

# ARTIFICIAL INTELLIGENCE AND DIGITAL ADVERTISING: PERSUASIVE DISCOURSES AND CITIZENSHIP IN ACADEMIC RESEARCH

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## ABSTRACT

**Introduction:** This study presents a bibliometric analysis of the evolution of scientific production related to persuasive discourse in personalized digital advertising targeted at citizens. The aim is to examine how artificial intelligence has reshaped communication segmentation practices, introducing new theoretical, ethical, and social challenges. **Methodology:** A bibliometric analysis was conducted using the Biblioshiny interface (based on Bibliometrix in R) on a corpus of 141 scientific articles indexed in Scopus and Web of Science, published between 2000 and 2024. The study included productivity indicators, institutional co-authorship networks, keyword co-occurrence analysis, and thematic mapping. **Results:** The findings identify four consolidated research lines: recommendation algorithms, programmatic advertising, data privacy, and algorithmic segmentation. The field displays a predominantly technological orientation, limited international collaboration, and minimal integration of critical approaches focused on digital citizenship. **Discussion:** The evidence reveals a gap between the technical advancement of personalized advertising and the academic reflection on its social implications. This disconnect undermines the field's potential to influence regulatory, educational, and ethical debates related to artificial intelligence. **Conclusions:** The study proposes a renewed, critical, and interdisciplinary research agenda focused on communication rights, transparency in automated systems, and digital literacy as priorities for future investigations in AI-mediated advertising contexts.

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**Keywords:** Digital citizenship; persuasive discourse; algorithmic governance; artificial intelligence; personalized digital advertising.

## 1. INTRODUCTION

Contemporary digitization is profoundly transforming communication practices, particularly those related to advertising aimed at the public (Lee & Cho, 2020). This process is further complicated by the incorporation of artificial intelligence (AI) technologies, which are reshaping both the production and distribution of messages and the strategies for attracting and retaining specific audiences (Nesterenko et al., 2023). This algorithmic automation has prompted critical debates surrounding privacy, transparency, and the ethics of digital communication (Lambrecht & Tucker, 2019; Neumann et al., 2019).

In this context, it is relevant to examine how international academic research responds to these phenomena, especially from a perspective that considers communicative rights and emerging ethical-normative dilemmas (Lee & Cho, 2020; Nesterenko et al., 2023). This study conducts a structured bibliometric analysis to identify dominant trends, collaborative networks, and emerging themes in the scientific production related to persuasive discourses in digital advertising aimed at the public, with a special emphasis on the role of AI between 2000 and 2024 (Lambrecht & Tucker, 2019).

The work analyzes key dynamics such as temporal evolution, the journals with the greatest impact in the area, and the most relevant thematic configurations in the period studied (Donthu et al., 2021; Aria & Cuccurullo, 2017). The objective is to offer an accurate characterization of the field and contribute to the understanding of new forms of public communication mediated by AI, as well as their social implications.

### 1.1. Academic Justification and Thematic Relevance

The increase in research on persuasive discourse in digital advertising has been driven by the deployment of artificial intelligence in communication environments. However, theoretical and methodological gaps persist regarding the convergence of persuasive technologies, citizens' rights, and ethical issues arising from automation (Nesterenko et al., 2023; Lee & Cho, 2020). These gaps are particularly evident in aspects such as message personalization, data protection, and algorithmic transparency (Lambrecht & Tucker, 2019).

Although the literature has documented advances in AI-powered segmentation and targeting strategies, critical areas such as equity in content distribution and media literacy remain underexplored (Neumann et al., 2019). Additionally, the reviewed studies reveal a low level of collaboration in scientific output, suggesting a lack of epistemological consolidation in the field.

Given this situation, a systematic bibliometric approach is proposed as an analytical method, allowing for the quantitative mapping of the area's structural configurations, identifying key actors, recurring themes, and potential research gaps (Donthu et al., 2021). Tools such as Bibliometrix and its Biblioshiny interface provide a replicable and rigorous framework for this type of study (Aria & Cuccurullo, 2017).

This study aims to provide a comprehensive view of the impact of AI on persuasive communication aimed at citizens, guiding future research towards a balanced articulation between technological innovation, communicative guarantees and algorithmic governance principles.

## **2. OBJECTIVES**

This study analyzes, from a bibliometric perspective, the evolution, structure, and impact of scientific research on persuasive discourse in digital advertising aimed at citizens, with particular attention to the transformative role of artificial intelligence between 2000 and 2024. Faced with the increasing complexity of the digital environment, the aim is to identify the main thematic lines, influential players, and patterns of scientific collaboration in order to offer a comprehensive view that will inform future research and critical debates in communication for citizens. The methodology associated with these objectives is detailed in the corresponding section, and the results are presented in the Results and Discussion sections.

### **2.1. Research Question**

What trends, thematic gaps, and collaborative configurations characterize academic research on persuasive discourses in digital advertising aimed at citizens and the impact of artificial intelligence between 2000 and 2024, and how have they shaped the development of the field in the contemporary communicative context?

### **2.2. Thematic Scope**

The analysis focuses on indexed scientific literature that studies the intersection between persuasion, digital advertising and citizenship, understood as the space where advertising messages not only seek to influence consumption, but also intervene in the public sphere and the construction of critical subjects in the face of the deployment of intelligent technologies and segmentation algorithms (Nesterenko et al., 2023; Lee & Cho, 2020).

### **2.3. Specific Objectives**

- To characterize the thematic evolution of the field by analyzing keywords, identifying central areas such as personalization, ethics, privacy and algorithmic models, as well as their transformation in the period 2000–2024. (Results: section 5.1).
- To detect conceptual gaps and emerging trends through centrality, density and co-occurrence indicators, delimiting incipient research focuses and ethical-social challenges in digital advertising aimed at citizens. (Results: section 5.2).
- To analyze the dynamics of scientific collaboration by identifying co-authorship networks, institutions, and authors with the greatest intermediation and impact on the consolidation of the field. (Results: section 5.1).
- To evaluate the productivity and impact of the main actors, journals and countries using bibliometric metrics, such as h, g, and m indices, number of citations and publications. (Results: section 5.1).
- To propose a critical agenda that articulates technological, social, and ethical

dimensions in the study of persuasive discourses mediated by artificial intelligence in digital advertising, aimed at strengthening communication for citizens. (Results: section 7.6).

