Research Article

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Integration of a virtual assistant for the management of a master's degree in radiodiagnostics using artificial intelligence

Volume 13 Issue 3 - 2025

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Received: July 27, 2025 | **Published:** September 26, 2025

Abstract

Introduction: Digital transformation has significantly impacted the management of scientific health societies and academic networks, driving the adoption of disruptive technologies such as artificial intelligence (AI). In this context, the integration of AI-based virtual assistants emerges as an innovative solution to optimize administrative processes, improve internal and external communication, and facilitate access to relevant information for its members.

Objective: To design a virtual assistant for the management of a master's degree in radiodiagnosis using artificial intelligence.

Methodology: The Design Thinking methodology was used, which includes five phases: empathize, establish, conceive, create a model, and test. In the prototyping phase, technologies such as HTML5, JavaScript, and CSS were used for screen design. The system was developed using tools such as Node.js, Laravel, PHP, and Python, while data management was performed using the PostgreSQL database.

Results: The development of the AGENTE_MDIM chatbot, as a conversational virtual agent, represents a key result with significant impact across multiple dimensions. This Artificial Intelligence-based system not only facilitates the management of a master's degree in radiodiagnosis but also optimizes its operations by automating critical processes.

Conclusions: The chatbot represents a key tool for digital transformation in academic networks and scientific societies. Its use automates processes, improves efficiency, and reduces the administrative burden. It facilitates communication, promotes participation, and strengthens organizational management. It is an innovative agent with great potential to scale in other educational and scientific environments.

Keywords: chatbot, process management, artificial intelligence, imaging, medical imaging diagnostics

Introduction

The era of digitalization has transformed the way individuals communicate and interact.[1] While in the past the communication methods were limited and unidirectional, today there are various means that have democratized communication channels and enhanced interpersonal interaction.[2] In this sense, the introduction either tel no. and Portable and smart cell phones have allowed people to stay connected to each other, from anywhere.[3] In addition to receive and make voice calls, the mobile phones also allow users to send and receive text messages globally.[4]

Through these devices, people can use tools that not only provide the opportunity to interact at any time, but have also begun to be used by various institutions to improve some services in the area of Public Health.[5] Due to this shift in communication, corporations are not only transforming the channels through which they engage with patients, but are also adapting to new expectations-patients now demand greater personalization in service and instant solutions to their needs.[6]

Thus, technological tools such as Artificial Intelligence (AI) have been used to satisfy them.[7] Additionally, its use has been expanded to understand, predict, and influence the development of better treatment protocols with the purpose of raising the quality of medical care and therefore the well-being of the sick patient.[8]

In harmony with the above, the integration of artificial intelligence (AI) in the academic management of a Master's Degree in Medical Imaging Diagnosis represents a strategic advance that connects technological innovation with specialized training.[9] In this context, the use of an AI-based virtual assistant not only optimizes the administration either n of academic processes and micros, such as planning either n curriculum, personalized attention to the student or monitoring of academic progress, but also enhances learning by incorporating tools specific to contemporary radiological practice.[10]

AI, applied directly to radiology, has proven to be key to improving diagnostic accuracy, reducing image reading times, and supporting clinical decision-making.[11] Therefore, integrating these technologies into the academic training environment allows not only to modernize the academic management, but also prepare professionals for a more efficient, automated medical practice aligned with international standards.[12]

Furthermore, the chatbot's ability to analyze and synthesize large amounts of data can help identify patterns and trends that might not be apparent to healthcare professionals, which can lead to a better understanding of the effectiveness of different techniques and protocols.[13] Ultimately, integrating chatbots into a academic processes helps improve the quality of student care and reduce the workload of teachers.[14]

In this sense, the scientific research question of this work asks: how is a virtual assistant (chatbot) designed for the management of a master's degree in radiodiagnosis from artificial intelligence?. This research aims to develop a virtual assistant powered by AI to support the academic administration of a Master's Degree in Diagnostic Medical Imaging. A new development in the research is the integration of a virtual assistant with artificial intelligence to academically manage a Master's Degree in Diagnostic Medical Imaging, uniting AI in radiological training and practice for the first time in a coherent and innovative way.[15]

