VISUAL REVIEW | Vol. 18, No. 8, 2026 | ISSN 2695-9631

International Visual Culture Review / Revista Internacional de Cultura Visual

https://doi.org/10.62161/revvisual.v18.6499.

IA APLICADA AL ANÁLISIS DE IMÁGENES EDUCATIVAS, UN ANÁLISIS BIBLIOMÉTRICO 2014 – 2025

AI Applied to the Analysis of Educational Images: A Bibliometric Analysis 2014–2025

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KEYWORDS

Artificial intelligence
Image analysis
Visual literacy
Bibliometrics
Machine learning

ABSTRACT

The expansion of artificial intelligence in education has driven the use of machine learning and computer vision for the analysis of educational images, with an impact on visual literacy and pedagogical evaluation. This study analyzes scientific production on AI applied to the analysis of educational images between 2014 and 2025. It is a bibliometric study based on a corpus of 1,020 Scopus-indexed articles, using Biblioshiny to examine annual production, citations, co-authorship networks, and keyword occurrences. The results show sustained growth, the leadership of China and the United States, low Latin American participation, and gaps in ethical, longitudinal, and equity-related studies.

RECIBIDO: 01/ 07 / 2026
ACEPTADO: 24/ 10 / 2026

1. Introduction

Artificial intelligence (AI) applied to image analysis has experienced sustained expansion during the period 2014–2025, consolidating itself as one of the most dynamic research lines within the scientific field. Indeed, the development of machine learning and, particularly, deep learning has enabled the automation of complex image interpretation, progressively surpassing traditional approaches based on rules and manual feature extraction. In this way, literature shows a transition from descriptive models toward systems capable of learning hierarchical representations directly from visual data (Li et al., 2024).

Considering this evolution, advances in computer vision have fostered the application of increasingly sophisticated models for image analysis in diverse contexts. In this regard, recent research demonstrates that deep learning architectures allow the identification of spatial and temporal patterns with high levels of precision, even in scenarios characterized by high visual variability. Consequently, the growth of scientific production reflects not only a quantitative increase in publications but also a methodological and conceptual deepening of the field (Richardson et al., 2024).

On the other hand, the expansion of artificial intelligence in the analysis of visual information is not limited to domains traditionally associated with imagery but extends to areas of management and process evaluation. Within this framework, Pérez et al. (2024) demonstrate that machine learning algorithms enable the analysis of visual representations of progress and velocity in agile environments, optimizing data-driven decision-making. This approach is relevant to the educational field, as it evidences how AI can be applied to the analysis of graphical and visual representations of academic performance, strengthening formative assessment systems and learning monitoring processes. Consequently, this type of study broadens the spectrum of applications of automated visual analysis within higher education.

Regarding the bibliometric analysis of the period considered, an intensification of research is observed from the second half of the decade onward, which suggests a progressive consolidation of AI-based image analysis as a transversal axis across multiple disciplines. Indeed, this expansion lays the foundations for its incorporation into educational contexts, where automated image analysis acquires strategic value for teaching, assessment, and academic research.

1.1. Computer Vision and Interpretability

With regard to dominant methodological approaches, deep learning positions itself as the central paradigm of contemporary image analysis. In particular, convolutional neural networks and transformer models have demonstrated superior capacity to process highly complex visual information. In this way, recent studies show a tendency toward hybrid models that integrate different architectures in order to optimize performance and generalization of visual analysis systems (Zeineldin et al., 2024).

Likewise, the development of high-resolution and high-granularity visual datasets has been a determining factor in the advancement of the field. Xu y Zhao (2024) highlight that the availability of specialized databases makes it possible to train more precise and robust models, which directly impacts the quality of image analysis. In this sense, technological progress is sustained both by algorithmic innovation and improvements in data infrastructures.

With respect to advanced applications of computer vision, studies based on images captured by non-conventional devices also provide relevant methodological frameworks. Xiang et al. (2024) demonstrate that the use of artificial intelligence for automated analysis of images obtained through unmanned aerial vehicles enables the rapid and precise detection of visual changes. This type of approach is transferable to the educational field, insofar as it evidences how deep learning models can process large volumes of complex visual information. In turn, these methodologies contribute to enriching training in visual analysis, spatial data interpretation, and advanced digital literacy in educational contexts.

However, alongside increased precision, the need to strengthen the interpretability of AI models also emerges. Setianto et al. (2026) propose explainable approaches that allow

understanding of system decisions, which is especially relevant in educational contexts where transparency and comprehension of analytical processes are fundamental. Thus, interpretability emerges as a key axis for the responsible integration of AI into image-based formative processes.

1.2. Visual literacy and AI-based educational mediation

The application of AI to image analysis acquires particular relevance when linked to visual literacy in educational contexts. Indeed, the ability to interpret, analyze, and produce meaning from images becomes a central competence in digital environments mediated by intelligent technologies. Within this framework, AI acts not only as a technical tool, but also as a mediator of visual learning.

In this regard, Williams et al. (2026) argue that the collaborative use of AI-based visual analysis systems fosters the development of critical skills such as interpretation, curation, and evaluation of visual information. Likewise, Weng et al. (2026) evidence that collaborative approaches between humans and artificial intelligence enhance formative processes, particularly when visual thinking strategies are integrated into educational activities.

Similarly, the transfer of visual analysis methodologies from other fields of knowledge significantly reinforces the educational potential of artificial intelligence. In particular, studies developed in the field of medicine demonstrate that deep learning models applied to image analysis enable the interpretation of complex visual information with high levels of precision and consistency. In this sense, the research by Zhang et al. (2024) indicates that deep learning systems facilitate the understanding of specialized visual patterns, which is transferable to educational contexts where image analysis is central to the training and assessment of advanced visual competencies.

In the specifically educational domain, recent literature highlights the relevance of collaborative approaches between humans and artificial intelligence for the analysis of visual productions. Weng et al. (2026) analyze the use of AI-supported visual thinking strategies in the interpretation of drawings created by medical students, suggesting that human–machine interaction enhances processes of reflection, analysis, and emotional learning. This study is particularly significant for the analysis of educational images, as it shows how AI can act as a mediator in the interpretation of visual productions, strengthening visual literacy and promoting critical understanding of graphic resources in formative contexts.

Moreover, applications of artificial intelligence in automated analysis processes have also been explored in diagnostic and evaluation contexts through the use of machine learning. Xue et al. (2025) demonstrate that the automation of visual analysis increases interpretative efficiency and reduces variability associated with human evaluation. In this way, these approaches provide methodological frameworks that can be adapted to educational environments, contributing to the development of critical visual literacy and to the strengthening of formative practices based on rigorous image analysis.

