Volume 11 issue 1; 2026

Ciencia y Deporte

Universidad de Camagüey "Ignacio Agramonte Loynaz"

Ciencia y Ciencia
ISSN 2223-1773, RNPS: 2276
Vol. 11. No. 1, January-April, 2026 p-e346

Original article

Artificial intelligence and applied statistics: a challenge for Physical Education teachers

[*Inteligencia artificial y la estadística aplicada: un desafío para profesores de Cultura Física*]

[*Inteligência artificial e estatística aplicada: um desafio para professores de Educação Física*]

Taimi Castañeda Rodríguez [1*], *Olga Margarita Moirón Vallar* [1], *Lazaro Antonio Bueno Pérez* [2]

[1] University of Physical Culture and Sports Sciences "Manuel Fajardo". Havana, Cuba.

[2] University of Camagüey "Ignacio Agramonte Loynaz". Camagüey, Cuba.

*Corresponding author: taimicr@gmail.com

Received: *2025-11-15*
Approved: *2026-01-15*

ABSTRACT

Introduction: Modern society is characterized by the constant generation of large volumes of data resulting from measurements in various social processes. The integration of artificial intelligence, as a growing trend, aims to streamline the recording, processing, and analysis of this information, as well as the procedures for applying statistical techniques to the data. In Physical Culture and Sport, the implementation of different Artificial Intelligence tools enhances the reliability of the information and the resulting analysis for decision-making.

Objective: For these reasons, the objective of the study was to explore the knowledge that the teachers of the University of Physical Culture and Sports Sciences "Manuel Fajardo" have about the usefulness of artificial intelligence tools for the application of statistical techniques.

Materials and methods: Accordingly, theoretical and empirical methods were applied, revealing a lack of knowledge among professionals in this field regarding artificial intelligence tools that facilitate data analysis. The statistical-mathematical method was also used.

Results: Frequency and contingency tables were used to present the results of the empirical investigations.

Conclusions: The identification of several tools that facilitate working with data and its analysis puts into perspective the future possibilities for these professionals.

Keywords: Artificial Intelligence, data analysis, statistics, Physical Culture and Sport.

RESUMEN

Introducción: la sociedad actual se ha caracterizado por la generación constante de grandes volúmenes de datos resultantes de mediciones en diferentes procesos sociales. La integración de la inteligencia artificial, como una tendencia creciente, llega para suavizar el registro, procesamiento y análisis de esta información, así como los procedimientos para la aplicación de técnicas estadísticas en los datos. En la Cultura

Física y el Deporte, la implementación de diferentes herramientas de la Inteligencia Artificial aporta potencia sobre la confiabilidad de la información y el análisis resultante para la toma de decisiones.

Objetivo: por tales razones, el objetivo del estudio consistió en explorar sobre los conocimientos que tienen los docentes de la Universidad de Ciencias de la Cultura Física y el Deporte "Manuel Fajardo" sobre la utilidad de herramientas de la inteligencia artificial para la aplicación de las técnicas estadísticas.

Materiales y métodos: En correspondencia, se aplicaron métodos teórico y empírico que permitieron constatar el desconocimiento de los profesionales de esta área, sobre las herramientas de inteligencia artificial que facilitan el análisis de datos. Del método estadístico-matemático

Resultados: se emplearon las tablas de frecuencia y contingencia para presentar los resultados sobre las indagaciones empíricas.

Conclusiones: la identificación de varias herramientas que facilitan el trabajo con los datos y su análisis, pone en perspectiva las posibilidades a futuro de estos profesionales.

Palabras clave: Inteligencia Artificial, análisis de datos, estadística, Cultura Física y el Deporte.

RESUMO

Introdução: A sociedade moderna caracteriza-se pela geração constante de grandes volumes de dados resultantes de medições em diferentes processos sociais. A integração da inteligência artificial, como tendência crescente, visa otimizar o registro, o processamento e a análise dessas informações, bem como os procedimentos para aplicação de técnicas estatísticas aos dados. Na área de Cultura Física e Esporte, a implementação de diferentes ferramentas de Inteligência Artificial aumenta a confiabilidade das informações e a análise resultante para a tomada de decisões.

Objetivo: Por essas razões, o objetivo deste estudo foi explorar o conhecimento que os professores da Universidade de Ciências da Cultura Física e do Esporte "Manuel

Fajardo" possuem sobre a utilidade das ferramentas de inteligência artificial para a aplicação de técnicas estatísticas.