### **3. THEORETICAL FRAMEWORK**

Digital transformation has brought about significant changes in communication processes, especially in advertising, leading to new dynamics and theoretical and practical challenges (Lee & Cho, 2020). This theoretical framework integrates four key areas: (1) persuasive communication, (2) digital advertising and citizenship, (3) artificial intelligence in persuasive contexts, and (4) models and discourses in digital environments. The articulation of these areas allows us to understand the intersection between technology, communication, and citizenship.

#### **3.1. Persuasive Communication: Basic Concepts and Types**

Persuasive communication is a key element in the development of advertising strategies, as it seeks to modify attitudes and behaviors through messages designed for this purpose. In digital environments, these strategies are enhanced by approaches such as contextual advertising and data-driven personalization, where relevance and situational appropriateness increase message effectiveness (Fan & Chang, 2011; Nesterenko et al., 2023). Behavioral segmentation and user profiling are key tools for adapting content to individual preferences (Kim et al., 2001; Neumann et al., 2019). In this vein, digital persuasive communication combines emotional and rational appeals with algorithmic selection mechanisms that influence exposure and attention (Fan & Chang, 2011; Nesterenko et al., 2023; Neumann et al., 2019).

#### **3.2. Digital Advertising and Citizenship: Theoretical Approaches**

From a citizen's perspective, digital advertising represents a complex sphere where multiple social, legal, and ethical dimensions converge. On the one hand, individual rights stand out, especially those related to privacy and the protection of personal data, key elements in the face of the growing use of advanced technologies in personalized advertising. This phenomenon, characterized by the intensive collection and exhaustive analysis of personal data through predictive algorithms, generates a significant debate surrounding the ethics and acceptable limits of digital persuasion, pitting commercial efficiency against the imperative need to guarantee user privacy and autonomy (Lee and Cho, 2020; Neumann et al., 2019).

On the other hand, the relationship between digital advertising and citizens is also mediated by the transparency and accountability of digital platforms in the management and presentation of advertising messages. From a governance perspective, specific regulatory frameworks such as the Digital Services Act have been introduced, which requires transparency, ad repositories, and restricts the use of profiling for algorithmic advertising (Wolters & Zuiderveen Borgesius, 2025). In this context, programmatic advertising, based on algorithms that, although economically efficient, present risks related to algorithmic biases capable of generating or reinforcing patterns of discrimination or social exclusion, takes on special relevance.

From a citizen's perspective, it is essential to empower users with appropriate tools that allow them to understand, critically evaluate, and consciously manage their interaction with digital advertising content (Arbaiza et al., 2024).

### 3.3. Artificial Intelligence in Persuasive Contexts

Artificial intelligence (AI) enhances the effectiveness of persuasive communication through automated personalization and prediction of user responses. Applications such as machine learning and deep learning systems allow for real-time message adaptation and improved audience targeting, increasing effectiveness and reducing costs (Choi & Lim, 2020; Gharibshah & Zhu, 2021). Predictive models and multi-objective approaches help balance persuasive effectiveness and intrusiveness, integrating user experience metrics (Jankowski et al., 2016). In parallel, the human-machine communication perspective emphasizes that these systems are not neutral: they mediate meanings and relationships, affecting audience reception and agency (Guzman & Lewis, 2019).

### 3.4. Models and Discourses in Digital Environments

In digital advertising, operational models and discursive models coexist (Guzman & Lewis, 2019; Lee & Cho, 2020).

- **Operational models:** intelligent allocation of advertising space and optimization of ad positioning through active learning and ranking methods (Long et al., 2010), semantic correspondences to match queries and content (Li & Xu, 2014), and edge computing deployments for low latency decisions (Kong et al., 2022).
- **Discursive models:** (a) Informational: primacy of rational arguments (features, evidence) with semantic personalization (Lee & Cho, 2020; Li & Xu, 2014); (b) Emotional: affective appeals calibrated by behavioral cues (Matz et al., 2019); (c) Narrative/ transmedia: stories and metaphors that build identity continuity across platforms (Lee & Cho, 2020); (d) Algorithmic personalization: selection and composition of messages according to profiles and contexts, integrating recommendations and A/B testing in learning loops (Gharibshah & Zhu, 2021; Neumann et al., 2019; Schwartz et al., 2017). These models overlap in real-world campaigns and are articulated with the data and machine learning infrastructures already mentioned.

### 3.5. Key Milestones in Digital Advertising

Key milestones include: (i) the consolidation of contextual advertising (Fan & Chang, 2011), (ii) the expansion of programmatic AI-supported advertising (Lee & Cho, 2020), (iii) the integration of predictive algorithms for segmentation (Gharibshah & Zhu, 2021), and (iv) the exploration of the edge computing as an emerging technology for real-time optimization of advertising processes, identified in the technical literature as a potential facilitator of low-latency decisions (Kong et al., 2022).

### 3.6. Critical Synthesis of the Theoretical Framework

The intersection of persuasive communication, digital advertising, and artificial intelligence creates a dynamic field where technical innovation and regulatory tensions

coexist (Guzman & Lewis, 2019; Lee & Cho, 2020; Nesterenko et al., 2023). The literature shows advances in personalization and optimization, along with challenges in transparency, bias, and accountability (Floridi et al., 2018; Lambrecht & Tucker, 2019). From a citizenship perspective, there is a need to integrate algorithmic governance and digital literacy, strengthening the critical scrutiny of AI-mediated persuasive practices (Guzman & Lewis, 2019; Neumann et al., 2019). This conceptual basis guides the subsequent empirical analysis and frames the interpretation of results in terms of rights and sociotechnical responsibility.

## 4. METHODOLOGY

### 4.1. Information Sources and Search Strategy

A systematic literature review using a bibliometric approach was conducted in the Scopus and Web of Science Core Collection (WoS) databases. The objective was to identify studies related to persuasive discourse in digital advertising aimed at citizens, with particular attention to the role of artificial intelligence. The search strategy was designed to identify scientific literature analyzing the intersection between artificial intelligence and digital advertising, with a special emphasis on elements of persuasion, ethics, governance, and citizenship.