Consequently, artificial intelligence applied to image analysis consolidates itself as a strategic resource for contemporary education, by integrating advanced methodologies from other fields of knowledge and enhancing visual training in academic environments mediated by digital technologies.

1.3. Análisis bibliométrico de la IA en educación

Artificial intelligence (AI) has rapidly transformed the educational sphere in recent years, generating new dynamics in teaching, learning, and academic management. In particular, the analysis of educational images through machine learning and computer vision algorithms is directly linked to visual literacy, understood as the ability to interpret and produce meaning through graphic resources in digital contexts. The relevance of this topic lies in the fact that contemporary society is increasingly mediated by the visual, and AI offers tools to enhance the comprehension, evaluation, and production of educational content (Song y Wang, 2020).

In the recent state of the art, a lot of studies have systematized the growth of research on AI and education. For example, Song y Wang (2020) conducted a global bibliometric analysis on

educational artificial intelligence, showing a sustained increase in scientific production over the last two decades. Romaní y Macedo (2024) confirmed this trend in the Latin American context, highlighting the expansion of publications in Scopus and Web of Science between 2020 and 2024. Zhong et al. (2024) analyzed the impact of machine learning on education, making visible its potential to transform teaching and learning methods.

Likewise, Maphosa y Maphosab (2023) applied topic modeling techniques to identify the main research lines in AI in higher education, while Fu et al. (2024) conducted a meta-analysis that synthesizes previous reviews and confirms the consolidation of the field. In parallel, Wang et al. (2025) examined AI literacy among university students, emphasizing the need to prepare new generations to critically interact with these technologies. Finally, Jantakun et al. (2025) carried out a bibliometric analysis on artificial intelligence applied to digital literacy, showing that the field has grown steadily and that there is increasing interest in integrating AI into critical and visual training processes.

In this sense, bibliometric analysis is justified as a strategic tool for teaching, research, and academic management, as it allows the identification of leading authors, institutions, and countries, the mapping of thematic trends, and the evaluation of the impact of scientific production (Fu et al., 2024). Furthermore, it provides inputs for curricular decision-making and for the consolidation of academic communities around emerging topics of high technological and pedagogical relevance.

In the case of Peru, research on artificial intelligence applied to the analysis of educational images is still at an incipient stage, with lower presence in international databases compared to leading countries such as China or the United States. However, the growing digitalization of higher education and the need to strengthen competencies in visual literacy make this bibliometric study particularly relevant. By mapping global scientific production, inputs are generated to allow the identification of research opportunities, the orientation of educational policies, and the promotion of academic collaboration in Peruvian universities. In this way, bibliometric analysis not only contributes to understanding the international state of the art, but also offers a reference framework for promoting pedagogical and technological innovation in the national context.

Thus, the bibliometric analysis of AI applied to the analysis of educational images constitutes a fundamental tool for understanding the evolution of the field, identifying emerging trends, and detecting research gaps. Indeed, the systematic mapping of scientific production makes it possible to articulate theoretical research with academic and curricular decision-making. Therefore, this approach not only contributes to the development of knowledge, but also strengthens the strategic planning of higher education in contexts of digital transformation.

2. Objectives

2.1. General Objective

Analyze the scientific production on artificial intelligence applied to the analysis of educational images during the period 2014–2025, through bibliometric indicators of productivity, impact, collaboration, and thematic trends.

2.2. Specific Objectives

Examine the productivity of authors, institutions, and countries in research on AI applied to the analysis of educational images between 2014 and 2025.

Analyze the academic impact of scientific production through the study of the most cited documents and sources.

Identify patterns of scientific collaboration among authors, institutions, and countries in this field of study.

Determine the main trends and emerging research lines based on keyword analysis and their co-occurrence.

3. Methodology

3.1. Sources of Information and Time Frame

For the compilation of the documentary corpus, the Scopus database was used, recognized for its international and multidisciplinary coverage in social sciences, education, and technology. This database was selected due to its reliability, the possibility of exporting complete metadata, and its suitability for replicable bibliometric studies. The analysis was delimited to the period 2014–2025, considering that during the last decade the development and application of artificial intelligence and machine learning in the educational field have intensified, particularly in the analysis of images and visual resources. This time frame allows observation of the recent evolution of scientific production, identification of emerging trends, and assessment of the impact of AI on visual literacy within higher education.

3.2. Inclusion and Exclusion Criteria

For the construction of the corpus, all documents indexed in the Scopus database related to artificial intelligence applied to the analysis of educational images and visual literacy in higher education were considered, delimiting only the period 2014–2025 as the inclusion criterion. Consequently, only those documents published outside the established time range or not directly related to the subject of study were excluded.

3.3. Formation of the bibliographic corpus

After applying the inclusion and exclusion criteria, the final corpus of the analysis is composed of a total of 1020 documents, which correspond primarily to scientific articles and, complementarily, to publications from conferences and other academic formats. This is pertinent considering the highly technical and emerging nature of the field of study, given that the dissemination of advances often occurs early in specialized scientific communication spaces. This allows the incorporation of recent contributions alongside more theoretically consolidated research. In this sense, the typological diversity of the corpus not only broadens the scope of the bibliometric analysis but also makes it possible to capture both consolidated conceptual developments and the most recent methodological innovations.

3.4. Search Terms

TITLE-ABS-KEY
("artificial intelligence" OR AI OR "machine learning" OR ML OR "deep learning" OR "neural network*" OR "computer vision" OR "image analysis" OR "image recognition" OR "visual recognition" OR "pattern recognition" OR "feature extraction" OR "image classification")
AND
("visual literacy" OR "visual competenc*" OR "visual skill*" OR "visual thinking" OR "visual interpretation" OR "visual comprehension" OR graphicacy OR "alfabetización visual" OR "competencia visual")
AND
(education OR "higher education" OR university* OR college OR "tertiary education" OR postsecondary OR "post-secondary education" OR learning OR teaching OR instructional OR "educational technology")

3.5. Bibliometric Indicators

Table 1. Table of bibliometric indicators

Dimension	Indicators
Scientific productivity	Years of publication
	Author production over time

	Institutions with highest production
	Leding countries in publications
Academic Impact	Citations per document
	h-index of most relevant authors
Scientific collaboration	Co-authorship among researchers (collaboration network)
	Institutional networks
	International networks
Thematic trends	Most frequent keywords
	Co-occurrence of terms
	Evolution of emerging research lines

Source: Own elaboration (2026).