Methodology

This research focuses on the use of a virtual assistant to manage the Master's program in Diagnostic Medical Imaging and improve program availability. Various technologies will be used to create the virtual assistant, both in the design of the user interface and in the system's operating logic. The main technologies are described in general terms below:

i. Programming languages and interface design

HTML5, JavaScript, and CSS: These languages will be used to design the chatbot screens. HTML5 is used for the content structure, CSS for the visual appearance, and JavaScript to add interactivity.

Bootstrap: A collection of tools that simplifies the creation of attractive interfaces compatible with different devices, whether mobile or desktop.

ii. Backend (System Operation)

Node. js: This will be used to run JavaScript on the server, which is essential for applications that require scalability.

Laravel: This framework facilitates the development of services and applications with a solid structure.

PHP and Python: Both programming languages were used to build various sections of the system in the backend.

iii. Database system

PostgreSQL: This platform is used to store and manage all the information needed for the chatbot.

These technologies were selected not only for their effectiveness in application development, but also because they are the company's preferred tools for creating these types of tools, and they are also the ones the development team is most proficient in.

Using the Analysis and Synthesis method, content and images were reviewed, selected, and arranged, and current trends and availability in our environment were established. Several design models were constructed, with a view to selecting the most suitable models in terms of ease of interaction, acceptance by the target audience, and relevance. Quality and performance tests were conducted to validate the solution. Interviews were conducted with health and communication experts regarding the variables of content and interactivity. User tests were conducted regarding interaction with the tools available in the application; resource tests such as memory consumption were performed; and white-box tests were conducted regarding the internal structure of the code.

Results

The results obtained from the design of the AGENTE_MDIM virtual assistant, an acronym for "Master's Degree in Medical Imaging Diagnosis." This name was chosen to directly reflect the chatbot's purpose and scope: to serve as an intelligent agent for academic management and guidance to students and faculty within the postgraduate program in medical imaging diagnostics. Furthermore, the use of a specific acronym strengthens its institutional identity, makes it easier to remember, and links technological development with the academic context in which it operates.

To represent the identity of AGENTE_MDIM, the image of an elderly medical professor was selected, a symbol of wisdom, experience, and authority in the field of medical imaging. This visual choice seeks to convey trust and veracity, reflecting the tradition and scientific rigor that underpin the Master's program. By associating the virtual assistant with a figure that represents the knowledge accumulated over the years, the perception of a reliable and professional supporter who accompanies students throughout their training process is strengthened (Figure 1)

Figure 1 Graphical representation of AGENT_MDIM.

To facilitate direct access to the AGENTE_MDIM virtual assistant platform, the following link has been provided:https://www.jotform.com/app/251926148285565, which allows users to log in quickly and securely. This link is essential to ensuring accessibility and promoting system adoption in academic settings, optimizing interaction and the flow of information among participants.

The user interface is one of the fundamental components in the design of a virtual assistant, as it determines how the interaction between the system and the end user develops. In the case of the AGENTE_MDIM chatbot, various functional and visual elements have been integrated to ensure an intuitive, accessible, and efficient user experience. These include the chat window, the main communication space; interactive buttons, which streamline responses and navigation; menu options, which structure content and facilitate access to different functions; and responsive design, which ensures the assistant adapts to different devices and screen sizes. The proper integration of these components not only improves usability but also strengthens the system's effectiveness in specialized academic contexts (Figure 2).

Figure 2. Conversational chat prototype with AGENTE_MDIM.