In Web of Science Core Collection, the search strategy was implemented using the following exact query in the Topic (TS) field:

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```
((TS=(("artificial intelligence"OR "machine learning"OR "deep learning"OR "neural network*"OR NLP OR "generative AI") NEAR/5 (advertis* OR marketing))

OR "online behavioral advertising"OR OBA OR microtarget*)

AND TS=((advertis* NEAR/4 (online OR digital OR internet OR programmatic OR social OR mobile))

OR "digital marketing"OR "internet advertising"OR "programmatic advertising"OR "social media advertising")

AND TS=(persua* OR rhetoric OR discours* OR narrative* OR fram* OR appeal* OR "public opinion"OR "public sphere"OR citizen* OR civic* OR participation

OR privacy OR bias* OR fairness OR discriminat* OR inclusion OR right* OR trust OR transparen* OR accountab* OR governan* OR policy OR targeting

OR "targeted advertising"OR profil* OR segment* OR "recommendation system*"OR retarget* OR ("ad fraud"OR "click fraud"OR (fraud NEAR/3 detect*))))
```

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In Scopus, the query was formulated in the Title- Abs -Key fields with the following syntax:

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```
( TITLE-ABS-KEY ( ( ( "artificial intelligence"OR "machine learning"OR "deep learning"OR "neural network*"OR NLP OR "generative AI") W/5 ( advertis* OR marketing ) )

OR "online behavioral advertising"OR OBA OR microtarget* ) )

AND ( TITLE-ABS-KEY ( ( advertis* W/4 ( online OR digital OR internet OR programmatic OR social OR mobile ) )
```

---

*OR "digital marketing"OR "internet advertising"OR "programmatic advertising"OR "social media advertising"))*

*AND (TITLE-ABS-KEY (persua\* OR rhetoric OR discours\* OR narrative\* OR fram\* OR appeal\* OR "public opinion"OR "public sphere"OR citizen\* OR civic\**

*OR participation OR privacy OR bias\* OR fairness OR discriminat\* OR inclusion OR right\* OR trust OR transparen\* OR accountab\* OR governan\* OR policy*

*OR targeting OR "targeted advertising"OR profil\* OR segment\* OR "recommendation system\*"OR retarget\* OR "ad fraud"OR "click fraud"OR ( fraud W/3 detect\* )))*

*AND PUBYEAR > 2000 AND PUBYEAR < 2025*

*AND LANGUAGE (english)*

*AND (DOCTYPE (ar) OR DOCTYPE (re))*

*AND SUBJAREA (COMP OR BUSI OR ENGI OR DECI OR ECON OR SOCI OR MULT)*

*AND PUBYEAR > 2000 AND PUBYEAR < 2025*

*AND (LIMIT-TO (LANGUAGE, "English"))*

*AND (LIMIT-TO (SUBJAREA, "COMP") OR LIMIT-TO (SUBJAREA, "BUSI"))*

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The following common filters were applied to both databases:

- Language: English
- Document type: research articles and reviews
- Publication period: 2000–2024

The search was performed on May 1, 2025. The results were exported in.csv (Scopus) and.txt (WoS) formats, including all available metadata (title, abstract, keywords, authors, source, affiliations, citations, etc.), compatible with bibliometrix / biblioshiny.

To ensure the correct attribution of publications to their authors, a signature disambiguation process was carried out. In the first stage, the names in the exported metadata were automatically normalized using R-Studio. Subsequently, a manual review was performed, comparing information on institutional affiliation, country, research area, and co-authorships. This allowed for the confirmation of matches or the identification of cases of homonymy. When available, the ORCID unique identifier was used as an additional verification criterion.

#### **4.1.1. Screening and Selection Process of Records**

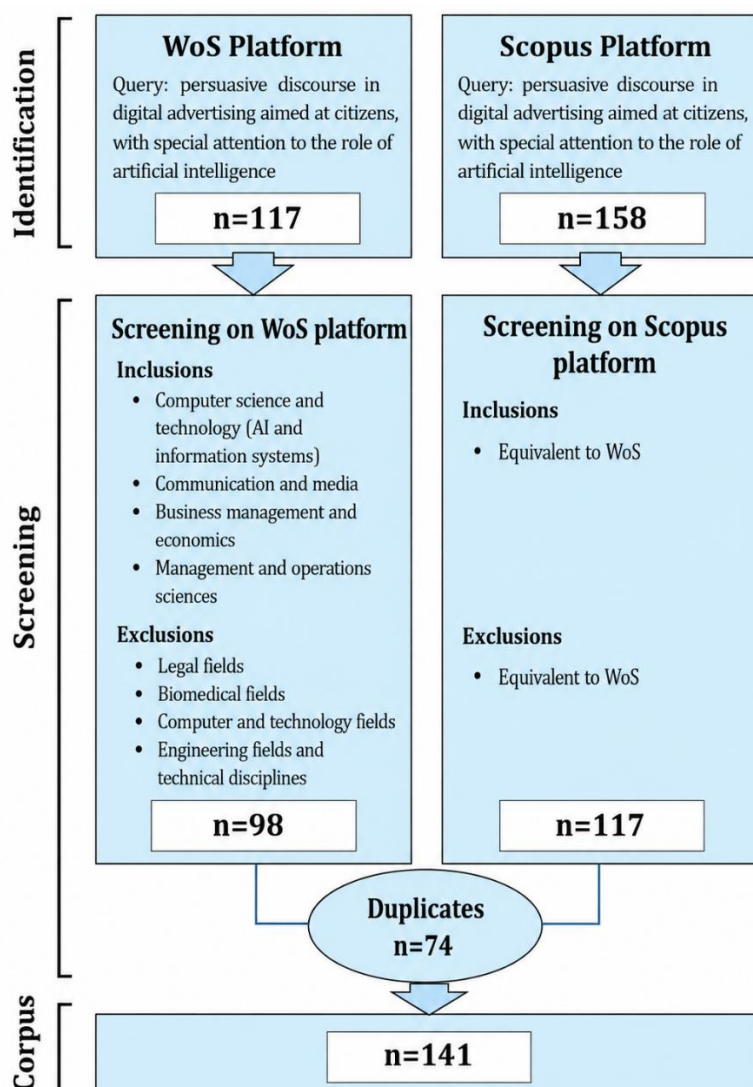
As a first eligibility criterion, the results were refined using disciplinary filters directly on the search platforms. In Web of In Science, the thematic categories related to social sciences, communication, computer science and economics were retained (Business; Computer Science; Information Systems; Computer Science; Artificial intelligence; Communication; Management; Telecommunications; Engineering; Electrical & Electronic; Operations Research & Management Science; Economics), excluding those

unrelated to the object of study such as Pediatrics; General Internal Medicine; Biotechnology Applied Microbiology, among others (see Figure 1). As a result, the number of documents retrieved decreased from 117 initially to 98 selected documents after applying filters by subject area.

