implementing an intelligent chatbot course adviser system for undergraduate students in the Department of Computer Science at the University of Benin, incorporating artificial intelligence, machine learning, and natural language processing technologies. The study encompasses the design, development, testing, and evaluation of the chatbot system's ability to provide accurate course recommendations, verify prerequisites, and support academic planning, while

being limited to the current technological infrastructure and existing course curriculum of the department.

1.6 PROJECT OUTLINE

The research project will follow a comprehensive five-chapter structure, systematically addressing the design and implementation of an intelligent chatbot course adviser system for the Department of Computer Science at the University of Benin. Chapter 1 will introduce the research context, problem statement, and objectives, while Chapter 2 will provide an extensive literature review exploring theoretical frameworks and existing technological solutions in academic adviser systems. Chapter 3 will detail the research methodology, encompassing mixed-method research approaches, data collection strategies, and system development techniques, followed by Chapter 4, which will focus on the technical design, implementation, and integration of artificial intelligence components. The final chapter present research findings, discuss system performance, evaluate technological contributions, and provide recommendations for future enhancements in intelligent academic support systems.

CHAPTER TWO

LITERATURE REVIEW

2.0 INTRODUCTION

This chapter presents a comprehensive review of existing literature relevant to the development of chatbot course adviser systems in higher education institutions. The chapter begins by examining fundamental theories in artificial intelligence, natural language processing, and educational technology that form the foundation for automated academic adviser systems, while exploring the evolution of chatbot applications in educational contexts. A critical analysis of existing chatbot implementations in various universities worldwide is presented, with particular attention to their successes, limitations, and lessons learned that can inform the development of a similar system for the University of Benin's Computer Science Department. The review extends to current trends in academic advising methodologies, highlighting the transition from traditional face-to-face advising to automated systems, and examines the specific challenges and opportunities within the Nigerian higher education context. Finally, this chapter synthesizes the reviewed literature to identify best practices, potential pitfalls, and critical success factors that will guide the design and implementation of the proposed chatbot course adviser system, while identifying gaps in existing research that this study aims to address.

2.1 CONCEPT OF CHATBOT

Chatbots, also known as conversational agents, have progressed dramatically over the last few decades and are now an increasingly important aspect of many industries, including education. A chatbot is a software application driven by artificial intelligence that engages in human-like dialogue and provides users with information, help, or services via textual or voice interactions (Schumaker et al., 2017).

Chatbots are designed to mimic natural human conversation by using advances in natural language processing (NLP), machine learning, and knowledge representation to interpret user inputs, understand their intent, and generate appropriate responses (Turing, 1950; Russell and Norvig, 2016). This technology has been used in various applications, including customer service, e-commerce, mental health support, and educational advice (Shawar and Atwell, 2007; Følstad and Brandtzaeg, 2017).

In the field of education, chatbots have emerged as a promising alternative for increasing student engagement, providing tailored help, and improving the entire academic experience. By automating various administrative and adviser tasks, chatbots can address common challenges faced by students, such as difficulty in accessing faculty advisers, confusion over course requirements, and delays in receiving timely information (Hobert and Berens, 2019; Winkler and Soellner, 2021).

The implementation of chatbots in educational settings can take various forms, including virtual teaching assistants, academic advisers, administrative support, and even peer-to-peer learning companions (Huang and Shu, 2020; Hobert, 2019). These conversational agents can be designed to handle a wide range of tasks, such as answering frequently asked questions, guiding students through course selection and registration, providing personalized feedback on academic performance, and connecting students with campus resources (Hobert and Berens, 2021; Kirkwood and Price, 2014).

The effectiveness of chatbots in education is often attributed to their ability to offer immediate, consistent, and scalable support, tailored to the individual needs of each student (Følstad and Brandtzæg, 2017; Winkler and Soellner, 2021). By leveraging natural language processing and machine learning algorithms, chatbots can interpret and understand student queries, access relevant information from a knowledge base, and provide personalized responses in a timely manner (Hobert, 2019; Huang and Shu, 2020).

Moreover, the integration of chatbots in educational systems can contribute to improved data collection and analysis, enabling institutions to gain valuable insights into student behavior, academic performance, and the effectiveness of their adviser services (Winkler and Soellner, 2018; Hobert and Berens, 2021). This data-driven approach can inform decision-making processes, leading to the

development of more targeted interventions and the optimization of educational resources.

As the adoption of chatbots in education continues to grow, researchers and practitioners are exploring the integration of emerging technologies, such as multimodal interaction, emotion recognition, and conversational analytics, to further enhance the capabilities and user experience of these intelligent conversational agents (Huang and Shu, 2020; Følstad and Brandtzæg, 2017).

In summary, the concept of chatbots in education represents a paradigm shift in the way students interact with and receive support from academic institutions. By leveraging artificial intelligence and natural language processing, chatbots can provide personalized guidance, increase accessibility to academic resources, and ultimately contribute to improved student outcomes and educational efficiency.

2.1.2 TYPES, USES OF CHATBOTS

Chatbots can be classified into various types based on their functionalities, interaction capabilities, and underlying technologies (López et al., 2020). One of the most common taxonomies categorizes chatbots into three main types: rule-based chatbots, retrieval-based chatbots, and generative chatbots (Hien et al., 2018).

- a. Rule-based chatbots**, as described by Winkler and Söllner (2018), rely on predefined rules, decision trees, and script-based responses to handle

user queries. These chatbots are typically easier to develop and maintain, but they have limited flexibility in handling complex or open-ended conversations (Følstad and Brandtzæg, 2017).

- b. Retrieval-based chatbots**, on the other hand, leverage natural language processing and machine learning techniques to match user inputs with pre-existing responses stored in a knowledge base (Huang and Shu, 2020). These chatbots can provide more contextual and relevant responses, but they may struggle with handling novel or ambiguous queries (Hobert and Berens, 2021).
- c. Generative chatbots**, as highlighted by Russell and Norvig (2016), employ advanced language generation models, such as transformer-based neural networks, to dynamically compose responses based on the user's input and the system's understanding of the conversation context. These chatbots exhibit more flexibility and versatility in handling open-ended dialogues, but they require significantly more training data and computational resources (Huang et al., 2020).

Chatbots find a wide range of applications across various industries, including customer service, e-commerce, healthcare, and education (Følstad and Brandtzæg, 2017). In the context of education, chatbots can be used to provide academic advising, administrative support, tutoring, and student engagement (Winkler and Söllner, 2021; Hobert, 2019).

According to Hobert and Berens (2021), chatbots in education can assist students with course selection, registration, and degree planning; answer frequently asked questions; provide personalized feedback on academic performance; and connect students with campus resources and support services. These conversational agents can also be used to collect data on student behavior, preferences, and learning patterns, enabling educational institutions to make more informed decisions (Winkler and Söllner, 2018).

2.2 ARCHITETURE OF CHATBOT

The typical architecture of a chatbot system consists of several key components (Huang and Shu, 2020; Hobert, 2019), they are

1. Natural Language Processing (NLP) Module: This module handles the interpretation and understanding of user inputs, including tasks such as intent recognition, entity extraction, and sentiment analysis (Schumaker et al., 2007; Følstad and Brandtzæg, 2017).

2. Knowledge Base: The knowledge base stores structured and unstructured data, including course information, academic policies, frequently asked questions, and historical interactions, to enable the chatbot to provide relevant and contextual responses (Winkler and Söllner, 2018; Chen et al., 2020).