Materiais e métodos: Para tanto, foram aplicados métodos teóricos e empíricos, que revelaram a falta de conhecimento entre os profissionais da área em relação às ferramentas de inteligência artificial que facilitam a análise de dados. O método estatístico-matemático foi utilizado.

Resultados: Tabelas de frequência e de contingência foram utilizadas para apresentar os resultados das investigações empíricas.

Conclusões: A identificação de diversas ferramentas que facilitam o trabalho com dados e a sua análise coloca em perspectiva as possibilidades futuras para esses profissionais.

Palavras-chave: Inteligência Artificial, Análise de Dados, Estatística, Educação Física e Esporte.

INTRODUCTION

Data analysis has intensified over the years due to the vast amount of information generated by most social processes. Scientific and technological development, along with the proliferation of measurable processes that influence decision-making, has heightened the need for efficiency in organizing and processing information. In this regard, Córdova (2003) recognizes statistics as the science that provides a set of methods, techniques, and procedures for collecting, organizing (classifying, grouping), presenting, and analyzing data in order to describe it or make generalizations. Jorrín and Kessel (2024), for their part, emphasize the importance of studying and applying statistics, based on its impact in various fields and with the aim of its systematic use in scientific research.

The foregoing justifies the importance of further exploring the elements that characterize its application in the training of professionals in Physical Culture and Sport, considering the four graduate profiles (Physical Education, Recreation, Prophylactic and Therapeutic Physical Culture and Sport, and Sport). In this vein, the arguments of Medina *et al.* (2022)

are taken into account, who assert that adapting program content for teaching and applying statistics can enhance learning processes, fostering new ways of teaching and learning where the teacher personalizes their teaching style to the needs of the students and the environment in which they operate.

To analyze the arguments presented, it is essential to consider the increasing integration of Information and Communication Technologies (ICTs) and new Artificial Intelligence (AI) models into academic processes, as well as the possibilities they offer. The incorporation of these tools into higher education provides an opportunity to redefine the teaching-learning process, making it more interactive, flexible, and personalized, thus responding to the needs of 21st-century students (Hernández, 2024). However, Holmer *et al.* (2023) caution that, while these tools have the potential to change how teachers teach and students learn, it is crucial to maintain the primary objective of achieving meaningful learning. Consequently, educational institutions must reflect on their pedagogical practices and design flexible learning environments that allow for the integration of **AI.**

Granados (2022) explains that **AI** is a form of reasoning developed by machines; that is, a machine's potential to interpret data. Marín (2023) argues that, within the growing technological package of this century, it is the simulation of human intelligence by a computer, with the aim of enabling the machine to identify and use "knowledge" at a specific stage in solving a given problem. For Mayol (2024), AI **is** the ability of machines to simulate the cognitive processes characteristic of the human species; he argues that in just over two years it has become an unexpected force in multiple knowledge management sectors. Along these lines, Jiménez et al. (2024) highlight the urgent need for educational institutions to validate the ethical and pedagogical suitability of **AI systems** for education, calling on the international community to reflect on their long-term implications for knowledge, teaching, learning, and assessment. Many of the fundamental ideas that have driven the field of statistics over the past 70 years have developed as a result of contributions to **AI**.

Statistical techniques and **AI** are powerful tools that have revolutionized multiple disciplines and, when combined, offer a wide range of applications in the field of Physical Culture and Sport. In this context, it is interesting to define the following objective for this study: To explore the knowledge that professors at the Manuel Fajardo University of Physical Culture and Sport Sciences have regarding the usefulness of artificial intelligence tools for the application of statistical techniques.

MATERIALS AND METHODS

The research is exploratory, as it focuses on investigating teachers' knowledge of AI tools for working with data and exploring those available, easily accessible and applicable in the context of Physical Culture and Sport, with the aim of collecting information that demonstrates their usefulness for the application of statistics from training and in the different professional graduation profiles.

To conduct the diagnostic measurements, a five-point Likert-type questionnaire with 15 questions was adapted from the literature (Vera, 2023). The evaluative criteria were represented by: 1 = Strongly Disagree (SD), 2 = Disagree (SD), 3 = Neither Agree nor Disagree (NA - Nd), 4 = Agree (AD), and 5 = Strongly Agree (SA). Initially, this allowed us to understand the criteria regarding the integration of AI into Higher Education, particularly for data processing, as well as to evaluate the knowledge and skills of UCCFD professionals in topics related to the application of statistical techniques using AI tools, given the ease with which these tools are used. Furthermore, it allowed us to determine their willingness to apply statistical techniques in research projects using AI tools, both during class and in their daily work.