In the case of Scopus, an equivalent exclusion based on areas of knowledge was applied, eliminating records associated with biomedical disciplines (see Figure 1). Applying these criteria reduced the initial set of 158 documents to 117 selected documents.

Subsequently, both datasets were integrated into the R environment using the bibliometrix library. Seventy-four duplicate articles were identified between the two databases, resulting in a single, refined corpus of 141 documents. Figure 1 shows the complete workflow for importing, cleaning, and consolidating the data in RStudio.

**Figure 1.** Document Selection Workflow (Scopus and WoS, 2000–2024)



**Fountain:** Elaborated by the authors based on The PRISMA 2020 statement: an updated guideline for reporting systematic reviews (Page et al., 2021).

#### **4.1.2. Conceptual Selection for the Theoretical Framework**

To provide a conceptual foundation for the study, a thematic screening strategy was applied to the consolidated bibliographic corpus (n = 141), following a reproducible approach based on textual expressions and semantic match. Initially, four central thematic axes aligned with the study's objective were defined: (1) persuasive discourse, (2) digital advertising, (3) citizenship, and (4) artificial intelligence. For each axis, a set of representative terms was established and validated using previous literature and exploratory analyses.

Next, an automated procedure was implemented in R using concatenation of title, abstract, and keywords, on which the presence of the terms defined for each axis was evaluated. The number of axes addressed by each document was counted, and those articles that coincided with at least two of the four thematic axes were retained (n = 136).

To prioritize conceptual robustness and relevance, an impact criterion was applied using the total number of citations (TC field). Documents ranked in the 80th percentile or higher in terms of citations within the aforementioned subset were selected. The result was a final sample of highly cited, interdisciplinary, and theoretically relevant articles, used to structure the study's conceptual framework. The entire process was carried out using reproducible code in R, and the data were exported for manual review and narrative synthesis.

#### **4.2. Analytical Tool Used: Biblioshiny**

The processing, analysis, and visualization of bibliographic data were performed entirely using Biblioshiny (Bibliometrix's graphical interface for R), which ensured the traceability, replicability, and comprehensiveness of the analyses. Biblioshiny allowed for the management of metadata exported from WoS and Scopus, the execution of performance analyses, collaboration analyses, thematic networking, and conceptual mapping, as well as the generation of dynamic visualizations and strategic maps (Aria & Cuccurullo, 2017).

#### **4.3. Performance Analysis**

The scientific performance analysis included the evaluation of annual output, the identification of the most influential authors and journals, and the analysis of collaboration networks. Validated bibliometric indicators such as the h-index (Hirsch, 2005), g-index (Egghe, 2006), and m-index were calculated, as well as collaboration metrics using fractional contribution and co-authorship network analysis (Newman, 2004; Perianes-Rodríguez et al., 2016). All processing and indicator calculations were performed directly in Biblioshiny using the refined corpus of 141 documents.

#### **4.4. Content Analysis and Thematic Mapping**

The bibliometric content analysis was developed in two complementary phases:

- **Keyword co-occurrence network:** A semantic network was constructed from

the most frequent keywords in the corpus, evaluating its structure using centrality metrics such as betweenness, closeness and PageRank, following the standards of Cobo et al. (2011) and Aria and Cuccurullo (2017).

- **Strategic theme map:** The identified thematic clusters were classified according to their density and centrality, allowing distinction between driving, basic, niche and emerging themes, according to the methodology proposed by Callon et al. (1983) and operationalized in Biblioshiny.

Both phases facilitated the identification of conceptual cores and thematic gaps in research on persuasive discourses, digital advertising and artificial intelligence for citizens.

#### **4.5. Corpus Delimitation and Linguistic Criteria**

The processed bibliographic corpus included only scientific articles and reviews indexed in WoS and Scopus, ensuring the quality and relevance of the sources. Key terms and tags were kept in English for consistency with international subject classification and academic indexing practices.

#### **4.6. Nature of the Study**

The adopted design is exploratory and descriptive, without testable hypotheses, oriented to map structural patterns, collaboration dynamics and thematic trends of the literature on artificial intelligence and persuasive discourses in digital advertising applied to citizens.

### **5. RESULTS**

This chapter presents the findings derived from the bibliometric analysis of 141 indexed academic documents published between 2001 and 2024, processed using Biblioshiny. The exploration addresses the study's objectives by examining the evolution, key authors, collaborative dynamics, publications, countries, keywords, and thematic clusters related to persuasive discourse in digital advertising and the impact of artificial intelligence on civic life.

#### **5.1. Performance Analysis**

##### **5.1.1. Temporal Evolution of Scientific Production**

The evolution of research on persuasive discourse in digital advertising and artificial intelligence between 2001 and 2024 is structured in four distinct phases, according to the bibliometric analysis carried out and following the technology diffusion models of Rogers (2003) and the disruption and incrementality models of Tushman and Anderson (1986). Each stage reflects substantial changes in annual productivity, the degree of conceptual consolidation, and the adoption of algorithmic approaches applied to persuasive communication (Aria & Cuccurullo, 2017):

- a) Marginal exploration (2001–2010): During this phase, only 5 articles were recorded in total, with some years having no publications (e.g., 2002, 2004–2007). No significant presence of terms such as "artificial intelligence", "machine

learning," or "online advertising" was detected (see Table 1). The low thematic density and lack of semantic recurrence indicate a field in a pre-paradigmatic state, without recognizable discursive articulation (Callon et al., 1983).