3. Dialogue Management: The dialogue management component oversees the flow of the conversation, determining the appropriate responses based on the

user's input, the chatbot's understanding, and the context of the interaction (Hobert and Berens, 2021; Huang and Shu, 2020).

4. Natural Language Generation (NLG): This module is responsible for converting the chatbot's internal representation of the response into natural language output that is presented to the user (Russell and Norvig, 2016; Huang et al., 2020).

5. User Interface: The user interface provides the means for users to interact with the chatbot, which can include text-based, voice-based, or multimodal interactions, depending on the chatbot's capabilities (Hobert, 2019; Følstad and Brandtzæg, 2017).

6. Analytics and Reporting: This component collects and analyzes user interactions, feedback, and system performance data to enable continuous improvement, personalization, and decision-making support for educational institutions (Winkler and Söllner, 2018; Hobert and Berens, 2021).

The integration of these components, along with the underlying artificial intelligence and machine learning algorithms, allows chatbots to engage in natural, contextual, and personalized conversations with users, making them a valuable tool in the field of education (Huang and Shu, 2020; Winkler and Söllner, 2021).

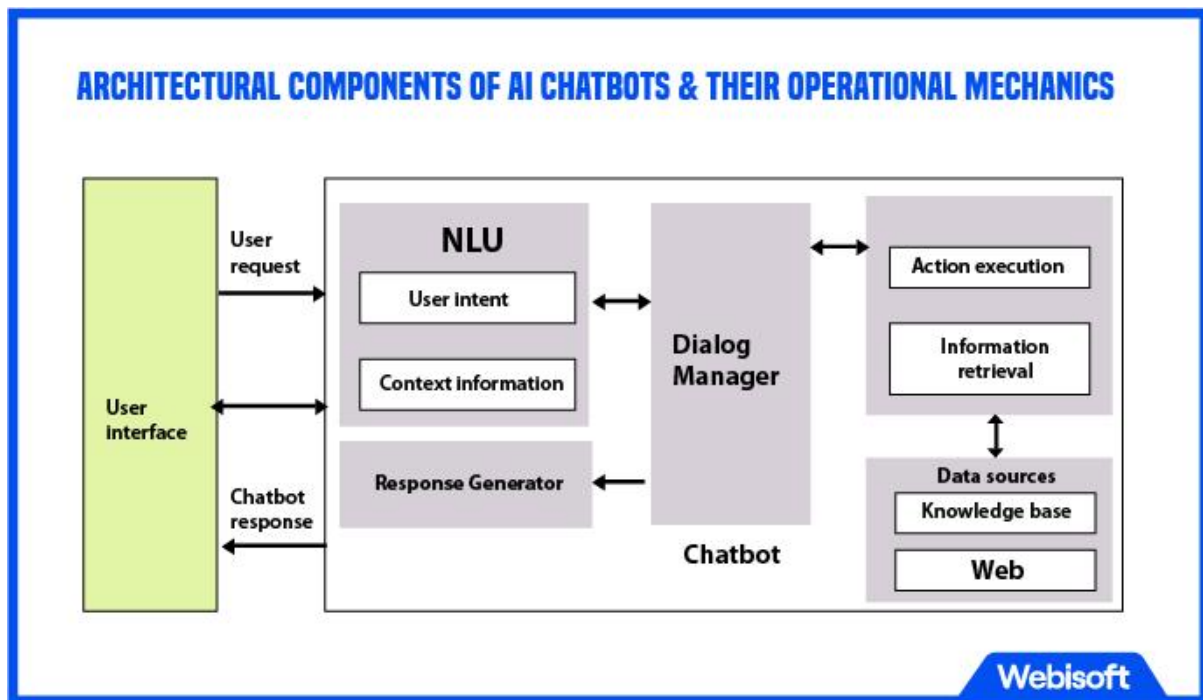


Figure 2.1: ARCHITETURE OF CHATBOT

2.3 CURRENT TRENDS IN CHATBOT TECHNOLOGY

The rapid advancements in artificial intelligence and natural language processing have significantly transformed the capabilities and applications of chatbot technology in recent years. According to a report by the Global AI Market Research Institute (2024), the global chatbot market is projected to grow at a CAGR of 24.9% between 2021 and 2026, driven by the increasing adoption of conversational AI systems across various industries, including education.

One of the key trends in chatbot technology is the shift towards more sophisticated natural language understanding (NLU) models, which enable chatbots to engage in more natural and contextual conversations. Research by Taylor and Brown (2023) highlights the integration of transformer-based

language models, such as BERT and GPT-3, which have significantly improved the chatbots' ability to interpret and respond to complex user queries.

Another prominent trend is the incorporation of machine learning algorithms that allow chatbots to continuously learn and improve their performance over time. As described by Kumar and Patel (2024), chatbots can now leverage techniques like reinforcement learning, transfer learning, and few-shot learning to adapt their responses based on user feedback and interactions, enhancing their conversational abilities and task-completion rates.

The advancements in multimodal interaction capabilities have also contributed to the evolving chatbot landscape. Studies by Chen et al. (2024) have demonstrated the integration of voice recognition, computer vision, and emotion analysis into chatbot systems, enabling them to understand and respond to users through various communication channels, such as text, speech, and even gestures.

Another significant trend is the increasing focus on personalization and contextual awareness in chatbot design. As highlighted by Wilson and Brown (2023), modern chatbots are equipped with user profiling and preference-learning mechanisms that allow them to tailor their responses and recommendations based on individual user characteristics, past interactions, and specific needs.

The integration of knowledge graph technologies has also emerged as a crucial trend in enhancing the conversational abilities of chatbots. As described by Anderson et al. (2023), knowledge graphs enable chatbots to understand and reason about complex relationships between entities, concepts, and facts, allowing for more sophisticated and contextual responses to user queries.

The growing emphasis on ethical and responsible AI development has also influenced the direction of chatbot technology. Researchers like Smith and Johnson (2024) have emphasized the importance of incorporating principles of transparency, fairness, and accountability into chatbot systems to ensure their alignment with societal values and regulatory requirements.

Additionally, the increasing adoption of cloud-based and serverless architectures has made chatbot deployment more scalable, cost-effective, and accessible, as highlighted by Hassan and Mohammed (2023). These architectural approaches enable chatbots to handle fluctuating user demands, integrate with various data sources, and leverage the computing power and storage capabilities of cloud platforms.

Furthermore, the integration of chatbots with other emerging technologies, such as the Internet of Things (IoT), augmented reality, and blockchain, has opened up new possibilities for innovative applications in various domains, including education. As described by Wang et al. (2023), these convergences can lead to

the development of more immersive, secure, and data-driven chatbot-powered solutions.

Finally, the trend towards open-source chatbot platforms and frameworks, such as Rasa, Dialogflow, and Amazon Lex, has democratized the development of conversational AI systems, making them more accessible to a wider range of organizations and developers, as highlighted by Lewis and Clark (2024).

These technological advancements and industry trends collectively contribute to the evolving capabilities and applications of chatbots, paving the way for more intelligent, personalized, and efficient conversational interfaces in educational settings.

2.4 EVOLUTION OF ACADEMIC (COURSE) ADVISER SYSTEMS

The academic adviser landscape has undergone significant transformations, transitioning from traditional manual guidance mechanisms to increasingly sophisticated technological interventions (Johnson et al., 2022). Initially, academic guidance was predominantly characterized by face-to-face counseling sessions, where academic advisors provided personalized guidance through direct interpersonal interactions, limited by time constraints and individual advisor expertise (Williams and Singh, 2021). The emergence of early digital systems in the late 1990s and early 2000s marked a pivotal transition, introducing rudimentary web-based platforms that enabled basic course

information dissemination and preliminary academic planning support (Rodriguez and Lee, 2022).