In accordance with the logic described, an unstructured interview was conducted with the study participants to learn about the software, platforms, browsers, search engines, resources, AI applications or virtual assistants that they used to facilitate the application of statistical techniques.

Among the theoretical methods employed were the analytical-synthetic and inductive-deductive approaches, which facilitated understanding the studied information and establishing the multiple relationships between AI tools and their operational capacity for conceptualizing, developing, and applying statistical content, as well as for processing the results obtained. Methodological triangulation was used for cross-checking the results obtained from the questionnaire and the unstructured interview.

From the statistical-mathematical field, descriptive statistics employed empirical frequency distribution tables, and a contingency table was also used to summarize and analyze the relationship between the categorical variables studied.

RESULTS AND DISCUSSION

The selected research setting was the Manuel Fajardo University of Physical Culture and Sports Sciences. The study participants included professors and administrative heads of the academic departments (department head and deputy head). The entire faculty was considered the population, and the sample was randomly selected from 50% of the professors using stratified sampling, ensuring representation from all 15 academic departments. All administrative heads were included in the study. A non-probability, purposive sampling method was used, as the aim was not "...to achieve representativeness of elements of a population, but rather to carefully and carefully select subjects with certain characteristics to obtain the maximum amount of information about the multiple realities that can be discovered" (Mesa, 2006, p. 15).

In carrying out the procedure, compliance with homogeneity indicators was taken into account in order to eliminate bias in the measurements. In this regard, it was ensured that the respondents:

- They were teaching staff of the UCCFD.
- They will work directly in undergraduate teaching.

- They will have more than three years of teaching experience.

The population and sample were represented in Table 1.

Table 1. *Population and sample*

Participants	Population	Sample	%
Teachers	257	129	50
Administrative managers	28	28	100

After the instruments were applied and the information collected, the results were analyzed. Initially, the responses provided by the teachers in the questionnaire were processed; these are represented in Table 2.

Table 2. *Absolute and relative frequencies regarding the opinion of the surveyed teachers on the use of AI for the application of statistical techniques*

No. Aspects evaluated	**TD**	**%**	**ED**	**%**	**Na - Nd**	**%**	**DA**	**%**	**TA**	**%**
-AI can improve the quality of Higher Education **in** Physical Culture and Sport.	0	0	2	2	35	27	56	43	36	57
-I am willing to use **AI-** based tools in my teaching activities and in scientific research for data processing and analysis.	0	0	3	2	23	18	46	36	57	44
AI tools can perform complex statistical analyses.	1	008	0	0	16	12	26	20	85	66
- I feel capable of effectively using **AI- based tools** for the application of statistical techniques in Physical Culture and Sport.	55	43	67	52	3	2	4	3	0	0
- I believe that **AI** can personalize the learning experience and application of statistical techniques in Physical Culture and Sport,	0	0	4	3	22	17	87	67	16	12

during training and in professional performance, effectively.										
- I believe it is necessary to provide more training on **AI** in the university context of Physical Culture and Sport for the application of statistics.	0	0	0	0	0	0	0	0	12	9
- I have ethical concerns about the use of **AI** for the application of statistical techniques to data generated in Physical Culture and Sport.	14	11	29	22	49	38	37	29	0	0
-I believe that **AI** can help identify individual needs in terms of learning and applying statistics, more accurately.	0	0	0	0	5	4	11	9	6	5
- I am willing to explore new forms of teaching and assessment that involve **AI** to facilitate the application of statistics in Physical Culture and Sport.	0	0	0	0	12	9	74	57	43	33
- I believe that **AI** can improve and facilitate the processes of measuring, processing, analyzing and representing information in Physical Culture and Sport and the feedback I provide to students.	0	0	0	0	4	3	57	44	68	53
-I believe that using ChatGPT can improve my knowledge of the applicability of statistical techniques.	0	0	0	0	45	35	82	63.5	2	2
- I am willing to use ChatGPT or another virtual assistant as a support tool in the teaching-learning and tutoring process of my students, for the application of statistical techniques in Physical Culture and Sport processes.	0	0	4	3	32	25	83	64	10	8
-I believe that CChatGPTu, another virtual assistant, can facilitate the resolution of doubts and questions, as well as identify statistical techniques and procedures to be used in research processes in Physical Culture and Sport.	1	008	3	2	18	14	69	53	38	29

-I have concerns about the lack of personalization and adaptability of GPT Chat or other virtual assistants, compared to human interaction in education for conducting data analysis in Physical Culture and Sport.	28	22	79	61	22	17	0	0	0	0
-I believe that the GPT Chat or another virtual assistant can be a useful tool to encourage active participation and the appropriation of statistical knowledge that facilitates informed decision-making.	0	0	0	0	17	13	86	67	26	20

Note:

Strongly disagree: SD.