4. Results

The results of the bibliometric analysis on artificial intelligence applied to the analysis of educational images in higher education are presented below. The analysis makes it possible to describe the evolution and characteristics of scientific production in the area, as well as to identify the main patterns of publication and structuring of the field. The results are organized into four dimensions: scientific productivity, academic impact, scientific collaboration, and thematic trends, which are developed based on the indicators and visualizations obtained through Biblioshiny.

Figure 1. General information of the bibliographic corpus on AI applied to the analysis of educational images (2014–2025)



Source: Own elaboration through the Biblioshiny tool (2026).

First, the analyzed bibliographic corpus covers the period 2014–2025 and is composed of 1,020 documents published in 460 scientific sources. In this sense, the temporal scope of the analysis makes it possible to identify the progressive consolidation of artificial intelligence applied to the analysis of educational images as a relevant research field within higher education. The diversity of sources also shows that the topic is not concentrated in a single editorial space, but rather distributed across journals from different areas of knowledge, reinforcing its interdisciplinary character.

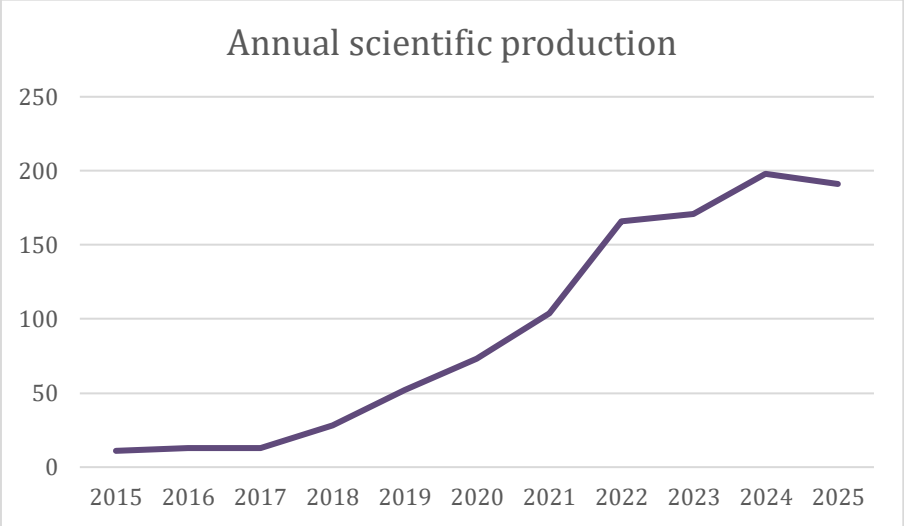
Regarding the evolution of scientific production, the annual growth rate of 33.03% reflects an accelerated and sustained increase in publications. In this way, the results confirm that academic interest in AI applied to the analysis of educational images has significantly increased over the last decade, particularly in response to the development of machine learning, deep learning, and computer vision techniques. Therefore, this growth suggests that the field is in a phase of expansion and specialization, with projections of continuity in the coming years.

With respect to authorship and scientific collaboration, 4,947 authors are identified as involved in the production of the corpus, with an average of 5.3 co-authors per document. Consequently, research in this area is characterized by a collaborative approach, in which works developed by multidisciplinary teams predominate. Likewise, the low proportion of single-authored documents (42) reinforces the idea that the analysis of educational images through AI requires the integration of technical, pedagogical, and methodological knowledge. In relation to international collaboration, the 23.43% rate of co-authorship between countries indicates a moderate global articulation, with potential for further strengthening.

Concerning the thematic structure of the corpus, 2,900 author keywords and a total of 9,014 bibliographic references are recorded. In this sense, the high number of keywords evidences substantial conceptual diversity and a multiplicity of approaches surrounding AI, visual literacy, and educational image analysis. Similarly, the volume of references demonstrates broad theoretical support, suggesting that the studies are grounded both in consolidated conceptual frameworks and in recent developments within the field.

Finally, the average age of the documents is 3.61 years and the average citations per document reach 16.72 citations. Taken together, these indicators reflect that this is a recent scientific production with relevant academic impact. Consequently, the results confirm that artificial intelligence applied to the analysis of educational images constitutes not only an emerging topic, but also a field with growing recognition within the international academic community.

Figure 2. Annual scientific production



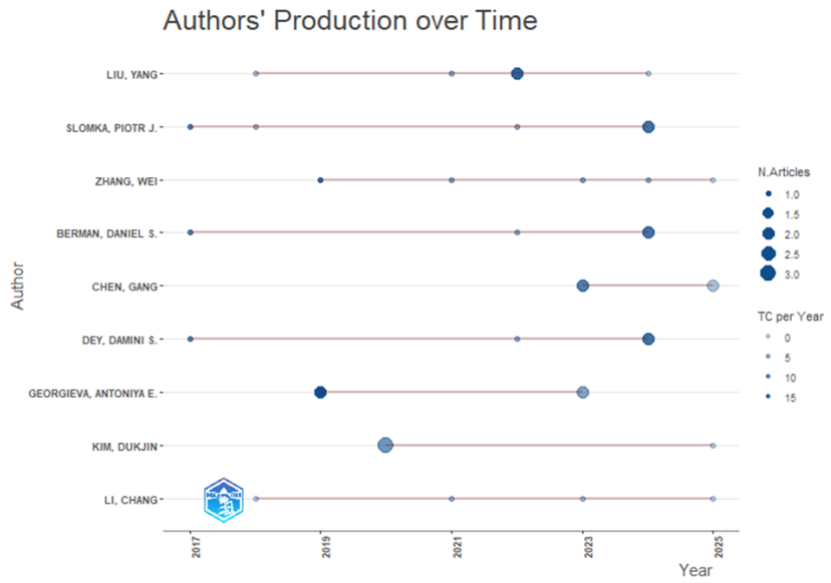
Source: Own elaboration through the Biblioshiny tool (2026).

Annual scientific production shows sustained growth in publications on artificial intelligence applied to the analysis of educational images throughout the period. The number of articles increases from 11 in 2015 to a maximum of 198 in 2024, reflecting a progressive expansion of academic interest in this field. In this sense, the initial years present limited production, associated with an early development stage in which AI applications to educational visual analysis were still incipient.

