



Importance of artificial intelligence to improve processes carried out in opticians

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ABSTRACT

Introduction: artificial Intelligence (AI) is currently playing a fundamental role, transforming many processes and revolutionizing the market through digital transformation, providing professionals and companies with essential, easy-to-understand tools to better serve their clients.

Objective: to determine the importance of AI in improving the processes carried out at Optical Center 763 in the municipality of Pinar del Río.

Methods: a documentary review was conducted on AI applied to optical services in the health sector, using the databases Scopus, SciELO, Redalyc, Latindex, REDIB, Virtual Health Library, Dialnet, and Lilacs.

Results: based on the results obtained, the relevance of AI in improving processes at Optical Center 763 in the municipality of Pinar del Río has been established. This technology provides multiple advantages and benefits, in addition to having the capacity to completely transform the way processes are carried out in optical centers.

Conclusions: advances in technology and data science have provided tools and methods that promise to improve patient care and efficiency in the optical field. Hence, the need to determine the importance of AI in improving the processes of Optical Center 763 in the municipality of Pinar del Río.

Keywords: Artificial Intelligence; Optics; Processes.

INTRODUCTION

In the current digital era, the use of AI has become an increasingly palpable necessity for all citizens. The role that AI applications play in our daily lives and in the workplace is a hot topic of conversation, as it could trigger radical and unprecedented transformations in our way of living and working.⁽¹⁾

AI is a field of computer science dedicated to developing systems capable of performing tasks that normally require human intelligence, such as learning, reasoning, and perception. These systems have the ability to perceive their environment, reason about knowledge, process information extracted from data, and make decisions to achieve certain objectives.⁽²⁾

On a global scale, AI has come to stay, so much so that the world of optics is not exempt from this, causing changes and challenges to be faced in our sector. An example of this in the optical sector of Spain is Visión Lab, which has been the first chain to integrate AI into the invention of graduated lenses under the name Kümer AI, while Latin Americans stand out in the field of industry and technology of the optical laboratory, highlighting the work of the Argentine company led by Mauro Stabile, an economist, who has been at the forefront of the transformation process of an optical shop, continued with an optical laboratory and later a company dedicated to the development of software for the design of digital lenses and technology to facilitate lens adaptation in optics; however, this level of digitalization has not yet been generalized throughout the sector, especially in small and medium-sized businesses.^(3,4,5)

The trend of this technology created opportunities in the optical industry by adopting innovative features, as demonstrated at the Shenzhen International Optics Fair 2024, which took place at the Shenzhen Convention and Exhibition Center in Futian District (China), where leading suppliers of the Shenzhen eyewear industry showcased their latest technological advances at the fair, emphasizing intelligent solutions.⁽⁶⁾

Cuba is not left behind, as it has a project resulting from bilateral collaboration between Cuba and China, created by the International Institute for AI Research at the University of International Studies of Hebei, directed at the country level by the University of Camagüey, together with other centers such as the Central University of Las Villas, UCI, CUJAE, among others, which emerged in 2019.

Currently, the institute has research laboratories on AI, big data, internet of things, blockchain, cloud computing, and software development.⁽⁷⁾

One of the most notable applications is due to AI's ability to analyze large volumes of data and recognize complex patterns; there are others that have the potential to improve accessibility to visual health care, especially in remote areas, from where images can be sent and a diagnosis obtained in a matter of minutes. Therefore, it is essential that the implementation of AI-based tools in any area of health be carried out with rigorous ethical consideration, ensuring the privacy and security of patient data and avoiding design flaws in algorithms that can lead to incorrect diagnoses regarding results.⁽⁸⁾

When conducting an exploratory study on the use of AI, the primary state of application of techniques of this type in the processes carried out in optical shops both in the country and in the province was evidenced, including optical center 763 in our municipality, where advances in the computerization of some of the processes carried out therein are appreciated. Considering the above, the present work aims to: Determine the importance of AI to improve the processes carried out at optical center 763 in the municipality of Pinar del Río.

METHODS

A documentary review was conducted on AI applied to optical services in the health sector, in the databases Scopus, SciELO, Redalyc, Latindex, REDIB, Virtual Health Library, Dialnet, and Lilacs. For the search, the words: "artificial intelligence; optics; processes" in Cuba were used; for this, the logical Boolean operator OR was used, which allowed all words to appear in the results, indifferently.

All bibliographic review articles or original research that addressed some aspect associated with AI applied to optical services, written in Spanish or English, through a methodology with scientific rigor, that responded to the research objective proposed in this study, were included. For content analysis, information was categorized, which allowed precise identification of the place where the research was conducted, the methodology used, the results, and the conclusions obtained. Finally, 23 articles with sufficient currency and scientific quality were selected.

DEVELOPMENT

When relating AI as an almost century-old technology, it is because its most remote origin dates back to the 1930s of the last century, in the hands of a relevant figure in the development of what we now call new technologies: Alan Turing, who has not only been considered the father of AI but also as the precursor of modern computing.⁽⁸⁾ In the 1940s, AI as a discipline finds its origin, where theorists from diverse disciplines begin to make advances in their particular fields that, over time, would find a common point.^(9,10)

In the 1950s, Turing conducted a study titled "Computing machinery and intelligence" where he reflects on the concept of AI, exposing that machines were "capable of thinking," and established what would later be known as the Turing Test, which would allow knowing whether a computer would behave according to what is understood as artificially intelligent or not. Despite Turing's notes being prominent and well-known, AI is not spoken of in terms we know today until 1956, where John McCarthy, Marvin Minsky, and Claude Shannon make reference during the Dartmouth conference called "Dartmouth Summer Research Project on Artificial Intelligence"; McCarthy is also credited with coining the term "cloud computing," who together with Minsky, founded the MIT laboratory where the first theorizations and prototyping of artificial intelligence would emerge.^(9,11)