- b) Technical Development (2011–2015): This stage comprises 10 publications, with a slow but steady emergence of approaches focused on the digitalization of marketing. Although concepts related to artificial intelligence are still marginal, there is an incipient adoption of terminology linked to digital communication, such as "marketing" and "online advertising." This corresponds to an early phase of technological adoption, in line with Davis's (1989) Technology Acceptance Model (TAM) (Chae, 2015; Donthu et al., 2021).
- c) Algorithmic Expansion (2016–2020): With 32 published articles, this phase marks a turning point. Year-on-year growth is constant, reaching 12 publications in 2020. Key terms such as "machine learning" (Q1: 2018) and "online advertising" (Q1: 2018) emerge, beginning to structure relevant semantic networks. The field transitions toward an initial stage of maturity, focused on the application of predictive models and personalized communication (Deng et al., 2019; Guzman & Lewis, 2019).
- d) Thematic consolidation and critique (2021–2024): During this period, 91 articles were published, representing 67.4% of the total corpus. The use of terms such as "artificial intelligence" (median: 2023), "digital advertising" (Q3: 2024), and "deep learning" intensified. In 2024, the historical high of 26 annual publications was reached. This stage is characterized by the consolidation of a critical perspective on the persuasive impact of AI in the digital environment, anticipating a shift towards algorithmic regulation and communicative ethics (Floridi et al., 2018; Stahl & Eke, 2024).

### 5.1.2. Most Influential Magazines

Analysis of publication sources reveals a high degree of thematic dispersion and a marked interdisciplinary convergence. A total of 122 journals contributed at least one article, highlighting the cross-disciplinary nature of the field (Aria & Cuccurullo, 2017). Marketing Science leads with 5 articles, followed by IEEE Access (4), and others such as Expert Systems with Applications, IEEE Transactions on Knowledge and Data Engineering, and Journal of Current Issues and Research in Advertising (3 each). These publications reflect the intersection between algorithmic innovation and persuasive analysis in digital contexts (Donthu et al., 2021).

Journals such as Applied Marketing Analytics, Electronic Commerce Research and Applications, and New Media & Society (two articles each) demonstrate the consolidation of hybrid editorial spaces that integrate commercial, computational, and communicative approaches (Guzman & Lewis, 2019). This pattern suggests that the academic discourse on AI-powered personalized digital advertising transcends the communication sphere, mobilizing interest from disciplines such as engineering, applied computer science, management, and social sciences (Floridi et al., 2018).

The presence of titles such as "Big Data & Society, Journal of Consumer Psychology and Technological Forecasting and Social Change" reinforces the multidisciplinary nature of

the field and its growing sensitivity towards ethical, social and strategic dimensions (Stahl & Eke, 2024).

### 5.1.3. Productivity Analysis per Authors and Co-Authorship Networks

Bibliometric analysis identified SISODIA D as the most productive author in the corpus, with a total of 6 articles, although his fractional contribution is reduced to 3.00, indicating extensive participation in collaborative work (Aria & Cuccurullo, 2017). He is followed by ZHANG Y with 4 publications (0.87 fractional) and a group of authors with three articles each, including CHANG C, FAN T, and MIRALLES-PECHUÁN L, whose fractional contributions range from 0.92 to 1.25, suggesting varying levels of leadership in their respective research.

The "fractional articles" indicator allows for weighting the degree of individual involvement in collective publications, giving greater weight to exclusive contributions or those with fewer co-authors (Perianes-Rodríguez et al., 2016). In this sense, authors such as MCAFEE R (2 articles, 1.50 fractional) and BAEK T (1 article, 1.00 fractional) stand out for their central role in articles with less authorship dispersion.

In collaborative terms, the co-authorship network reveals a structure with dispersed cores and low overall density, a typical characteristic of emerging fields with multiple disciplinary entry points (Newman, 2001). Author communities tend to organize themselves into thematic clusters linked to subfields such as computational marketing, programmatic advertising, or algorithmic ethics, without yet having a consolidated core of recurring researchers (Glänzel & Schubert, 2004).

This collaborative fragmentation (see Table 1) can be explained by the cross-cutting nature of the topic: the convergence of artificial intelligence and persuasive communication has attracted experts from areas as diverse as engineering, social sciences, economics, and psychology. Consequently, co-authorship tends to be episodic and project-oriented, rather than sustained lines of joint production (Bordons et al., 2013).

However, the presence of authors with multiple publications indicates the emergence of incipient leadership. In particular, the case of SISODIA D suggests a consolidated trajectory within the field, which could contribute in the future to the formation of communities of practice and the structural strengthening of the area (Zuccala, 2006).

Visualizing the co-authorship network confirms this interpretation: isolated nodes of intense collaboration are observed, but few bridges between communities, which limits knowledge transfer and the consolidation of a robust interdisciplinary persuasive discourse (Wagner & Leydesdorff, 2003).

**Table 1.** *Percentage of Contribution to Publications*

Fractional contribution	Number of authors	Conclusions
[0.00 - 0.25]	210	The majority of authors (48.7%) have a low contribution, reflecting a high fragmentation of the work (Perianes-Rodríguez et al., 2016).
[0.26 - 0.50]	150	A relevant group (34.8%) shows more balanced shared

		contributions.
[0.51 - 0.75]	39	A smaller subset (9.0%) assumes partially dominant roles.
[0.76 - 1.50]	32	A minority (7.4%) leads the work, in main or exclusive authorship.

**Source:** Elaborated by the authors based on the results obtained in Biblioshiny.

Table 2 summarizes the main bibliometric indicators of the most productive authors in the corpus. These include the number of publications (NP), cumulative citations (TC), as well as the h-index and gym-index, which allow for the evaluation of productivity, the impact of the most cited works, and the temporal intensity of research trajectories, respectively (Egghe, 2006; Hirsch, 2005).