Citation: Fuentes JC, Barbie SV, Tamayo YC. Integration of a virtual assistant for the management of a master's degree in radiodiagnostics using artificial intelligence. *MOJ Surg.* 2025;13(3):77–81. DOI: 10.15406/mojs.2025.13.00298

Components

Chat window

Description: This is the main space for interaction between the user and the virtual assistant. This is where messages sent by both parties are displayed and where the conversational flow occurs. The chat window represents the core of a chatbot's user experience (UX). Its design must be clear, intuitive, and accessible, as it determines how comfortable and understood the user feels during the interaction. A well-structured chat improves the flow of communication, allows for a visible record of the conversation, and generates a sense of immediacy and closeness, simulating human interaction. It can also incorporate additional features such as typing indicators, welcome messages, conversation history, and rich messages (with images, links, or buttons), which increase the virtual assistant's usefulness and dynamism.

Buttons

Description: These are interactive elements that allow the user to select options or perform actions within the chatbot without having to type text.

Buttons represent an effective way to guide user interaction and reduce cognitive friction, especially in systems that focus on efficiency and rapid response. By offering predefined options, natural language interpretation errors are minimized and decision-making is accelerated. Furthermore, buttons improve accessibility for users with less digital experience, as they simplify navigation and reduce the need to type. They can be used to access menus, confirm actions, choose between multiple options, or redirect the user to other pages, and are essential for maintaining a structured conversation, especially in educational or administrative contexts.

Menu options

Description: These are drop-down lists or hierarchical structures that group specific functionalities or topics within the virtual assistant. Menus allow you to organize chatbot content in a logical and accessible way, facilitating navigation across the various services or subject areas it offers. In the academic field, for example, they can include access to modules such as "Academic Calendar," "Grade Check," "Technical Support," or "Study Materials." This categorized approach facilitates user orientation, reduces cognitive load, and improves the navigation experience. Furthermore, menus offer an efficient way to scale the system without cluttering the conversation with multiple commands or open-ended questions, while maintaining a clear and functional structure.

Responsive design

Description: It is the ability of the virtual assistant to adapt to different screen sizes and devices (PC, tablets, mobile phones).

In an increasingly diverse digital environment, responsive design is a key feature to ensure chatbot accessibility and usability on any platform. Interface adaptability allows all users, regardless of the device they use, to have a consistent, efficient, and visually pleasing experience. In academic contexts, where students and faculty may access the chatbot from multiple locations (campus, home, mobile devices on the go), a non-responsive design can be a significant barrier to access and participation. Responsive design also improves system performance, facilitates touch navigation, and contributes to digital inclusion.

Expert judgment

The feasibility stage of the Design Thinking methodology is essential for verifying the viability of the proposal and perfecting the created product. In this phase, the goal is to gather accurate information on the product's performance, its user acceptance, and its impact on the organization, which facilitates adjustments before its final implementation. To this end, the methodology is evaluated using expert judgment.

The Delphi method was used to assess the experts' opinions. This approach allows us to gain an overview of the development of complex situations through a statistical analysis of the opinions of experts on the subject. The process involves several phases: defining the objective, designing the questionnaire, selecting the application method, and analyzing the data. The definition of the objective focuses on evaluating the virtual learning environment using a Moodle platform for managing the Master's degree in Diagnostic Medical Imaging.

The experts' competency level was examined by calculating the K competency coefficient. This was achieved by using a standardized questionnaire developed by Cruz and Martínez (2012), which measures knowledge and experience in the field. Out of a total of 56 applicants, 51 were selected who demonstrated a high level of competency. The group consisted of 30 master's degrees in diagnostic media, 11 PhDs in science, 15 executives, 10 full professors, 15 assistant professors, and 6 teaching assistants, most of whom had more than 20 years of teaching experience.

During the questionnaire design phase, the principles of communication theory were considered. After identifying the specialists' competency level, a survey was conducted among those selected to analyze the proposal's key ideas in relation to the management of the master's program. The experts consider the proposal innovative and emphasize the importance of using virtual learning platforms for imaging faculty.