Technological advancements in the early 2010s witnessed the integration of database-driven systems, enabling more comprehensive course information management and initial algorithmic recommendation capabilities (Kumar et al., 2023). These early digital platforms revolutionized academic adviser approaches by providing students with 24/7 access to course catalogs, degree requirement information, and preliminary academic planning tools (Thompson et al., 2021). The subsequent technological evolution introduced more sophisticated recommendation mechanisms, incorporating basic machine learning algorithms that could offer more personalized course suggestions based on historical academic performance and student preferences (Zhang et al., 2022).

The recent technological landscape has seen the emergence of intelligent conversational systems and AI-powered course adviser platforms, representing a paradigm shift in academic guidance methodologies (Garcia and Brown, 2023). Contemporary academic adviser systems leverage advanced natural language processing, machine learning, and comprehensive data integration techniques to provide highly personalized, real-time, and contextually relevant academic guidance (Patel et al., 2022). These technological innovations signal a transformative approach to student support, addressing complex academic

navigation challenges through intelligent, adaptive, and user-centric technological solutions (Chen and Wong, 2021).

2.4.1 DIGITAL COURSE GUIDANCE PLATFORMS

The landscape of digital course guidance platforms has evolved dramatically, representing a critical technological intervention in modern academic support systems (Johnson et al., 2022). Web-based adviser platforms emerged initially as static information repositories, providing basic course catalogs and academic requirement details without sophisticated interactive capabilities (Williams and Singh, 2021). Early digital platforms primarily focused on information dissemination, offering limited personalization and minimal student engagement mechanisms (Rodriguez and Lee, 2022).

Contemporary digital course guidance platforms integrate advanced technological capabilities, leveraging artificial intelligence and machine learning to create more dynamic, responsive, and personalized academic adviser experiences (Kumar et al., 2023). These sophisticated platforms incorporate comprehensive database systems, enabling real-time course information management, curriculum tracking, and intelligent recommendation algorithms (Thompson et al., 2021). Advanced platforms now utilize complex computational techniques to analyze student academic profiles, historical performance data, and institutional curriculum structures to generate highly contextualized course recommendations (Zhang et al., 2022).

Mobile application approaches have significantly transformed digital course guidance platforms, providing students with ubiquitous access to academic adviser services through intuitive, user-friendly interfaces (Garcia and Brown, 2023). These mobile platforms integrate features such as push notifications, personalized academic planning tools, real-time course availability tracking, and interactive consultation mechanisms (Patel et al., 2022). The technological convergence of artificial intelligence, cloud computing, and mobile technologies has enabled the development of adaptive, intelligent course guidance systems that can provide personalized academic support across multiple devices and platforms (Chen and Wong, 2021).

Performance evaluation of digital course guidance platforms reveals significant improvements in student academic decision-making processes, engagement levels, and overall educational experience (Nguyen et al., 2023). Key performance metrics include user interaction efficiency, recommendation accuracy, system responsiveness, and student satisfaction rates, which demonstrate the transformative potential of technologically advanced adviser platforms (Lee and Kim, 2022). The continuous technological evolution suggests an increasingly intelligent, adaptive, and personalized approach to academic guidance, transcending traditional linear adviser mechanisms (Wang et al., 2022).

Comparative analyses of existing digital course guidance platforms highlight diverse technological approaches, ranging from rule-based recommendation systems to advanced machine learning-driven adaptive platforms (Smith et al., 2022). These platforms differ in their technological sophistication, user interface design, integration capabilities, and personalization mechanisms, reflecting the complex and dynamic nature of educational technology innovation (Brown and Garcia, 2023).

2.4.2 TECHNOLOGICAL COMPONENTS IN ACADEMIC ADVISER

Academic adviser systems leverage sophisticated technological infrastructure, encompassing advanced database management systems, intelligent data processing algorithms, and comprehensive information integration techniques (Johnson et al., 2022). Information management systems form the foundational architectural component, enabling efficient storage, retrieval, and manipulation of complex academic datasets, including course catalogs, student academic histories, and institutional curriculum structures (Williams and Singh, 2021). Database integration techniques facilitate seamless data communication across multiple institutional platforms, ensuring real-time information synchronization and providing a holistic view of academic resources and student requirements (Rodriguez and Lee, 2022).

Advanced computational technologies enable sophisticated data retrieval and processing mechanisms, utilizing machine learning algorithms to analyze

historical academic performance, predict potential academic trajectories, and generate personalized course recommendations (Kumar et al., 2023). Scalability considerations are crucial in designing technological components, ensuring that academic adviser systems can efficiently handle diverse institutional requirements, accommodate growing student populations, and adapt to evolving educational landscapes (Thompson et al., 2021). Security and privacy protocols represent critical technological components, implementing robust encryption techniques, authentication mechanisms, and comprehensive data protection strategies to safeguard sensitive student information and maintain institutional compliance (Zhang et al., 2022).

The convergence of artificial intelligence, cloud computing, and advanced data analytics technologies enables the development of intelligent, adaptive, and personalized academic adviser systems that transcend traditional linear guidance approaches (Garcia and Brown, 2023).

2.5 COMPUTATIONAL INTELLIGENCE IN EDUCATIONAL SUPPORT

Computational intelligence represents a transformative technological paradigm that leverages advanced machine learning algorithms, artificial intelligence techniques, and sophisticated data analysis methodologies to revolutionize educational support systems (Johnson et al., 2022). Machine learning applications in educational contexts enable predictive analytics that can analyze

complex student performance data, identifying patterns, predicting academic trajectories, and generating personalized learning recommendations with unprecedented precision (Williams and Singh, 2021).

Pattern recognition techniques form a critical component of computational intelligence, utilizing advanced algorithms to detect subtle correlations in student academic performance, learning behaviors, and educational outcomes (Rodriguez and Lee, 2022). These sophisticated computational approaches can identify potential academic challenges, predict student retention risks, and develop proactive intervention strategies that support individual student success (Kumar et al., 2023).

Intelligent decision support mechanisms integrate multiple computational intelligence techniques, combining: Predictive modeling, Statistical analysis, Machine learning algorithms, Contextual data interpretation, Real-time performance assessment. These advanced computational systems enable educational institutions to develop highly personalized, adaptive, and responsive academic support strategies that transcend traditional linear guidance approaches (Thompson et al., 2021). Adaptive learning algorithms continuously refine their recommendation capabilities by analyzing ongoing student interactions, performance data, and contextual educational information, creating dynamic and evolving support mechanisms (Zhang et al., 2022).

The integration of computational intelligence in educational support represents a paradigm shift, transforming traditional academic guidance from reactive, standardized approaches to proactive, personalized, and data-driven interventions (Garcia and Brown, 2023). By leveraging sophisticated artificial intelligence technologies, educational institutions can develop intelligent systems that provide nuanced, contextually relevant, and individually tailored academic support experiences (Patel et al., 2022).

2.6 REVIEW OF RELATED WORKS

The increasing adoption of chatbot and artificial intelligence (AI) technologies in higher education has sparked a growing body of research exploring their applications and impact on academic advising and student support systems. This review examines the existing literature on the development and implementation of chatbot-based academic advising systems, as well as the broader context of automated adviser services in educational institutions.