There are many definitions by authors about AI; for example, Nebendah 1988 and Delgado 1998 define it as the field of study that focuses on the explanation and emulation of intelligent behavior based on computational processes based on experience and continuous knowledge of the environment.⁽¹²⁾

The authors Rich and Knight 1994 and Stuart 1996 define AI as the capacity that machines have to perform tasks that at the moment are performed by human beings; however, Farid Fleifel Tapia describes it as: the science of computing that studies the resolution of non-algorithmic problems through any available computing technique, without taking into account the form of reasoning underlying the methods applied to achieve that resolution.^(13,14)

Since then, AI has several areas of application, and we will quickly explain some of them:

- Expert system: it attempts to emulate a human expert in a specific discipline.
- Machine learning: as its name indicates, it is the capacity of software to learn by itself.
- Deep learning: it is a type of machine learning that attempts to learn from a high level of abstract data.⁽¹⁵⁾

AI works with the process of large quantities of data through evolved algorithms that imitate the way humans learn, reason, and make decisions. These systems explore patterns in information, process them, and generate responses or predictions based on their learning.

In general, AI makes combinations of data, mathematical models, and computational volumes, and through this route carries out tasks that previously required human intervention, from recognizing images to generating text or acquiring strategic decisions.⁽¹⁶⁾

Reasonable questions have arisen about the reliability and professional ethics of its use in research, so it is essential to establish guidelines to define what role these AI tools can have to improve processes without breaking the ethical provisions of science.⁽¹⁷⁾

AI is proving to be a blessing for the optical sector. One of the fundamental reasons for the rapid integration of AI and machine learning in the production of optical products is the ability to incorporate data from hypothetical analysis into advanced high-performance machine learning algorithms. This singular ability is feasible thanks to powerful computer vision and AI software operating with graphics processing units (GPU). By using these machines, optical design companies can develop new products with greater speed and at a reduced cost.

Benefits of AI in the optical industry

1. Advanced computer vision systems based on GPU can be used for the configuration of complex equipment, such as test benches or robotic systems on a chip (SoC).
2. AI-based design software also has the ability to reduce the time needed to identify a new lens shape or an optoelectronic component, as well as to evaluate its optical performance before production begins.
3. AI-based CAD systems enable users to establish highly specific lenses with optical characteristics such as refractive index, dispersion, and Abbe number. These characteristics are not only relevant to meet the application requirements of a product but also ensure the final outcome of the company by reducing production costs and increasing productivity.⁽¹⁸⁾

Advantages of AI in optics

1. Automation of processes carried out in optics: by streamlining tasks whose execution may require a lot of time for humans.
2. Control and optimization of productive processes and production lines: More efficient processes are achieved, free of errors, achieving greater control over production lines in the company.
3. Expedites decision-making: By being able to analyze large amounts of data in much less time and allowing decisions to be made quickly based on evidence.
4. Fosters creativity: By reducing the time dedicated to optical processes that do not add value, workers can focus on amplifying their creativity.
5. Improves precision: Reduces errors that may be made when analyzing certain data thanks to Data Driven.^(19,20)

In addition to the different benefits and advantages that the application of AI has, it also has a significant impact on the economy by creating new jobs and changing industries; all this poses new challenges such as the need for continuous training of workers, in this case in optical shops, so it is important that companies and the government work together to mitigate the negative effects of automation and encourage the creation of new roles.

Economic impact

1. Increased productivity: AI automates tasks and optimizes processes.
2. New jobs and sectors: Creates opportunities in software development, data analysis, cybersecurity, and robotics. Promotes new business models based on AI.
3. Improved decision-making: Analyzes large amounts of data for more efficient and profitable business decisions.
4. Personalization: Allows adapted products and services, increasing customer satisfaction and loyalty.
5. Retraining and training: Need for training programs to adapt to changes in the labor market driven by AI.⁽²¹⁾

Through the results obtained, it has been possible to establish the relevance of AI in improving processes in Optical Center 763 of the Municipality of Pinar del Río, as these are inefficient in terms of precision and efficiency to avoid, with the use of these techniques, the loss or deterioration of information. It is evident that the implementation of AI in this sector has a significant impact on the economy. This technology provides multiple advantages and benefits, in addition to having the ability to completely transform the way processes are carried out in optical centers. Through intelligent interconnection between processes and products, it can be sustained that these technologies are fundamental to improve efficacy, reduce costs, in addition to offering higher quality service to our customers.

AI is currently playing a fundamental role in the visual health sector with digital transformation, providing professionals and companies with essential tools to understand and better serve their clients, optimize their operations, and remain competitive in a constantly changing market, offering important advances either in the diagnosis and treatment of eye diseases or in the manufacture of ophthalmic and contact lenses as well as in support of administrative activities of the optical center.⁽⁸⁾

CONCLUSIONS

The research demonstrates the importance of artificial intelligence (AI) in improving the processes of Optical Center 763 in Pinar del Río, mainly through automation and reduction of manual tasks. AI provides benefits such as faster and more accurate analyses, reduction of human errors, and greater accessibility to visual health services, especially in remote areas. Although it does not replace the professional, it does optimize their work, which requires continuous training to face the changes and challenges in optics and optometry. With adequate training, AI becomes a strategic ally to advance toward new frontiers in vision medicine.

Conflict of Interest

The authors declare that there is no conflict of interest.

Author Contribution

All authors participated in conceptualization, formal analysis, project administration, writing – original draft, writing – review, editing, and approval of the final manuscript.

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