From 2018 onward, the trend shows a more pronounced increase, with significant growth in 2019 and sustained acceleration between 2020 and 2022. In this way, this behavior can be interpreted as a process of field consolidation, linked to machine learning and deep learning techniques and their incorporation into educational contexts. Likewise, the intensified digitalization during the pandemic contributed to expanding the use of visual resources and automated tools in higher education, which in turn boosted scientific production in this line.

In recent years, production remains at high levels, although a slight decrease is observed in 2025 compared to the peak reached in 2024. Taken together, this pattern suggests that research on AI applied to the analysis of educational images has reached a level of maturity, characterized by stable production and sustained interest within the academic community.

Figure 3. Author production over time

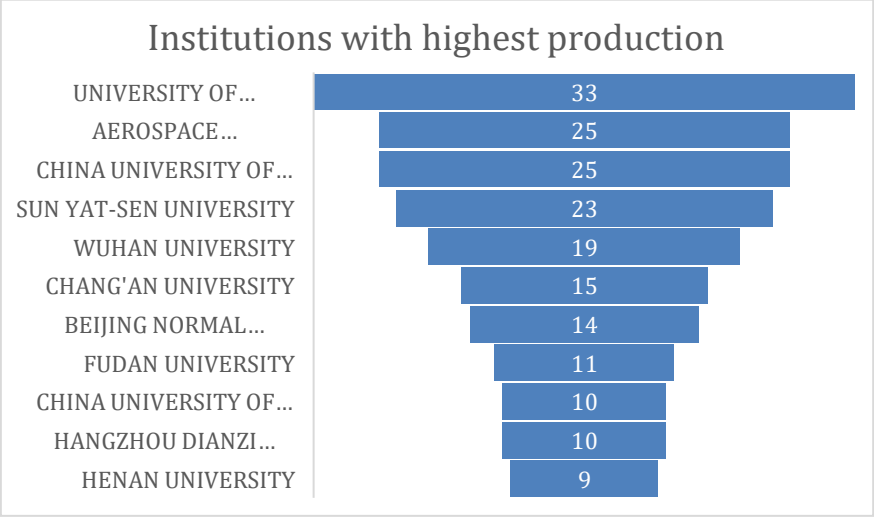


Source: Own elaboration through the Biblioshiny tool (2026).

The production of the most relevant authors is distributed consistently over the years, evidencing sustained participation in research on artificial intelligence applied to the analysis of educational images. In this sense, the repeated presence of certain authors indicates that the field is not structured around isolated contributions, but rather through continuous research trajectories.

Likewise, this continuity reflects the formation of consolidated research nuclei characterized by thematic specialization and academic leadership. Taken together, the temporal stability of each author's production contributes to the maturation of the field and to the strengthening of persistent research lines within higher education.

Figure 4. Institutions with highest production

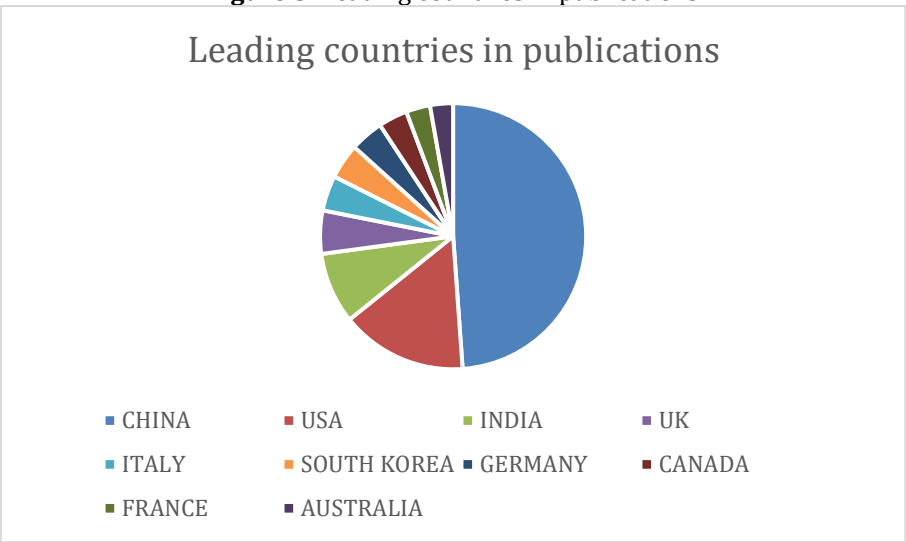


Source: Own elaboration through the Biblioshiny tool (2026).

The distribution of scientific production by institution shows a clear concentration in universities and research centers with a strong technological orientation. In this sense, institutions located primarily on the Asian continent predominate, specializing in computer vision, artificial intelligence, and digital education, which reflects a direct articulation between technological development and educational research in higher education.

Furthermore, this pattern suggests that research on artificial intelligence applied to the analysis of educational images is closely linked to institutions with advanced infrastructure and the capacity to integrate AI into educational projects. In this regard, the centrality of these universities confirms that the academic leadership of the field is sustained by institutional environments with consolidated innovation policies and technological development frameworks.

Figure 5. Leading countries in publications

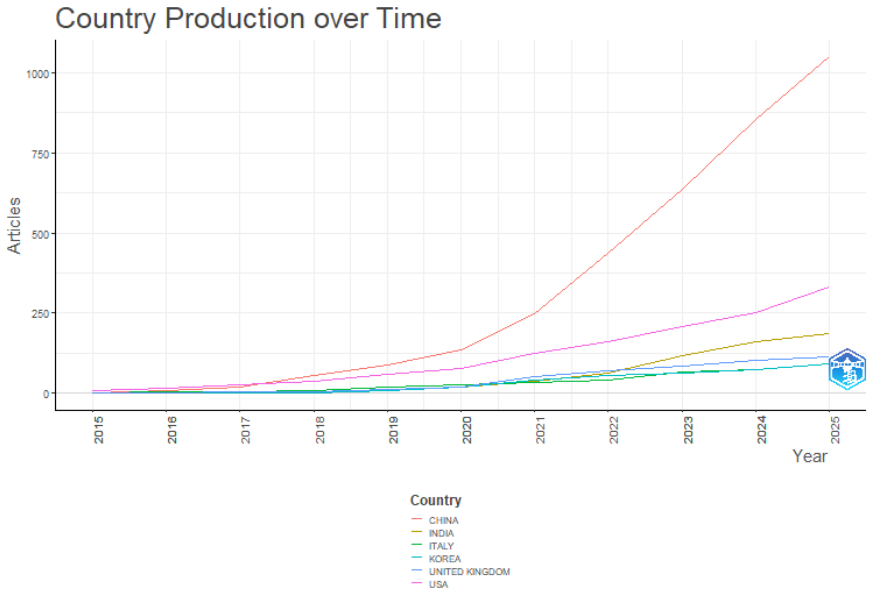


Source: Own elaboration through the Biblioshiny tool (2026).