This information will be key to determining whether the product is ready for full implementation or whether additional modifications are needed to improve its performance and ensure it is aligned with the organization's objectives. Analyzing this data will allow for specific suggestions to optimize the product and increase its positive impact on both users and the organization.

Discussion

The implementation of the AGENTE_MDIM chatbot as a virtual assistant for the management of the Master's Degree in Diagnostic Medical Imaging represents a significant advance toward the digitalization and optimization of academic processes in medical education. The incorporation of artificial intelligence in this context not only automates administrative tasks but also improves communication and facilitates access to information, which is in line with previous studies that highlight the effectiveness of chatbots in educational environments.[16]

In the field of medical imaging, artificial intelligence has revolutionized image interpretation, enabling more accurate and efficient analysis.[17] This technological progress naturally extends to specialized education, where knowledge management and information accessibility are essential for continuing education. In this way, AGENTE_MDIM positions itself as a link between technological innovation in radiology and the modernization of educational processes.

Using natural language processing, the chatbot offers an interactive channel to answer academic questions, guide students, and deliver personalized information about the master's degree. This functionality coincides with evidence that highlights the positive role of virtual assistants in improving the learning experience and offering immediate support.[18] Higher education, especially in highly specialized areas such as imaging, faces the challenge of managing training in an efficient and personalized manner; in this sense, chatbots alleviate the administrative burden and allow faculty to focus on teaching and research.[19]

However, a chatbot's effectiveness depends on the quality of its design, the accuracy of its query recognition, and the constant updating of its knowledge base. The results of AGENTE_MDIM demonstrated that these conditions were met, reflected in high levels of acceptance by pilot users, which is consistent with studies that emphasize the importance of training and maintenance for AI-based systems.[19,20]

Furthermore, the use of this virtual assistant fosters a digital culture within the academic field, promoting the adoption of emerging technologies that are essential for vocational training in the 21st century. This is consistent with the need to transform traditional educational models into more innovative and technological schemes.[21] The close relationship between imaging and artificial intelligence is strengthened by incorporating chatbots into training, given that both fields share the foundation of complex data analysis and the pursuit of precision. In this way, AGENTE_MDIM functions as a facilitator between theory and practice, promoting ongoing training and rapid access to specialized resources.[21]

Despite the obvious benefits, there are limitations related to technological dependence and potential resistance to change on the part of some users. Therefore, it is essential to support implementation with training and awareness-raising strategies to maximize the positive impact of these tools.[20,21]

This research opens the door to expanding the use of virtual assistants in other medical and educational areas, proposing increasingly integrated systems that combine clinical analysis with training and administrative support, thus strengthening interdisciplinarity and institutional efficiency.

In summary, AGENTE_MDIM is an innovative tool that contributes to the modernization of academic management in the Master's Degree in Diagnostic Medical Imaging, integrating artificial intelligence to improve educational quality and facilitate user interaction. This work establishes a solid foundation for future research and development in the use of chatbots in higher medical education. Finally, this experience serves as a precedent for future research aimed at continuously improving training processes through the use of emerging technologies, fostering a more flexible and accessible medical education model aligned with the demands of the contemporary professional environment.

Conclusion

The development and implementation of the AGENTE_MDIM virtual assistant proved to be a viable and relevant proposal for improving academic management in the Master's Program in Diagnostic Medical Imaging, integrating artificial intelligence technologies into higher medical education. The incorporation of a chatbot with natural language processing capabilities enabled the automation of administrative tasks, provided personalized support, and facilitated access to key information, contributing to optimizing the experience of students and faculty in the training environment.

This research confirms the value of artificial intelligence not only in the clinical field of imaging, but also in the educational context, where it can become a strategic tool for academic management and support. The results obtained demonstrate high user acceptance, which supports the applicability of AGENTE_MDIM and its potential to be adapted to other graduate programs in medical sciences, thus promoting a digital and innovative culture within educational institutions.

Acknowledgements

None.

Conflicts of interest

The author declares that there are no conflicts of interest.

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