Disagree: ED.

Neither agree nor disagree: N/A.

Agree: A.

Strongly agree: SA.

The results show that 80% of respondents agree or strongly agree with using AI-based tools in teaching activities and scientific research for data processing and analysis, and 86% believe that AI tools can perform complex statistical analyses. However, in contrast to these views, 95% of teachers do not feel adequately trained to use AI-based tools effectively for applying statistical techniques in the

Physical Culture and Sport. This is a topic that generates concern due to the rapid development of technology in recent decades and, even more recently, the use of AI and generative artificial intelligence tools to support and improve efficiency in multiple social processes.

In light of the aforementioned elements, it is considered satisfactory that 90% of respondents are willing to explore new teaching and assessment methods that incorporate AI to facilitate the application of statistics in Physical Culture and Sport. This is considered a progressive approach to acquiring contemporary skills and knowledge

that foster self-directed learning and knowledge management, in this case, by promoting a statistical culture for professionals in this field.

Another valuable element to highlight is that 92% of the teachers participating in the study consider Chat GPT, as an AI model that uses natural language processing to understand and answer questions or participate in conversations with users, can facilitate the resolution of doubts and questions, as well as identify statistical techniques and procedures to be used in research processes of Physical Culture and Sport.

The results of the instrument applied to the administrative managers are no different; in this case, they will be represented in Figure 1, given its usefulness in presenting complex information in a comprehensible way. For the analysis, it should be noted that these are the same indicators evaluated using the same scale as that used in the previous table.

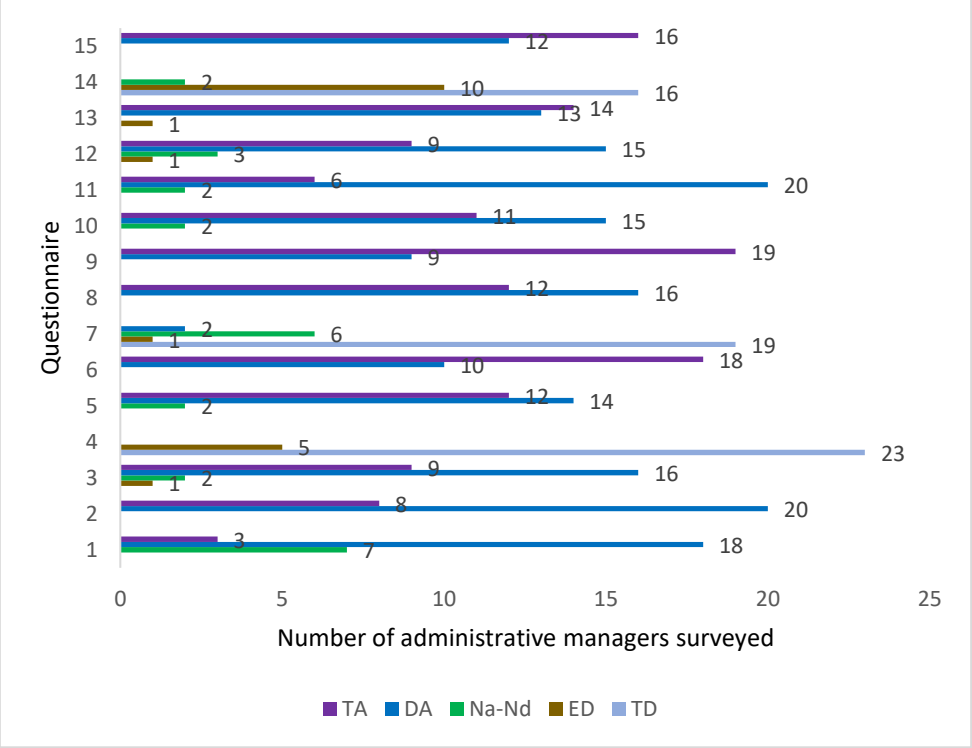

Fig. 1. - *Results on the opinion of the surveyed administrative managers regarding the use of* ***AI*** *for the application of statistical techniques*

These values suggest that 100% of the surveyed managers are willing to use AI-based tools for the development of teaching activities and scientific research for data processing and analysis. However, 82.1% of them strongly agree that they do not feel capable of effectively using AI-based tools for the application of statistical techniques in Physical Culture and Sport. This hinders their functions as heads of an organizational unit, where they must guide the implementation of technological advances and be able to constantly collect, process, and present statistical information on the processes they manage.