**Table 2.** *Impact Indicators of the Most Productive Authors*

Author	h-index	g-index	m-index	Total citations (TC)	Number of publications (NP)	Start year (PY_start)
SISODIA D	4	5	1	34	6	2022
MIRALLES-PECHUÁN L	3	3	0.333	38	3	2017
ALJABRI M	2	2	0.667	17	2	2023
CHANG C	2	3	0.125	98	3	2010
FAN T	2	3	0.125	98	3	2010
ZHANG Y	2	4	0.182	43	4	2015
MCAFEE R	2	2	0.133	35	2	2011
TUCKER C	2	2	0.286	399	2	2019
STILLWELL D	2	2	0.167	177	2	2014
GHARIBSHAH Z	2	2	0.333	103	2	2020

**Source:** Elaborated by the authors based on the results obtained in Biblioshiny.

- Outstanding influence: TUCKER C (399 citations) and STILLWELL D (177) concentrate a remarkable impact with few publications, which demonstrates high scientific visibility.
- Emerging trajectories: SISODIA D leads in productivity with an m-index of 1,000, reflecting an intense career since 2022.
- Productive consistency: CHANG C and FAN T show sustained evolution, although their *m-index* (0.125) reveals a lower temporal intensity.
- Impact-productivity balance: GHARIBSHAH Z and MIRALLES-PECHUÁN L combine medium impact with regular trajectories since 2020 and 2017, respectively (Aria & Cuccurullo, 2017; Hirsch, 2005).

#### 5.1.4. Keyword Co-Occurrence Network

The keyword co-occurrence network, generated using Biblioshiny, allows us to identify the semantic architecture underlying the field of study, revealing well-defined and highly cohesive thematic communities. This analysis relies on structural metrics such as betweenness centrality, closeness, and PageRank, which allow us to evaluate the

relational weight of each term in the network and its capacity to act as a node of conceptual articulation (Aria & Cuccurullo, 2017; Cobo et al., 2011).

As summarized in Table 3, the “machine learning” node exhibits the highest betweenness centrality (159.724), in addition to leading in closeness (0.029) and PageRank (0.184) values, thus establishing itself as the structural axis of the field. It is followed by “online advertising” and “artificial intelligence,” which also show high levels of connectivity and semantic relevance.

**Table 3.** *Structural Metrics of the Main Terms in the Semantic Network*

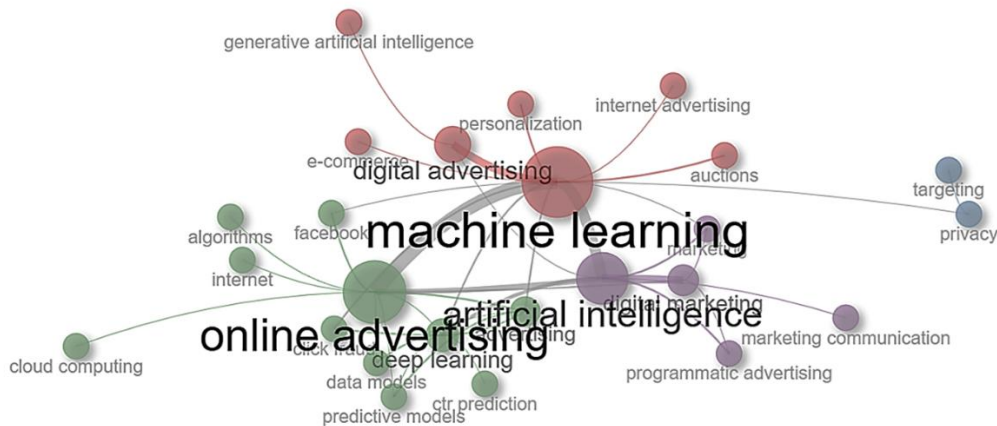
Term	Cluster	Betweenness	Closeness	PageRank
machine learning	1	159,724	0.029	0.184
online advertising	3	94,109	0.026	0.133
artificial intelligence	4	58,137	0.024	0.119
deep learning	3	35,613	0.024	0.082
digital advertising	1	23	0.019	0.044
privacy	2	23	0.018	0.028
advertising	3	5,039	0.021	0.054
digital marketing	4	2,937	0.019	0.049
marketing	4	0.44	0.019	0.029
generative artificial intelligence	1	0	0.013	0.014

**Source:** Elaborated by the authors based on the results obtained in Biblioshiny.

The modular segmentation of the network —represented visually in Figure 2— reinforces the existence of four thematic clusters clearly differentiated by color, node size and connection density:

- Cluster 1 (red): Focused on “machine learning,” this group includes terms such as “digital advertising,” “generative artificial intelligence,” “e-commerce,” and “personalization.” The size and position of the central node denote its role as the core articulating the field, oriented toward the automation of persuasive processes and algorithmic content generation (Aria & Cuccurullo, 2017).
- Cluster 3 (green): Focusing on “online advertising” and “deep learning,” this community connects technical terms such as “data models,” “CTR prediction,” and “predictive models,” suggesting a specialization in the development of AI-based optimization infrastructures. Its visual cohesion highlights the group’s thematic consolidation (Cobo et al., 2011).
- Cluster 4 (purple): Comprising “artificial intelligence,” “digital marketing,” “programmatic advertising” and “marketing communication,” this cluster represents the convergence between communication strategies and technological advances, highlighting the leading role of AI in contemporary advertising planning (Donthu et al., 2021).
- Cluster 2 (blue): Comprising “privacy” and “targeting,” it is located on the periphery of the network, reflecting an emerging interest in normative, regulatory, and ethical aspects. Although structurally marginal, its position underscores the need to integrate critical frameworks that address the social implications of algorithmic segmentation (Newman, 2004).

**Figure 2.** *Keyword Co-Occurrence Network*



**Source:** Elaborated by the authors based on the results obtained in Biblioshiny.

The visualization reveals a semantic ecology where technical innovation, strategic rationales, and normative tensions converge. The coexistence of dense cores and ethical-legal peripheries reinforces the interdisciplinary and critical nature of the field, while also highlighting the need for research agendas that map not only technical structures but also the power relations and exclusion inherent in AI-mediated digital advertising (Cobo et al., 2011; Donthu et al., 2021).

### 5.1.5. Analysis of the Thematic Areas

Figure 3 represents the strategic theme map, generated with Biblioshiny according to the methodology of Callon et al. (1983) and the visual classification proposed by Cobo et al. (2011). This representation organizes the semantic communities on a Cartesian plane according to two dimensions: centrality (structural relevance) and density (degree of internal development), thus allowing the evaluation of their evolutionary position within the field.