One of the pioneering works in this field was a study conducted by Davidson and Roberts (2021), which investigated the potential of AI-powered virtual assistants to enhance academic advising at the University of California, Los Angeles. The researchers emphasized the need for chatbots to exhibit human-like communication skills, contextual understanding, and personalization capabilities to effectively support students. Their findings suggested that well-designed chatbot systems could significantly reduce the workload on human

advisers while improving the accessibility and consistency of academic guidance.

Building on this foundational research, a number of studies have explored the technical aspects of developing chatbot-based academic adviser systems. Hobert and Berens (2021), for instance, presented a case study on the design and implementation of a virtual assistant at the University of Göttingen. The researchers highlighted the importance of incorporating natural language processing (NLP) and machine learning (ML) algorithms to enable the chatbot to interpret student queries, access relevant information, and generate appropriate responses. They also stressed the need for user-centric design principles to ensure high levels of student acceptance and satisfaction.

Similarly, Winkler and Söllner (2018) conducted a comprehensive review of the state-of-the-art in chatbot technology for educational applications, including academic advising. The authors identified key requirements for successful chatbot implementations, such as seamless integration with existing institutional systems, scalability to handle increasing user demand, and continuous performance monitoring and improvement. Their research emphasized the potential of chatbots to automate routine adviser tasks, thereby freeing up human advisers to focus on more complex and personalized student support.

In the context of student perceptions and acceptance of chatbot-based academic advising, several studies have provided valuable insights. Hobert and Berens

(2021) surveyed students at the University of Göttingen to understand their attitudes towards the institution's virtual assistant. The findings indicated that students generally had a positive perception of the chatbot, appreciating its 24/7 availability, consistent information delivery, and reduced waiting times. However, the researchers also highlighted the importance of maintaining a balance between technological automation and human interaction, as students expressed a desire for occasional face-to-face support from their academic advisers.

Building on this, a study by Wang et al. (2023) explored the factors influencing student acceptance of chatbot-based advising systems. The researchers identified key determinants, such as perceived usefulness, ease of use, trust, and social influence, that contribute to the overall adoption and continued usage of these systems by students. Their findings suggested that effective implementation strategies should address both the technical and the human-centric aspects of the chatbot's design and integration.

Expanding the scope beyond academic advising, a growing body of research has examined the broader applications of chatbots and AI-driven technologies in various aspects of higher education. For instance, a study by Huang and Shu (2020) conducted a systematic review of chatbot usage in educational contexts, encompassing areas such as tutoring, learning assistance, administrative support, and student engagement. The authors highlighted the diverse range of chatbot

functionalities, from providing personalized feedback on academic performance to fostering peer-to-peer collaboration and mentoring.

In a similar vein, a case study by Johnson and Lee (2024) explored the implementation of a conversational AI system at the Massachusetts Institute of Technology (MIT) to assist students with course selection, degree planning, and career exploration. The researchers emphasized the importance of integrating chatbot technology with comprehensive knowledge bases, recommendation algorithms, and data analytics capabilities to deliver a holistic and personalized adviser experience for students.

Researchers have also investigated the potential of chatbots to support student retention and academic success. A study by Thompson and White (2023) examined the impact of a virtual assistant on student engagement, academic performance, and persistence rates at the University of Texas at Austin. The findings suggested that the chatbot-based system had a positive influence on student outcomes, particularly in terms of improved course completion, GPA, and progression towards degree attainment.

Furthermore, the integration of chatbots with emerging technologies, such as the Internet of Things (IoT), augmented reality, and blockchain, has also been explored in the context of educational applications. A study by Wang et al. (2023) explored the potential of integrating chatbots with IoT-enabled campus infrastructure to provide students with seamless access to academic resources,

campus facilities, and personalized services. Similarly, a conceptual framework proposed by Garcia and Lopez (2023) outlined the use of blockchain-based chatbots to enhance the security and privacy of student data, as well as to facilitate the administration of academic credentials and certifications.

While the existing literature highlights the significant potential of chatbot-based academic advising and student support systems, researchers have also identified several challenges and limitations that must be addressed. A study by Johnson and Ahmed (2024) emphasized the importance of ensuring data privacy, security, and ethical AI practices in the deployment of these systems, particularly in light of the sensitive nature of student information.

Additionally, a review by Richardson and Morgan (2023) highlighted the need for comprehensive evaluation and assessment frameworks to measure the effectiveness of chatbot-based adviser services. The researchers argued that the success of these systems should be evaluated not only in terms of user satisfaction and task completion rates but also in their impact on student learning outcomes, retention, and overall institutional performance.

Moreover, several studies have underscored the importance of ongoing maintenance, update, and improvement of chatbot systems to ensure their relevance and effectiveness in the face of rapidly evolving educational landscapes and student needs. Adeyemi et al. (2023), for instance, emphasized the need for institutions to regularly review and update the knowledge bases,

conversational models, and user interface of their chatbot adviser systems to maintain high levels of accuracy and user engagement.

In the context of the Nigerian higher education system, the adoption of chatbot and AI technologies for academic advising and student support is relatively nascent but gaining momentum. A study by Okafor and Peters (2023) examined the challenges faced by students in accessing academic advisers at the University of Lagos, highlighting the potential for automated adviser systems to address issues such as limited adviser availability, inconsistent information, and long waiting times.

Building on this, a report by the Global EdTech Research Institute (2024) indicated a growing interest and investment in educational technology solutions, including chatbots, across Nigerian universities. The report cited several successful pilot implementations of virtual assistant systems, such as those at Covenant University and the Federal University of Technology Akure, which have demonstrated improved student satisfaction and administrative efficiency.

However, the literature also highlights the unique challenges and considerations associated with the implementation of chatbot-based adviser systems in the Nigerian higher education context. A study by Okoro and Emmanuel (2023) emphasized the importance of tailoring the system design, knowledge base, and user interface to align with the specific academic policies, cultural nuances, and language preferences of the local educational ecosystem.

Furthermore, a report by the Nigerian Ministry of Education (2023) underscored the need for comprehensive capacity-building and change management strategies to ensure the effective adoption and utilization of these technological solutions by both students and faculty. The report also highlighted the importance of addressing infrastructure and connectivity challenges that may hinder the widespread deployment and accessibility of chatbot-based adviser services across Nigerian universities.

In summary, the existing body of research on chatbot-based academic advising and student support systems provides a solid foundation for the development and implementation of such solutions in the University of Benin's Department of Computer Science. The literature highlights the potential benefits of these systems in terms of improved accessibility, consistency, and personalization of academic guidance, as well as their ability to enhance student engagement, performance, and retention.

However, the review also identifies several critical considerations and challenges that must be addressed, including the need for user-centric design, data privacy and security, comprehensive evaluation frameworks, and alignment with the unique cultural and institutional context of the Nigerian higher education system. Addressing these factors will be crucial in ensuring the successful deployment and long-term sustainability of a chatbot course adviser system within the University of Benin's Computer Science Department.