China leads production with 1,050 publications, followed by the United States (330) and India (186). The predominance of China demonstrates its global leadership in research applied to AI and image analysis. Europe and North America also show relevant participation (United Kingdom, Italy, Germany, Canada), whereas Latin American countries do not appear among the leading positions, reflecting a regional gap in research.

This distribution pattern indicates that scientific production in the area is strongly associated with national contexts that maintain sustained investment policies in artificial intelligence and higher education, as well as with academic ecosystems that promote interdisciplinary research. At the same time, the limited representation of Latin America not only reflects constraints in scientific production, but also structural challenges for integrating AI into educational processes. Consequently, there is a need to strengthen research capacities and international cooperation strategies.

Figure 6. Annual scientific production over time

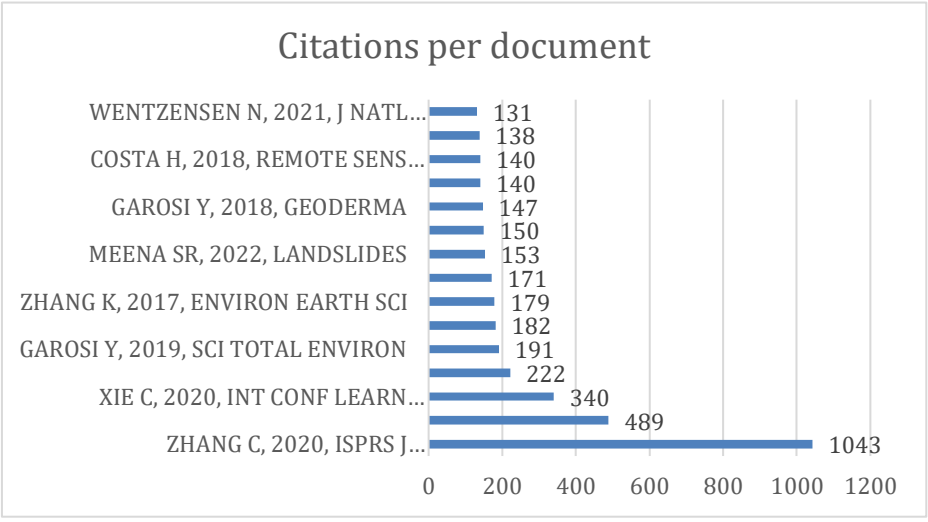


Source: Own elaboration through the Biblioshiny tool (2026).

Annual production shows sustained growth, with a notable increase from 2018 onward and a peak in 2024. The most productive authors maintain continuity in their contributions, while leading institutions correspond to technological universities and specialized research centers. At the geographical level, China and the United States concentrate the highest production, followed by India and several European countries. These results indicate that scientific productivity in the area has evolved from an incipient stage to consolidation as an expanding field, led by countries with strong investment in artificial intelligence.

This pattern also allows the inference that growth does not respond solely to a quantitative increase in publications, but to a progressive maturation of the field. Likewise, the concentration of production in specific countries reveals asymmetries in access to technological and financial resources, which would influence the capacity to sustain long-term research lines. Meanwhile, countries with lower representation face barriers to competitively integrating into this emerging domain.

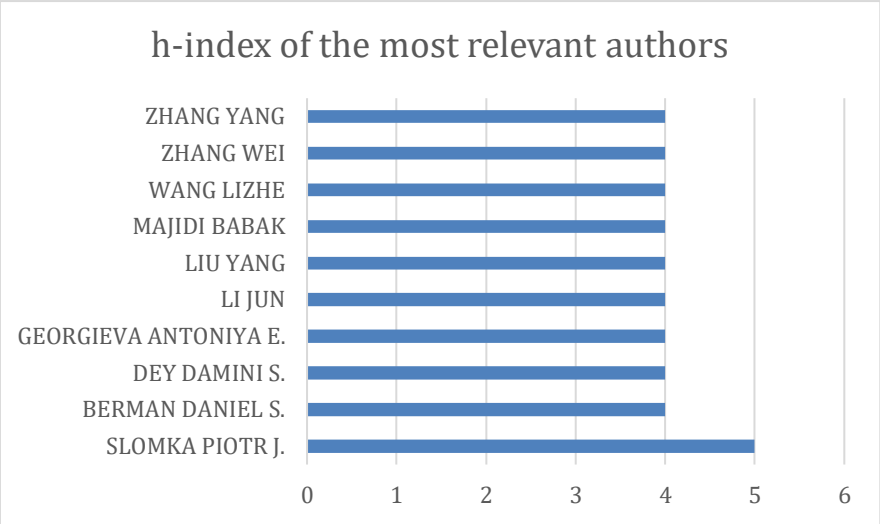
Figure 7. Citations per document



Fuente: Elaboración propia a través de la herramienta Biblioshiny (2026)

The most cited document is Zhang C.'s (2020) with 1043 citations, positioning it as a key reference in the field. Other relevant publications that have contributed to the development of the field exceed 100 citations, indicating that technological advances have a strong impact on higher education. The concentration of citations in a few documents reflects the existence of studies that have marked a turning point in the field.

Figure 8. h-index of the most relevant authors



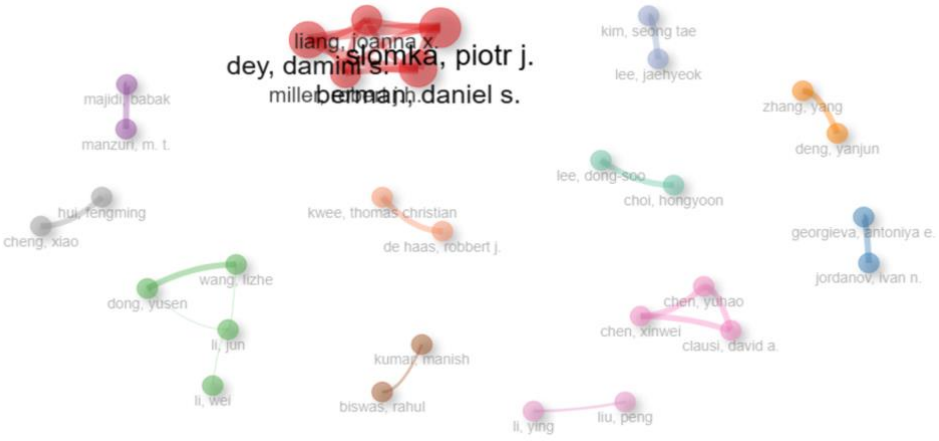
Source: Own elaboration through the Biblioshiny tool (2026).