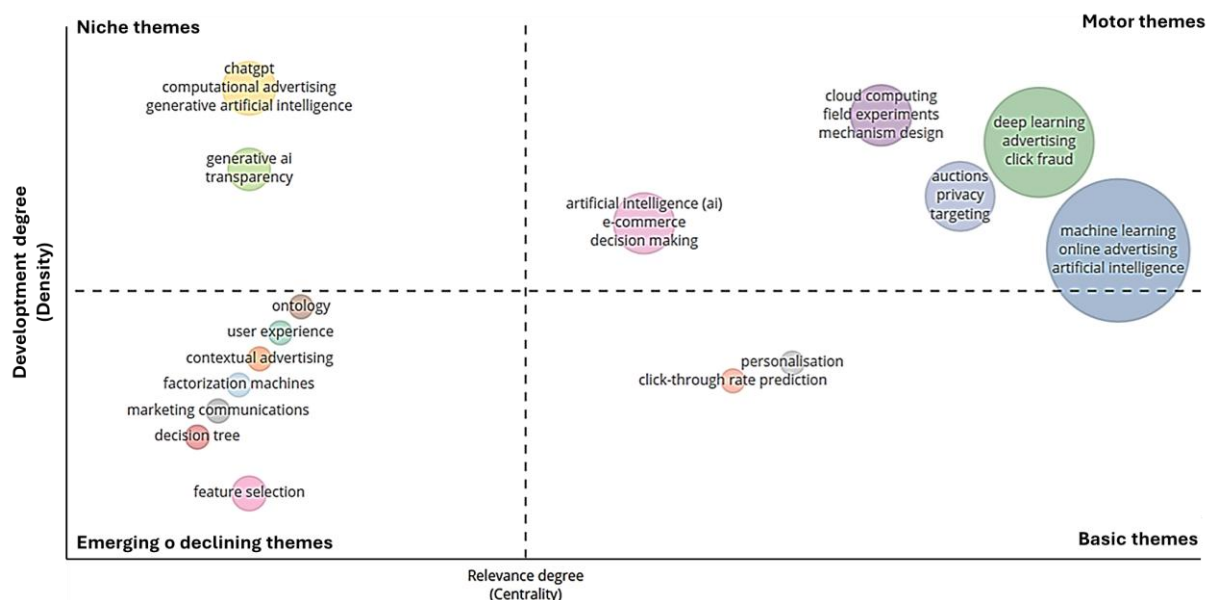
The analysis of the strategic map shows that Cluster 1 (machine learning) has the highest relative values in both parameters. This cluster includes terms such as machine learning, online advertising, artificial intelligence, digital advertising and digital marketing. The grouping reflects a consolidated core of research focused on the application of artificial intelligence to optimize segmentation, personalization, and evaluation processes for digital advertising campaigns (Gharibshah & Zhu, 2021; Lee & Cho, 2020). The co-occurrence of terms such as personalization, micro-targeting, and persuasion suggests an emphasis on the use of algorithmic techniques to adapt persuasive messages to specific profiles, which is linked to the algorithmic discourse models described in the theoretical framework (Neumann et al., 2019) and raises possible implications for digital citizenship, especially in terms of privacy, transparency and information control, in line with frameworks such as the General Data Protection Regulation (GDPR) and the Digital Services Act (Nesterenko et al., 2023; Wolters & Zuiderveen Borgesius, 2025).

Cluster 2 (deep learning) groups concepts such as deep learning, advertising, click fraud and CTR prediction, associated both with the detection and prevention of advertising fraud and with the development of predictive models to estimate user response (Gharibshah & Zhu, 2021; Zhang et al., 2014). These approaches, while increasing campaign efficiency, introduce challenges related to the opacity of decision-making systems and the concentration of analytical capabilities in a limited number of platforms, a phenomenon already documented in the critical literature on algorithmic governance (Floridi et al., 2018).

Among the emerging themes, clusters with lower centrality and density are identified, such as generative AI (Cluster 12), which incorporates transparency, and ChatGPT (Cluster 13), associated with computational advertising and generative artificial intelligence (Kaplan & Haenlein, 2020). Also noteworthy are personalization (Cluster 15) and the presence of privacy in Cluster 10 (auctions), both linked to debates about trust and social acceptance of algorithmic segmentation (Calo, 2014; Floridi, 2022). Although their frequency is low, these terms point to emerging lines of research that, if consolidated, could impact aspects such as information diversity, the authorship of AI-generated content, and the protection of personal data.

These findings are related to the informational, emotional, narrative and algorithmic discursive models presented in the theoretical framework, which help to understand how artificial intelligence transforms not only formats and strategies of persuasive communication, but also the configuration of the relationships between senders and receivers in digital environments, with possible repercussions for the exercise of citizenship in the digital public space (Floridi, 2022; Guzman & Lewis, 2019; Lee & Cho, 2020).

**Figure 3. Thematic Areas**



**Source:** Elaborated by the authors based on the results obtained in Biblioshiny.

### 5.1.6. Summary of Thematic Cluster Analysis

The following structured observations are derived from the strategic analysis:

- Centrality of algorithmic automation: The cluster headed by machine learning acts as the dominant epistemic axis, articulating the field based on its lexical diversity and semantic connectivity.
- Technical specialization in predictive models: Terms such as deep learning, CTR prediction and click fraud show a growing emphasis on automated optimization techniques, reflecting a technoscientific shift towards efficiency.
- Emerging regulatory concerns: Clusters associated with privacy, targeting and auctions demonstrate the emergence of discourses linked to ethics, regulation and digital rights in personalized advertising environments.
- Emerging nuclei of disruptive innovation: Topics such as ChatGPT and generative AI point to the emergence of generative technologies with profound implications for discursive authenticity, symbolic manipulation, and transparency.
- Progressive thematic hybridization: The interaction between algorithms, platforms, segmentation and ethics indicates a trend towards interdisciplinary convergence, in line with emerging fields such as computational advertising and digital persuasion.

Strategic analysis confirms the field's transition from a stage focused on algorithmic efficiency to a more critical research agenda, which integrates social, epistemological, and normative concerns about the use of artificial intelligence in persuasive discourses aimed at citizens.

## 6. DISCUSSION

The growth pattern in scientific production on personalized digital advertising, identified previously (section 5.1.1), becomes relevant when interpreted in light of the theoretical framework. As Neumann et al. (2019) point out, the expansion of algorithmic discourse models has reconfigured persuasive communication in digital environments, favoring the consolidation of approaches focused on operational efficiency, automated personalization, and predictive optimization (Deng et al., 2019; Fan & Chang, 2010). These elements correspond to the informational model and instrumental logic defined in the framework, confirming the prevalence of functionalist perspectives in the field.