The majority of these managers (100% and 92.8% respectively) are willing to explore new forms of teaching and assessment that involve AI to facilitate the application of statistics in Physical Culture and Sport, and they believe that AI can improve and facilitate the processes of measurement, processing, analysis and representation of information in Physical Culture and Sport and the feedback they provide to students.

The unstructured interviews revealed that most respondents lacked skills in managing AI tools. In many cases, the technology prevented them from using them, while others indicated that statistics remained a challenge for them. Among those interviewees who were knowledgeable about the subject and understood its usefulness for applying statistical techniques, and who also actually used them, a list was compiled of the techniques they employed. The most frequent, listed in order of priority, were:

- Statistical software (SPSS, Statistical Package for the Social Science).
- Microsoft Copilot.
- ChatGPT.
- Python.

These are just a few of the many tools available for collecting, processing, and analyzing information using statistical techniques. This demonstrates the faculty's need for further training in these areas. Based on the collected information, a contingency table was constructed to summarize the actions of these professionals in applying statistical techniques with the aid of AI tools. The results are presented in Table 3.

Table 3. *Implementation of AI by UCCFD professionals for the application of statistical techniques*

	Implementation of **AI** for the application of statistical techniques	**AI** tools for the application of statistical techniques	Total
Teachers	7	122	129
Administrative managers	0	28	28
Total	7	150	157

These values indicate that the technological skills of professionals in this scientific field working at the institution show weaknesses in the incorporation of AI tools into their processes, especially for data analysis and processing. This impacts the efficiency and power of the research results obtained from the application of statistical techniques. Of these professionals, 150 indirectly report not implementing **AI tools** for statistical applications; therefore, it can be inferred that they must possess a strong foundation in mathematical knowledge to perform the procedures required for applying statistical-mathematical methods.

The authors of this study consider these last lines a questionable approach from the perspective of the systematic nature of professional practice in this area of science, despite the importance and necessity of this knowledge. Accordingly, they agree with Lozada *et al.* (2022), who state that reviewing the statistical processes developed in research in the area of Physical Activity and Sport provides a theoretical basis for supporting future practical and research work; it also allows for guiding decision-making in educational institutions, which can serve as the foundation for establishing priorities.

Medina *et al.* (2022) and Mayol (2024) highlight several arguments that Physical Culture and Sport professionals should consider, given that this is a data-generating field par excellence and that its results are shaped by the analyses and predictions made from this

data. These academics emphasize that automation plays a crucial role in the interpretation of statistical data with AI, eliminating the need for manual processes and reducing the margin of error. AI tools for statistical data interpretation can perform complex analyses in fractions of the time, freeing scientists to focus on higher-value tasks and ensuring that interpretations are always relevant and accurate.

A review conducted by the researchers on AI-assisted platforms, consultation of various sites dedicated to their study for data analysis and statistics, the rating given by various users of the platforms to these tools, and the review of coincidence in blog documents on the subject matter, allowed the identification of some of these tools for working with data that could generate benefits for Physical Culture and Sport, which were named in Table 4.

Table 4. *AI tools to assist statistical data analysis*

Tool name	Features of the AI tool
GitHub Co-pilot	AI-powered code generation. Real-time suggestions. Multilingual support.
pandasAI	Automated data cleaning. Natural language queries. Python integration.
ChatGPT	Natural language processing. Code explanation. Data interpretation.
Jupyter AI	Interactive notebooks. AI-assisted coding. Data visualization. Data interpretation.

Hugging the face	Pre-trained ML models. NLP capabilities. Community-driven.
Data robot	Automated machine learning. Model implementation. Feature engineering.
H2O.ai	Open-source ML platform. AutoML capabilities. Scalable architecture.
Tableau AI	AI-powered visualizations. Natural language queries. Predictive analytics.
KNIME	Visual workflow designer. Drag-and-drop interface. Extensible platform.
Data	Collaborative data science. MLOps capabilities. Visual data preparation.
Fast Miner	Automated data preparation. Model validation. Visual workflow design.