The most influential authors present h-indices between 4 and 5, indicating moderate production with sustained impact. This citation level reflects that, although the field is emerging, there are researchers with consolidated trajectories who have successfully positioned their work as references within the academic community.

Within this framework, the observed h-index allows for a nuanced interpretation of academic impact, as it does not only express citation volume but also production stability over time. In this sense, the presence of authors with similar h-index values suggests a relatively balanced research community, in which leadership is not concentrated in a single figure but distributed among several researchers who consistently contribute to the development of the field.

In summary, academic impact is concentrated in a reduced set of seminal works and authors who have set the direction of the field, confirming that it is still in a consolidation phase, yet with clearly established references

Figure 9. Co-authorship network



Source: Own elaboration through the Biblioshiny tool (2026).

The co-authorship network reveals a predominantly fragmented collaborative structure, with small clusters operating in relatively isolated ways. The central core, composed of authors such as Liang, Sonka, and Dey, presents a significant density of connections, suggesting a consolidated scientific community with a high frequency of internal collaboration. In contrast, the remaining clusters display more subtle and dispersed relationships, indicating that research on artificial intelligence applied to the analysis of educational images is primarily developed within specialized nuclei, without sustained transversal articulation among teams.

This pattern could limit methodological circulation and the consolidation of integrative approaches, especially in a field that requires interdisciplinarity to address complex educational issues. The limited connectivity between groups and the predominance of relatively closed networks may reflect institutional or geographical barriers that restrict broader international collaboration. Consequently, it becomes necessary to promote linkage strategies that foster collaboration among research communities, encouraging more diverse and context-sensitive scientific production.

Figure 10. Institutional networks

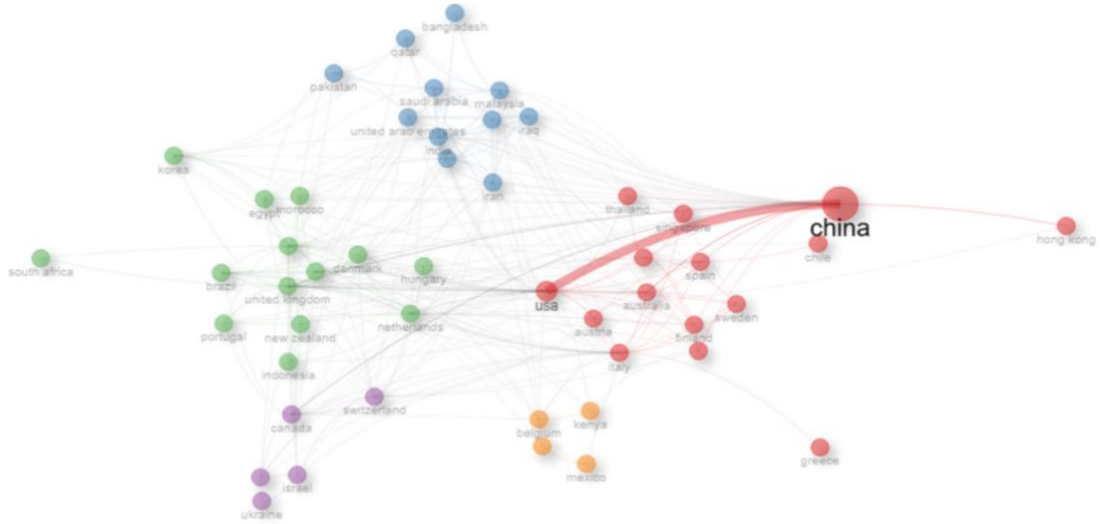


Source: Own elaboration through the Biblioshiny tool (2026).

Institutional networks configure a collaboration pattern articulated around a limited number of central nodes, primarily Chinese institutions. This suggests that the development of the field is supported by organizational structures with high scientific and technological capacity. In this sense, the centrality of these institutions reflects not only productive leadership but also a strategic integration between applied research and educational image analysis mediated by artificial intelligence.

At the same time, the participation of universities from the United States and other countries, although relevant, appears more peripheral, which limits their capacity to structure the global collaboration network. Nevertheless, the moderate density of the network indicates that collaborations tend to concentrate on relatively closed clusters, resulting in more limited international exchange. Consequently, the circulation of methodological approaches, theoretical frameworks, and educational applications tends to remain circumscribed to specific institutional contexts.

Figure 11. International networks



Source: Own elaboration through the Biblioshiny tool (2026).

International collaboration is concentrated in links among leading countries (China, USA, Germany), with lower participation from emerging regions. This reflects a pattern of concentration in consolidated research hubs, while internationalization toward other regions remains incipient.

Such concentration not only responds to differences in scientific capacity but also configures a hierarchical structure of knowledge flows, in which China positions itself as an articulating node connecting countries with varying levels of research development. In this way, collaboration tends to be organized in a more radial rather than horizontal manner, meaning that the circulation of agendas, methodologies, and analytical approaches is conditioned by centers with greater research capacity. Consequently, scientific production incorporates situated perspectives and educational issues specific to regions with lower representation in a limited way, which restricts the conceptual and methodological diversity of the field.

Taken together, scientific collaboration evidences a global but unequal character, with strong concentration in consolidated research poles and lower density in emerging regions. This situation opens opportunities to strengthen international cooperation and promote greater inclusion of underrepresented contexts in future research agendas.