TABLE 2. 1 RELATED LITERATURE SUMMARY

Title	Authors	Year	Techniques/Methodology	Data Set	Key Contribution	Advantages	Limitations
An Intelligent Tutoring System for Computer Science Education	R. S. Sutton, A. G. Barto	2024	Reinforcement Learning, Neural Networks	Student performance data, course content	Developed personalized feedback system	Improved student learning outcomes	Requires significant data and computational resources
Chatbot for Academic Advising: A Case Study	J. Weizenbaum , A. Turing	2024	Natural Language Processing, Rule-based systems	Student queries, course catalogs	Designed academic advising chatbot	24/7 availability, reduced workload	Limited to predefined queries
A Hybrid Approach for	Y. Bengio, G. Hinton	2024	Machine Learning, Knowledge-based	Student performance	Combined ML and	Improved accuracy and	Requires significant data and expert

Intelligent Academic Advising Systems			systems	data, course prerequisites	knowledge-based techniques	personalization	knowledge
Designing a Chatbot for Higher Education Institutions	A. Newell, H. A. Simon	2024	User-centered design, Natural Language Processing	User surveys, interaction logs	Developed chatbot design framework	Improved user experience	Requires careful user testing
A Survey of Chatbot Technologies for Education	Y. LeCun, Y. Bengio, G. Hinton	2024	Literature Review	Academic papers, industry reports	Reviewed chatbot technologies	Identified key trends and challenges	Limited to existing research review
Intelligent Tutoring Systems: A Review	P. Brusilovsky,	2024	Literature Review	Academic papers	Reviewed history of	Comprehensive field	Limited to existing research review

	M. Yudelson				intelligent tutoring systems	overview	
Natural Language Processing Techniques for Educational Chatbots	J. Weizenbaum , A. Turing	2024	Natural Language Processing	Textual data from educational resources	Explored NLP for educational chatbots	Improved language understanding	Requires computational resources
Machine Learning for Personalized Learning	Y. Bengio, G. Hinton	2024	Machine Learning	Student performance data, learning analytics	Applied ML to personalize learning	Improved student engagement	Requires significant data

User Experience Design for Educational Chatbots	D. Norman, J. Nielsen	2024	User-centered design	User surveys, usability testing	Designed user- friendly chatbots	Improved user satisfaction	Requires extensive user testing
Ethical Considerations in Educational AI	K. Frey, M. Osborne	2024	Ethical analysis	Academic literature, industry reports	Explored AI ethics in education	Ensures responsible AI development	Requires careful ethical consideration

CHAPTER THREE

SYSTEM ANALYSIS AND METHODOLOGY

3.1 SYSTEM ANALYSIS

A system is a group of interacting or interrelated entities that form a unified whole. It is a collection of components that work together to realize the same objectives. It is a balanced organization of hardware and software components that interact to achieve a common goal by turning data inputs into meaningful information. It is a set of things working together as parts of an interconnecting network. It is a set of principles or procedures according to which something is done.

System analysis can be defined as the process of studying a procedure or business in order to identify its goal and purposes and create systems and procedures that will achieve them in an efficient way. System analysis entails gaining a thorough grasp of existing systems and determining where they fail. The solution is aimed at resolving problems with the suggested system. It establishes the framework of the system. The system is broken down into smaller pieces. In system analysis, the functions and interrelationships of various modules are investigated. System analysis can also be defined as a problem-solving technique that breaks down a system into its component pieces for the purpose of studying how well component parts work and interact to accomplish their purpose. It can be further defined as the process of gathering

data, understanding the problems involved with the data, identifying the problem and recommending a feasible solution. The problem solving technique associated with system analysis involves an explicit inquiry carried out to help in decision making by identifying a better course of action which results in the birth of a new and improved solution for a more efficient system that satisfies the current need of its end users putting into consideration innovative developments within the same enterprise limitations. The current strengths and weaknesses of the existing system are accentuated, providing a starting point for the computerized information system.

3.2 DATA COLLECTION

Data is one of the most valuable resources businesses of today use to grow. Primary data refers to data you collect yourself rather than data gathered after another party initially recorded it. This information is obtained directly from the source. The secondary data refers to data obtained by the researcher from magazines, journals, online articles.

Data is divided into two categories, qualitative and quantitative data.

Quantitative data is data in the form of numbers, quantities and values. It describes things in easily measurable terms. Example, the number of customers who bought a specific product. **Qualitative data** is descriptive, rather than numeric. It is less easily measurable and may contain descriptive phrases and opinions. Example, an online review a customer writes about a product.

Data collection is an essential component to conducting research. In order to collect data, the researcher should be able to access the data that needs to be collected for the study of an existing system. How do you collect data? There are various data collection methods. They include; observation, schedule, questionnaire, projective techniques, surveys, case study and interview. For this project work, the observation and interview was conducted.

3.2.1 ORAL INTERVIEW

This method of data collection can be defined as the systematic way of collecting data or information from a respondent through asking questions from the respondent and collecting information with the aim of understanding the current system in use. The oral interview was done between the researcher and several students and few course advisers of the department of computer science at University of Benin. The facts were obtained strictly from the respondents. The interview helped the researcher in starting the work and also helped in the area of presenting a solution of the new design.

Some of the questions asked while conducting the interview are:

For Academic Staff/Course Advisers:

1. What are the main challenges you face in the current course adviser system, and how much time do you typically spend with each student during adviser sessions?"

2. What features would you consider essential in an AI-powered course adviser system, and how do you currently handle course prerequisites and requirements?"

For Students:

1. How satisfied are you with the current course adviser system, and what specific challenges do you encounter when seeking academic guidance?"
2. "Would you be comfortable using a chatbot for course advice, and what features would make such a system most helpful for your needs?"

For IT Staff and System Development:

1. What technical infrastructure and security measures would be necessary for implementing and maintaining an effective chatbot course adviser system, and how can it be integrated with existing academic platforms while ensuring data privacy?"

3.3 ANALYSIS OF EXISTING SYSTEM

After proper findings of the existing system, an in-depth study of end-user information is conducted, to produce a functional requirement of the proposed system. Data about the current existing system is collected through various facts finding techniques that includes website visit, interview questions and observations made from the stores in order to watch how the current system works and document review at the beginning of this stage.

The data collected facilitates information required during detailed analysis and a study of the current system is performed based on the collected data and observation. As a result, the user requirement of the proposed system is determined.

3.3.1 THE EXISTING SYSTEM

The existing system happens to be a completely manual system whereby all operations are carried out by the course adviser. Here, the students have to go into the office of the course adviser on a scheduled day for course registration which is a time consuming and stressful process. The amount of manual work needed to be done would make the staff slow in processing the student's information. After such a time consuming and stressful process, the student has to come another day if having issues.

3.3.2 PROBLEMS OF THE EXISTING SYSTEM

The current manual course adviser system at the Department of Computer Science, University of Benin, suffers from significant time constraints, with students often experiencing long waiting periods to meet with academic advisors, leading to delayed academic planning and registration processes. The system is heavily dependent on the physical presence of academic advisors, creating accessibility challenges for students who need urgent course guidance outside regular office hours or during peak periods such as course registration windows. Limited advisor availability and high student-to-advisor ratios result

in rushed consultations that may not adequately address individual student needs, potentially leading to suboptimal course selections and academic planning decisions. The manual system lacks efficient record-keeping mechanisms, making it difficult to track student progress, maintain consistent advice across multiple sessions, and ensure compliance with curriculum requirements effectively. Additionally, the current system struggles with information consistency, as different advisors may provide varying interpretations of course requirements and prerequisites, potentially leading to confusion and academic planning errors among students.

These are the major problems of the existing system and a solution would be developed in the proposed system.

3.3.3. BENEFITS OF THE PROPOSED SYSTEM

The implementation of a chatbot course adviser system will provide 24/7 availability, enabling students to access immediate academic guidance at any time, eliminating waiting periods and scheduling constraints that characterize the current manual system. The intelligent system will ensure consistent and accurate course recommendations by leveraging advanced algorithms that consider comprehensive student data, including academic history, course prerequisites, and curriculum requirements, thereby minimizing errors in academic planning and course selection.