The tools listed are just some of the most commonly used, but not the only ones; the truth is that these tools are innovative and require a basic understanding of technology to use. Physical Culture and Sports professionals face a challenge they must embrace, as it has been more than proven that integrating AI into various processes, and particularly into the application of statistical techniques and data analysis, optimizes tasks and improves the efficiency of results.

CONCLUSIONS

The integration of artificial intelligence tools with statistical techniques offers a modern and effective approach to training professionals in Physical Culture and Sport. Through the use of these technologies, students not only acquire theoretical knowledge but also develop practical skills that are essential in today's workplace. The ability to analyze data, make decisions, and conduct research prepares future professionals to face the challenges of the modern world. The study highlighted the need for these professionals to update their skills in integrating AI into the application of statistical techniques, as well as the importance of data processing and its advantages for decision-making in this area of science, demonstrating the usefulness of AI for making decisions based on informed data.

BIBLIOGRAPHIC REFERENCES

Córdova, M. (2003). *Estadística descriptiva e inferencial. Aplicaciones*. Moshera S.R.L.

Granados, J. (2022). Análisis de la inteligencia artificial en las relaciones laborales. *CES Derecho, 13* (1), 111-132. https://dx.doi.org/10.21615/cesder.6395

Hernández, A. D. (2024). Herramientas digitales para la participación del estudiantado universitario. En V. L. Gutiérrez (Coord), La aplicación de chatgpt y otras herramientas de inteligencia artificial en el aula universitaria (pp. 13-29). Dykinson S.L. Madrid – 2024. ISBN: 978-84-1070-449-7

Holmer, W., Bialik, M., & Fadel, C. (2023) Artificial intelligence in education. The Center Curriculum Redesing,151-180. https://dx.doi.org/10.4018978-1-66843595-3.ch012

Jiménez, K. A., Gamboa, P. G., Vaughan, M. & Moreno, R. A. (2024) Validación de un cuestionario diagnóstico sobre la integración de la inteligencia artificial generativa en la práctica docente. Revista Digital de Tecnologías Informáticas y Sistema, 8 (1), 217-224. https://doi.org/10.61530/redtis.vol8.n1.2024

Jorrín, E. M, & Kessel. J. G. (2024). *Implementación del contenido estadístico en los estudios de la carrera Licenciatura en Cultura Física y el Deporte*. 14to Congreso Internacional de Educación Superior Universidad 2024. https://rein.umcc.cu/handle/123456789/2056

Lozada, J. L., Padilla, J. R., Cortina, M. de J., & Baldayo, M. (2023). Estadística utilizada en tesis doctorales de ciencias de la Actividad Física y el Deporte. *Búsqueda*, *9*(1), e580. https://doi.org/10.21892/01239813.580

Marín, A. E. (2023). El impacto de la Inteligencia artificial en el deporte: presente y futuro. Un recorrido por su uso y retos. Anesma. https://www.researchgate.net/deref/https%3A%2F%2Fwww.anesma.com%2Fel-impacto-de-la-inteligencia-artificial-en-el-deporte-presente-y-futuro%2F?_tp=eyJjb250ZXh0Ijp7ImZpcnN0UGFnZSI6InB1YmxpY2F0aW9uIiwicGFnZSI6InB1YmxpY2F0aW9uIn19

Mayol, J. (2024). Impacto de la Inteligencia Artificial generativa en la publicación científica. *Enfermería Nefrológica*, *27*(3), 187-188. https://dx.doi.org/10.37551/s2254-28842024019

Medina, E. J., Muñiz, J. L., Guzmán, D. S., & Holguín, A. (2022). Recursos y estrategias para la enseñanza de la estadística y la analítica de datos en la educación superior. *Formación universitaria*, *15*(3), 61-68. https://dx.doi.org/10.4067/S0718-50062022000300061

Mesa, M. (2006*). Asesoría Estadística en la investigación aplicada al deporte*. José Martí.

Vera, F. (2023). *Cuestionario sobre la integración de la Inteligencia Artificial en la Educación (CIIAE).* https://rediie.cl/wp-content/uploads/CIIAE.pdf

Conflict of interest:

The authors declare no conflicts of interest.

Authors' contribution:

The authors have participated in the writing of the work and analysis of the documents.

This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License.

Copyright (c) 2026 Taimi Castañeda Rodríguez, Olga Margarita Moirón Vallar, Lazaro Antonio Bueno Perez