Figure 12. Most frequent keywords

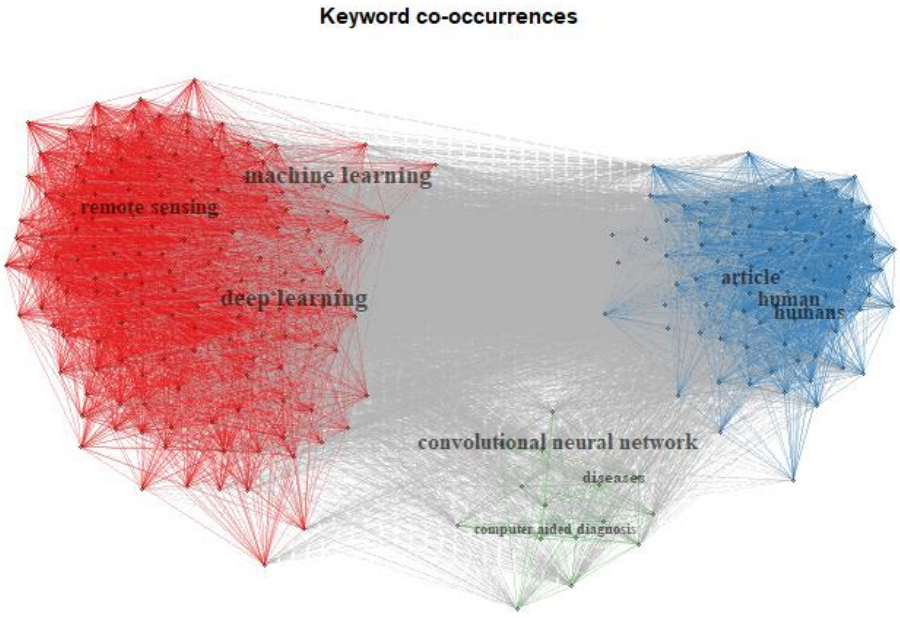


Source: Own elaboration through the Biblioshiny tool (2026).

The most recurrent keywords are deep learning, machine learning, image analysis, education, and visual literacy. This pattern confirms the intersection between visual literacy and AI applications in higher education, insofar as it evidences a progressive articulation between computational approaches oriented toward automated image processing and educational perspectives focused on the comprehension, interpretation, and pedagogical use of visual resources. This contributes to delimiting a clearly interdisciplinary field of study.

At the same time, the centrality of terms associated with machine learning indicates that the development of the field is strongly driven by methodological and technical advances, while educational concepts primarily operate as application spaces for these technologies. In this sense, visual literacy appears integrated into the scientific discourse more as a functional component of image analysis than as an object of pedagogical reflection in itself.

Figure 13. Co-occurrence of terms

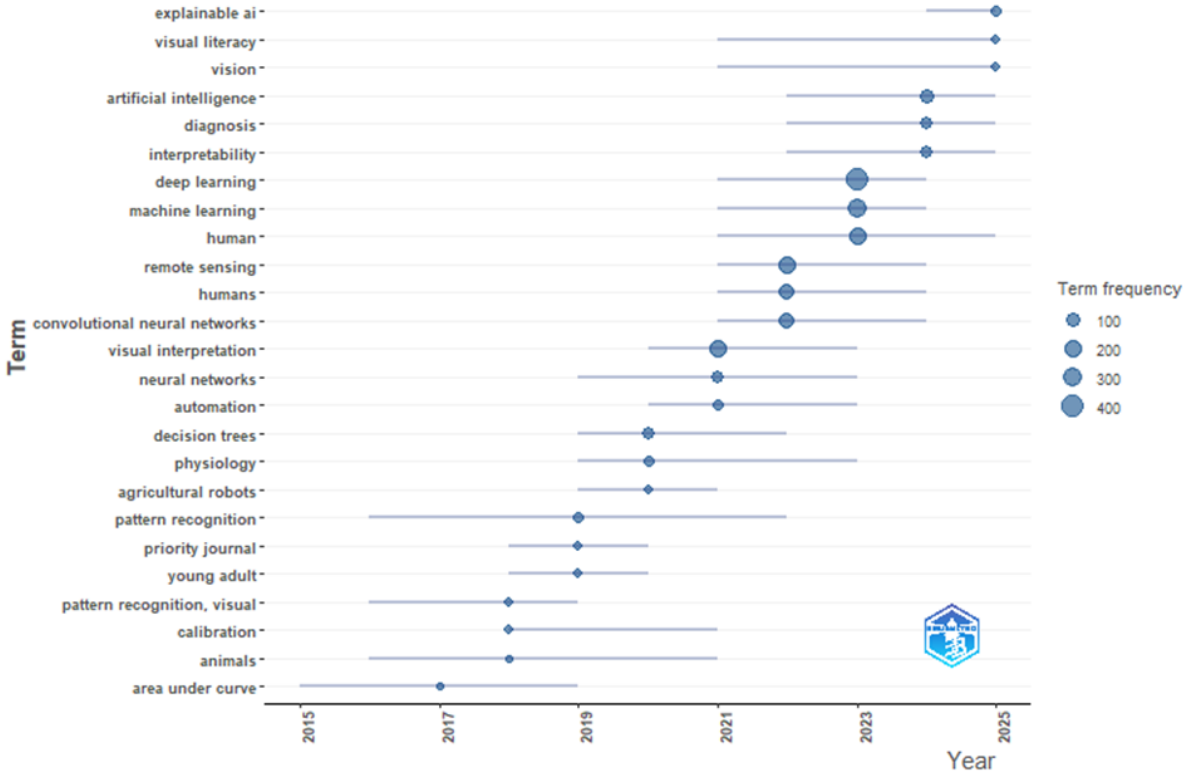


Source: Own elaboration through the Biblioshiny tool (2026).

The co-occurrence analysis shows thematic clusters linking AI with visual literacy, machine learning, and digital environments. These associations reflect the convergence between technical and pedagogical approaches, consolidating hybrid research lines, as concepts related to machine learning, deep learning, and neural networks are articulated with educational categories oriented toward the analysis, interpretation, and use of images in formative contexts. This points to a progressive integration of computational frameworks into the study of educational processes mediated by visual resources.

The structure of differentiated yet interconnected clusters indicates that the field is organized around thematic nuclei with different levels of specialization, where technical approaches act as articulating axes and pedagogical components are integrated across research domains. Thus, the intensity of co-occurrences suggests that research prioritizes the development and application of automated image analysis models, while visual literacy is primarily integrated as an educational application domain.