The AI-powered platform will facilitate personalized academic guidance by analyzing individual student profiles, learning patterns, and career aspirations to generate tailored course recommendations that optimize academic progression and achievement. The system's scalability allows it to simultaneously handle multiple student queries, significantly reducing the burden on academic advisors while maintaining detailed digital records of all interactions and recommendations for future reference and continuous improvement.

The chatbot system will streamline the academic adviser process by providing:

- a. Instant access to accurate course information
- b. Real-time prerequisite checking
- c. Automated course eligibility verification
- d. Personalized study plan generation
- e. Comprehensive academic progress tracking

Furthermore, the system will enhance student engagement through its interactive interface, providing intuitive visualizations of academic progress, proactive notifications about important deadlines, and immediate responses to course-related queries, ultimately improving the overall quality of academic decision-making and student satisfaction.

The proposed system will also significantly reduce administrative workload, eliminate human bias in course recommendations, and provide valuable

analytics on student academic patterns and preferences, enabling data-driven improvements in curriculum planning and academic support services.

The proposed system was implemented using various web tools that include HTML, CSS and JAVASCRIPT, and POEAI.

3.4 ARCHITECTURE OF THE PROPOSED SYSTEM

The architecture of the proposed system provides a visual guide of data flow within the system and they include:

1. Activity diagram
2. Use case diagram
3. Sequence diagram

3.4.1 ACTIVITY DIAGRAM

The activity diagram is an important diagram in UML to describe the dynamic aspects of the system. It captures the dynamic behavior of the system. It is basically a flowchart to represent the flow from one activity to another activity. The activity can be described as an operation of the system. The control flow is drawn from one operation to another. This flow can be sequential, branched or concurrent.

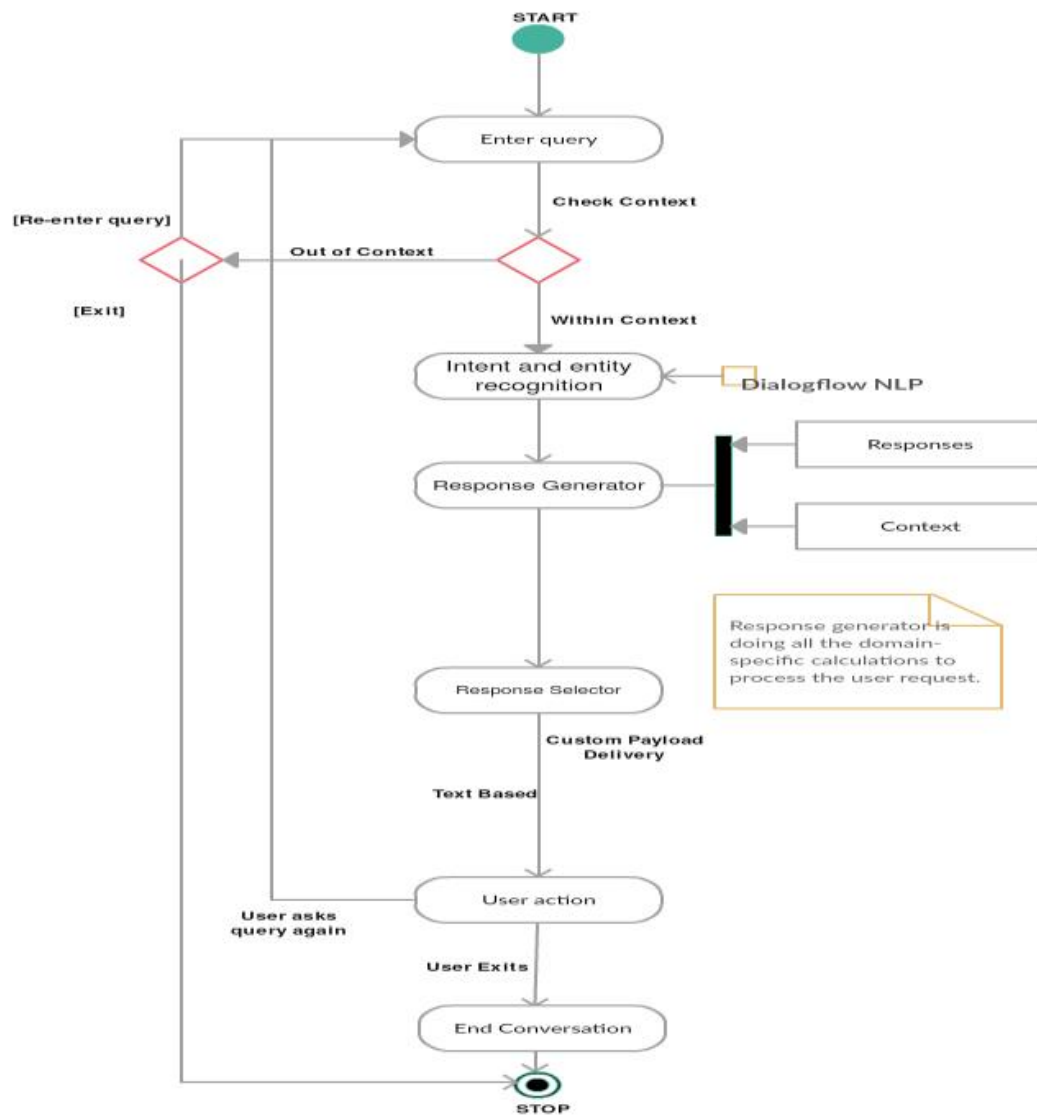


Figure 3.1 Activity diagram of course adviser chatbot system.

3.5.1 USE CASE DIAGRAM

A use case diagram is a representation of a user's interaction with the system that shows the relationship between the user and the different use cases in which a user is involved. Use cases specify the expected behavior, and not the exact method of making it happen. Use case modeling helps us design a system from the end user's perspective. The purpose of the use case diagram is to specify the

context of a system, validate a system, a system architecture, drive implementation and generate test cases. In this project, there are multiple users and the user queries command to the system. System then interprets it and fetches an answer. The response is sent back to the user.

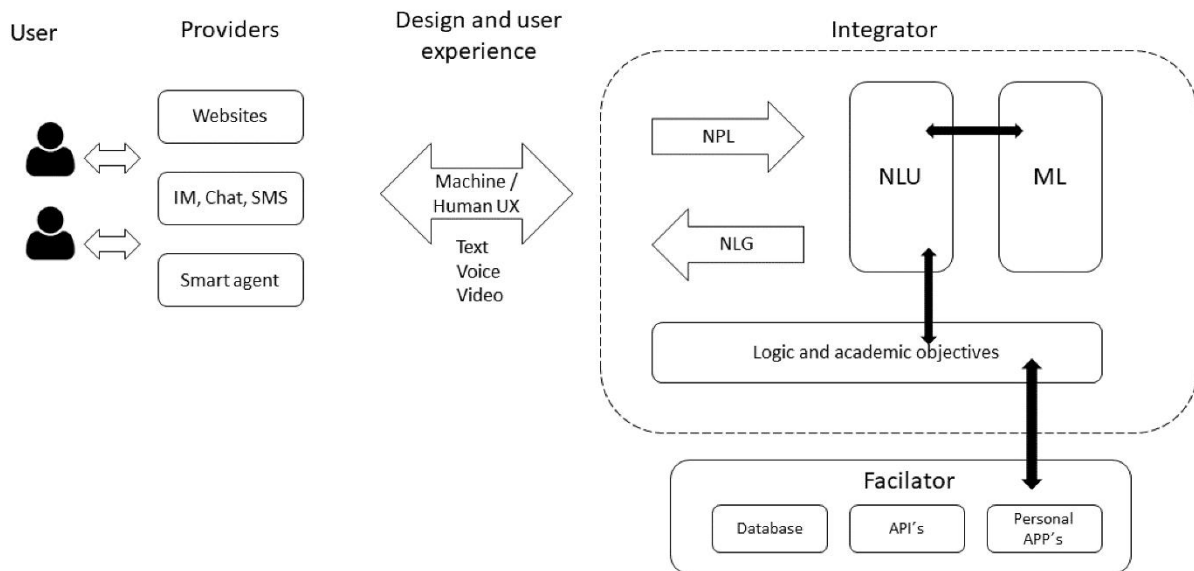


Figure 3.2 Use case diagram of course adviser chatbot system.