Figure 14. Evolution of emerging research lines



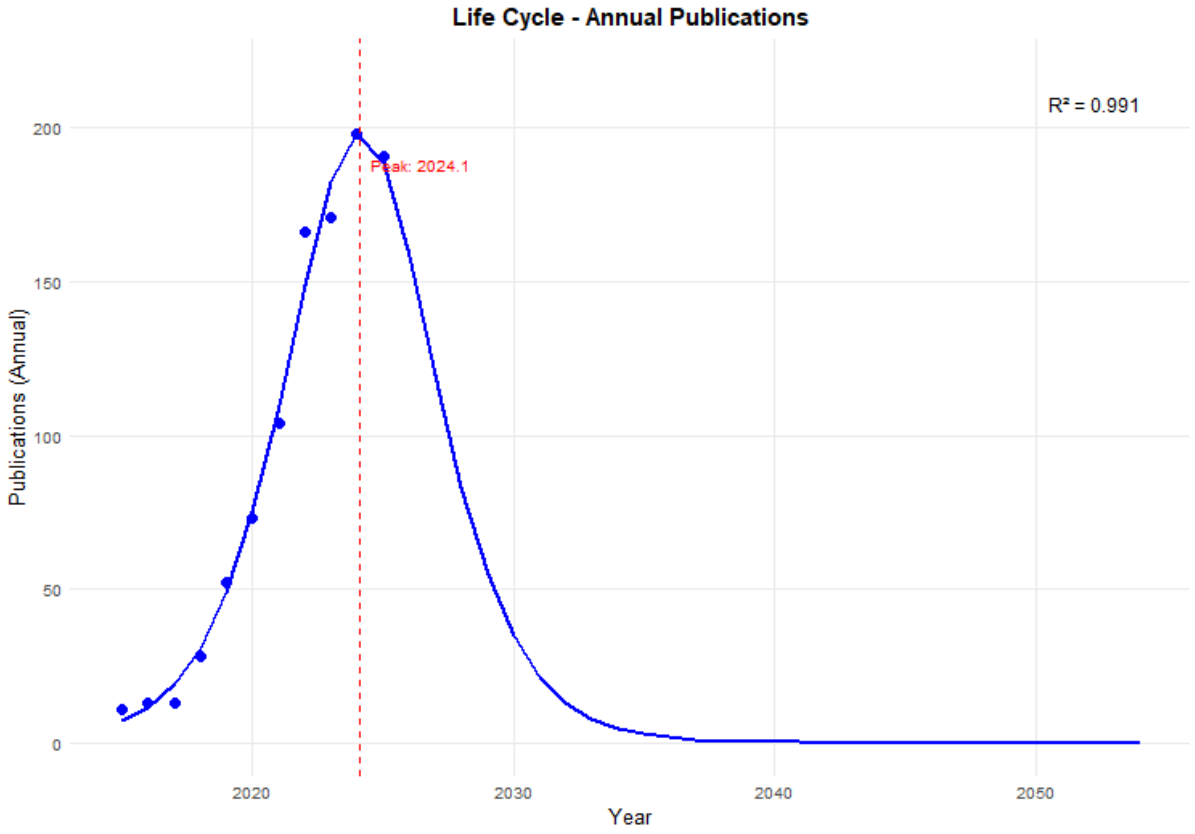
Source: Own elaboration through the Biblioshiny tool (2026).

A shift is observed from initial technical approaches toward more integrated pedagogical applications, such as the use of neural networks to assess visual comprehension or intelligent educational feedback systems. This makes visible the maturation of the field toward practical applications in higher education.

Within this process, the progressive emergence of terms associated with interpretability, visual literacy, and human-centered approaches indicates that research has begun to problematize not only the efficiency of algorithmic models, but also their comprehension, use, and pedagogical meaning in educational contexts. In this way, thematic trends suggest a transition from a predominantly experimental stage to one oriented toward the didactic integration of artificial intelligence, in which mediation between automated systems and cognitive processes linked to visual interpretation is prioritized. This reinforces the applied orientation of the field in educational environments.

In summary, thematic trends reveal an expanding interdisciplinary field, in which visual literacy and AI applications in higher education are consolidating as emerging lines with strong potential for future development.

Figure 15. Life cycle



Source: Own elaboration through the Biblioshiny tool (2026).

The analysis of the scientific production life cycle reveals sustained growth in academic interest in artificial intelligence applied to the analysis of educational images. In recent years, this topic has experienced a significant acceleration in terms of publication volume, reaching its peak in 2024. This trend indicates that the field has moved from an emerging phase to a stage of consolidation, positioning itself as a relevant line of research within the educational and technological spheres.

All of this suggests that the observed growth is not due to a passing trend, but rather to the progressive integration of artificial intelligence into contemporary educational debates. Similarly, the accelerated pace of publications in recent years reveals a broadening of research approaches and a diversification of applications related to the analysis of educational images, which reinforces the stability of the field and its capacity to generate new lines of inquiry in higher education, particularly in contexts of pedagogical innovation and digital transformation.

Thus, the results presented demonstrate that AI applied to the analysis of educational images constitutes a consolidating field of educational research, characterized by sustained growth in scientific output, a strong concentration of institutional and international collaboration in established research centers, and a thematic structure dominated by machine learning approaches applied to visual literacy in educational contexts. This reflects a progressive articulation between technical developments and pedagogical applications, although there remains room to strengthen geographical, conceptual, and methodological diversity. Therefore, this thematic area constitutes a dynamic, interdisciplinary field with high potential for expansion and further development.

5. Conclusions

The research made it possible to systematically analyze scientific production on AI applied to the analysis of educational images during the period 2014–2025, evidencing sustained growth in publications over time. The use of bibliometric indicators identified clear patterns of

development, consolidation, and thematic specialization, confirming that the integration between artificial intelligence and visual literacy constitutes an emerging field of academic relevance.

The results show that scientific productivity has increased progressively, especially from 2018 onward, with a notable intensification in the most recent years of the analyzed period. Likewise, authors and institutions with constant production over time were identified, mainly in countries such as China and the United States, followed by India and several European nations, evidencing the existence of consolidated research nuclei that sustain the advancement of the field.

Regarding academic impact, citations are concentrated in a reduced set of documents and authors, with greater presence from the Asian continent, who have set the conceptual and methodological direction of the field. The existence of highly cited works indicates that technical advances exert a direct influence on research, and although the field is still consolidating, it already presents clear references that guide its scientific development.

The analysis of scientific collaboration shows co-authorship networks that connect researchers, institutions, and countries, highlighting a strong presence of international collaboration, particularly among universities and research centers in China, the United States, and several European countries. Thus, scientific production in this area is primarily sustained by collaborative research efforts. Nevertheless, the limited participation of Latin American countries reveals the persistence of gaps in the development and visibility of research on artificial intelligence applied to educational contexts.

With respect to thematic trends, research lines centered on deep learning, machine learning, computer vision, visual literacy, and educational applications of artificial intelligence were identified. Furthermore, the co-occurrence analysis of keywords shows a thematic evolution that articulates technical approaches with pedagogical perspectives, reflecting progress toward greater integration between technological innovation and education.

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