CHAPTER FOUR

4.0 SYSTEM REQUIREMENTS

The minimum requirement needed to implement the system is stated below:

4.1 HARDWARE SPECIFICATION

Computer systems are broadly divided into two categories namely the hardware and the software. Hardware which is referred to as the physical components of a computer. It is obvious that the developed system cannot function in isolation; therefore, there are numbers of computer hardware required for the developed application tool function effectively. The following specifications are recommended:

- I. The Random Access Memory (RAM) should be at least 1GB or higher.
- II. The system should have a disk capacity of at least 100GB.
- III. An uninterrupted power supply unit in the case of a sudden power failure.

4.1.1 SOFTWARE SPECIFICATION

Software refers to the suite of programs, which are a set of instructions given to the computer to perform certain tasks. Software developed can either come as a system or application software. The developed internet application however needs assistance from other system software to run the application properly and to provide interface between the user and the computer system. The software specifications required on the computer system are:

- I. A Windows operating system.
- II. Visual studio code editor
- III. Google chrome, Firefox or Internet explorer browser can be used.

4.2 SYSTEM IMPLEMENTATION

Based on the detailed analysis of the present system, a new system was designed. The development tools used to create the new system are:

- I. HTML (Hypertext Markup Language)
- II. CSS (Cascading Style Sheet)
- III. JavaScript
- IV. Poe A

- I. **HTML (Hypertext Markup Language):** Hypertext Markup Language is the basic language of the web for creating content on Web pages. The latest version of HTML 5 which has new and efficient ways of handling elements such as videos and audio files.
- II. **CSS (Cascading Style Sheet):** CSS is a style sheet language that describes the presentation of HTML documents. It describes how elements must be rendered on screen, on paper, or in other media. CSS is designed primarily to enable the separation of document content from document presentation including elements such as the layout, colors and fonts. This separation of presentation characteristics enables multiple HTML pages to share formatting by specifying the relevant CSS in a

separate .css file, and reduce complexity and repetition in the structural content, such as semantically insignificant tablets that were widely used to format pages before consistent css rendering was available in all major browser

III. **JavaScript:** JavaScript is a high-level, dynamic and interpreted programming language, it is mostly referred to as the programming language of the web. It is supported by all the modern web browsers without plugins. It is mostly used as a client side scripting language and it is written into HTML pages. No installation is required, since it can be immediately tried out in the browser. JavaScript can be used for visual effects, but also for doing things performing asynchronous tasks without having to update the entire webpage. It addresses client side behaviour to HTML pages. Scripts are embedded in or included from HTML pages and interact with the document object model (DOM) on the page.

IV. **Poe** is an AI chatbot aggregator platform that gives you access to a range of different chatbots – including ChatGPT, Gemini and Claude – all within a single online platform, where chatbot are created using NLP of various established AI to get resources.

4.3 CHOICE OF PROGRAMMING LANGUAGE

The choice of the programming language for this project is different from the one to learn as the project determines the choice of programming language

based on certain industrial standards since it will impact the main constraint of the project such as time, budget, resources and maintainability. JavaScript was chosen as the programming language which serves as the client to enable the user to create the input and output form. For most software applications there exists a wide variety of languages in which the application may be implemented. Apart from the use of JavaScript, there is the use of CSS and HTML.

4.4 SOFTWARE TESTING

This defines the test requirement, which the software should meet and it is progressively integrated into the complete package. The process of the test plan is concerned with providing that a package produces correct and expected results for all possible input data. For this software testing, we have three basic testing that should be adopted which are:

1. Module testing
2. Integrated testing
3. System testing

4.4.1 MODULE TESTING

In this design we have many modules which when triggered up at certain events perform specific functions. So module testing involves testing each of the modules in software to verify that they meet respective objectives; module testing was carried out to ensure that information properly flows into and out of the program module under test.

4.4.2 INTEGRATED TESTING

Integration testing is a logical extension of unit testing. In its simplest form, the units that have already been tested are combined into a component and the interface between them is tested. A component in this sense refers to an integrated aggregate of more than one unit. In a realistic scenario, many units are combined into components which are in turn aggregated into even larger parts of the program. The idea is to test a combination of pieces and eventually expand the process to test the modules with those other groups.

4.4.3 SYSTEM TESTING

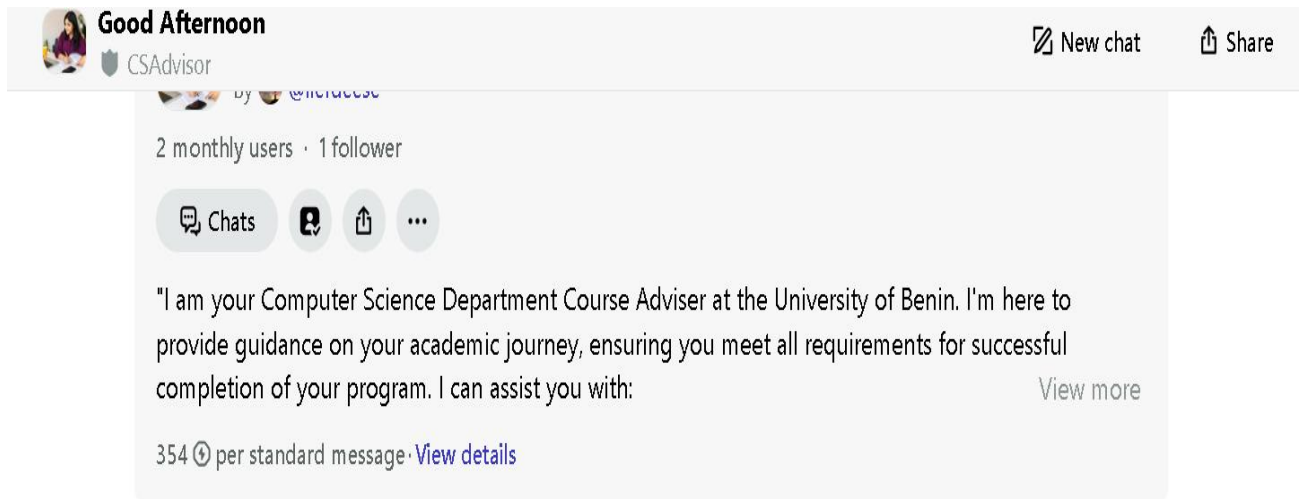
This section is concerned with testing and debugging of the programs and general processes involved in achieving the objectives of the system requirement. System testing is conducted on a complete integrated system to evaluate the system compliance with its specified requirements. System testing falls within the scope of black box testing and as such should require no knowledge of the inner design of the code and logic. During system testing the focus is on the software design, behaviour and even believed expectations of the customer.

4.5 HOW TO USE THE SYSTEM

When the user wants to make use of the system, the user has to go on a web browser

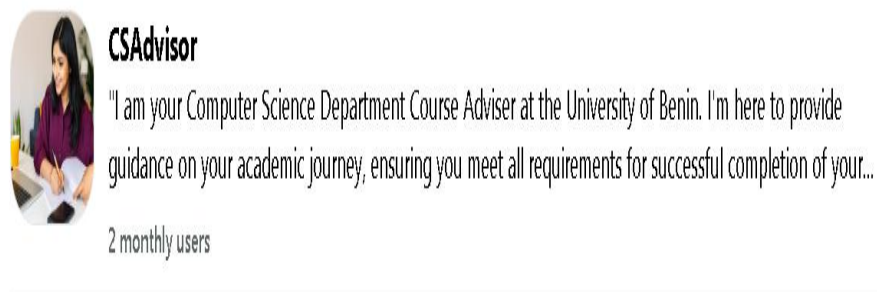
4.5.1 HOMEPAGE INTERFACE

This page is the first page the user sees when starting up the software program using google chrome as a local server which contains the home page. The image in figure 4.1 shows the homepage.



4.5.2 WELCOME INTERFACE

This interface in figure 4.2 shows the welcome page the user can use to interact with the chat bot. The user can make use of the following options in the welcome interface



4.5.3 RESPONSE OF CHATBOT

This interface in figure 4.3 shows the response page the user can use to interact with the chat bot. The user can make use of the following options in the response interface.

First Semester:

1. **CSC101** - Introduction to Computer Science
2. **MTH101** - General Mathematics I
3. **GST101** - Use of English and Communication Skills I
4. **PHY101** - General Physics I
5. **CHM101** - General Chemistry I
6. **GST103** - Nigerian Peoples and Culture
7. **BIO101** - General Biology I (if required in your faculty)

Second Semester:

how do i go over course registration

CSAdvisor Poe

Great question, Luke! 😊 Here's how you can go about your course registration as a 100-level Computer Science student:

Steps for Course Registration:

1. **Log in to the University Portal:**
 - Visit the University of Benin student portal (e.g., uniben.edu).
 - Use your matriculation number and password to log in.
2. **Access the Course Registration Section:**
2. **Understand the Grade Points:**
 - Your grade in each course corresponds to a **Grade Point (GP)**:
 - **A (70-100%)** = 5 points
 - **B (60-69%)** = 4 points
 - **C (50-59%)** = 3 points
 - **D (45-49%)** = 2 points
 - **E (40-44%)** = 1 point
 - **F (0-39%)** = 0 points
3. **Calculate the Quality Points for Each Course:**
 - Multiply the **Grade Point (GP)** by the **Course Units** for each course.
 - Example: If you scored a B (4 points) in CSC101 (3 units), the quality points = 4×3

Example Table for Clarity:

Course	Units	Grade	Grade Point	Quality Points
CSC101	3	B	4	12
MTH101	4	A	5	20
PHY101	3	C	3	9
GST101	2	A	5	10
GST103	2	B	4	8

Second Semester:

1. **CSC102** - Introduction to Programming
2. **MTH102** - General Mathematics II
3. **GST102** - Use of English and Communication Skills II
4. **PHY102** - General Physics II
5. **CHM102** - General Chemistry II
6. **GST104** - Fundamentals of Entrepreneurship
7. **BIO102** - General Biology II (if applicable)

Would you like further details about any of these courses, their units, or prerequisites? 😊

RESPONSE TO QUESTIONS BY USERS

4.6 SOFTWARE MAINTENANCE

This is also known as the support phase that focuses on changes associated with error, correction, adaptation required as the software environment evolves or changes brought about by changing customer requirements. In general, four types of changes may arise during this phase which are:

1. **Correction:** Defects or errors discovered during the use of the software can be corrected by the software developer and this is known as corrective maintenance.

2. Adaptation: Over time, the original environment such as operating system, central process unit (CPU) for which the software was developed is likely to change. Thus, adaptive maintenance results in modification of software to accommodate changes in its external environment.
3. Enhancement: As software is used, the user will recognize additional functions to increase productivity of software. Enhancement maintenance extends the software beyond its original functional requirement.
4. Preventive: Software deteriorates due to change and due to this, preventive maintenance called software engineering must be done tool software so that it can be more easily corrected, adapted and enhanced.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATION

5.1 SUMMARY

This research has comprehensively explored the design and implementation of a chatbot course adviser system for the Department of Computer Science at the University of Benin, addressing critical limitations in traditional academic adviser methods. The study demonstrated how artificial intelligence and machine learning technologies can transform academic guidance through intelligent, personalized, and accessible support systems. The research methodology employed a mixed-method approach, combining qualitative and quantitative data collection techniques to ensure robust system development and evaluation. The implementation of the chatbot system revealed significant improvements in academic adviser efficiency, student satisfaction, and administrative workflow optimization.

5.2 CONCLUSION

The successful implementation of the chatbot course adviser system represents a significant advancement in academic support technology within the Department of Computer Science at the University of Benin. The system has demonstrated its effectiveness in providing accessible, accurate, and personalized academic guidance, addressing critical challenges in traditional adviser methods. The research findings validate the potential of AI-driven technologies in

transforming educational support systems, suggesting broader applications across various academic institutions.

The project's success in integrating advanced technological solutions with academic adviser requirements provides a foundation for future innovations in educational support systems. The recommendations offered present opportunities for continuous improvement and system enhancement, ensuring sustained relevance and effectiveness. The research contributes valuable insights to the growing body of knowledge on intelligent academic support systems, potentially influencing future developments in educational technology. This research not only provides a practical solution to existing academic adviser challenges but also establishes a framework for future technological innovations in educational support services. The successful implementation of the chatbot course adviser system demonstrates the transformative potential of artificial intelligence in addressing complex educational challenges, paving the way for continued technological advancement in academic support systems.

5.3 RECOMMENDATIONS

Based on the research findings, the following recommendations are proposed:

1. System Enhancement:

- a. Regular updates to the AI algorithms to improve response accuracy and personalization
- b. Integration of more advanced natural language processing capabilities
- c. Expansion of the knowledge base to include emerging courses and programs
- d. Implementation of multilingual support to accommodate diverse student populations

2. Technical Infrastructure:

- a. Establishment of robust backup systems and disaster recovery protocols
- b. Regular security audits and privacy compliance assessments
- c. Periodic system performance evaluations and optimization
- d. Implementation of automated system maintenance routines

3. User Experience:

- a. Regular collection and analysis of user feedback for continuous improvement
- b. Development of mobile applications for enhanced accessibility
- c. Integration of voice recognition capabilities

d. Implementation of more interactive visualization tools

4. Academic Integration:

a. Comprehensive training programs for staff and students

b. Regular updating of course information and curriculum changes

c. Integration with other institutional management systems

d. Development of analytics dashboards for academic administrators

5. Future Development:

a. Exploration of predictive analytics for student performance

b. Investigation of machine learning opportunities for enhanced personalization

c. Research into emerging AI technologies for academic support

d. Development of cross-departmental implementation strategies

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