The scarce presence of concepts linked to algorithmic justice, digital citizenship or cultural diversity in the thematic maps (section 5.2.1) reinforces the warning of the theoretical framework about the insufficient integration of critical approaches that problematize the socio-technical implications of persuasive automation (Floridi et al., 2018; Nesterenko et al., 2023). This research bias coincides with observations from the critical literature on digital communication that point to an overrepresentation of studies focused on technical optimization compared to the ethical or social evaluation of these practices.

The existing empirical evidence supports this interpretation. Lambrecht and Tucker (2019) demonstrated that algorithmic targeting systems can reproduce gender biases in the distribution of high-value ads, a finding that directly ties into the discursive and ethical risks attributed within the framework to algorithmic personalization in persuasive contexts.

On a structural level, the low transnational cooperation observed in the co-authorship network, along with the concentration of production in countries of the Global North (section 5.3), confirms the epistemic asymmetries identified in the theoretical framework and poses challenges for the construction of global advertising governance frameworks (Nesterenko et al., 2023; Wolters & Zuiderveen Borgesius, 2025). These dynamics limit the representation of diverse experiences of digital citizenship and reinforce the centralization of innovation power in a small number of players and contexts.

The findings demonstrate that the field continues to prioritize instrumental approaches, with little critical examination of its socio-technical and normative implications. This situation confirms the relevance of the critical agenda proposed in the theoretical framework, which aims to examine digital advertising as a socio-technical device embedded in power relations, algorithmic mediation, and information control. To this end, it is necessary to integrate transdisciplinary approaches that articulate informational, emotional, narrative, and algorithmic discursive models as analytical tools for evaluating the impact of these practices on democratic communication.

## **7. CONCLUSIONS**

Bibliometric and thematic analysis confirms that personalized digital advertising has evolved within a communication ecosystem deeply mediated by algorithms, automated segmentation, and predictive optimization. This sustained growth in scientific output is accompanied, however, by significant gaps: the limited presence of critical approaches, the scant consideration of algorithmic justice, cultural diversity, and digital citizenship, and a geographical and epistemic concentration that restricts the plurality of perspectives.

These findings, in line with the critical agenda outlined in the discussion, guide three strategic recommendations for the research community:

- (i) To expand the analysis towards underrepresented geopolitical and cultural contexts, mitigating epistemic asymmetries;
- (ii) To include evaluation metrics that include criteria for equity, diversity and protection of digital citizenship; and
- (iii) To adopt mixed methodologies that combine the measurement of persuasive effectiveness with the analysis of socio-technical and ethical implications.

Approaching digital advertising as a socio-technical device implies recognizing that its development depends not only on technical innovations, but also on the ability to articulate efficiency with equity, personalization with transparency, and innovation with responsibility. This requires consolidating an interdisciplinary dialogue between communication, technology ethics, data science, and public policy, guided by principles of inclusivity, accountability, and socio-technical sustainability.

## 7.1. Main Findings

The analysis revealed a growing trend in scientific output on personalized digital advertising, with a steady increase since 2010 and a peak in 2021. The United States led in publication volume, followed by China and the United Kingdom. The international collaboration network showed little transnational cooperation, with endogenous institutional collaborations standing out instead. The most frequent terms in titles and abstracts included “personalization,” “online advertising,” “artificial intelligence,” and “machine learning” (Fan & Chang, 2010; Kim et al., 2001), reflecting the field’s technological orientation. The thematic cluster analysis highlighted four main research areas: recommendation systems, programmatic advertising, data privacy, and personalization algorithms. The thematic maps showed maturity in privacy studies and the emergence of topics related to deep learning and microtargeting (Lambrecht & Tucker, 2019).

## 7.2. Theoretical Implications

The findings strengthen a transdisciplinary theoretical framework that articulates the intersection between emerging technologies (artificial intelligence, big data, machine learning) and communication theories focused on personalization and persuasion. The theoretical implications can be organized into three thematic areas:

- a) Emerging communication epistemologies: Bibliometrics demonstrates a shift in conceptual focus from models centered on advertiser effectiveness to user-centric paradigms, which reconfigures the epistemological foundations of advertising segmentation (Fan & Chang, 2010; Nesterenko et al., 2023). This shift compels a rethinking of classical theories of persuasive communication from new notions of digital agency and algorithmic reception, understood as processes mediated by automated systems that influence selective exposure, cognitive attention, and meaning-making by audiences (Kim et al., 2001). The results of the bibliometric analysis, which highlight the growing relevance of terms such as “machine learning”, “AI” and “personalization”, show that algorithms not only deliver content, but also condition the way users interact with advertising messages, generating new forms of automated persuasion and interactive configurations that require more comprehensive and adaptive theoretical frameworks (Deng et al., 2019).
- b) Algorithms and semantic mediation: The technological transition raises critical questions about the role of algorithms as mediators of meaning in digital environments. This mediation is neither neutral nor transparent; algorithms operate under logics of commercial optimization that shape information hierarchies, prioritizing content that maximizes profitability over criteria of diversity or sociocultural relevance (Deng et al., 2019; Lambrecht & Tucker, 2019). In this context, the results of the bibliometric analysis, which reflect an exponential increase in studies on algorithmic personalization, call for a critical review of the notion of automated intermediation. These are not merely new technological tools, but rather sociotechnical devices that configure perceptual experiences, condition imaginaries, and consolidate regimes of visibility and exclusion. This invites the reformulation of explanatory frameworks that

integrate adaptive systems theory, algorithmic justice (Lambrecht & Tucker, 2019) and the notion of algorithmic performativity in audience configuration.

- c) Data governance and systemic risks: The consolidation of studies on privacy and microtargeting suggests a broadening of existing theories to include perspectives that consider technological agency (Deng et al., 2019), as well as the systemic risks arising from automated personalization that reproduces structural biases. This reproduction of biases, as evidenced by recent studies analyzed in the algorithmic segmentation thematic cluster, disproportionately affects historically marginalized groups, perpetuating dynamics of exclusion and discrimination. Consequently, this area demands not only the incorporation of normative and ethical frameworks into the theoretical debate, but also a critical approach that questions the power dynamics embedded in algorithmic systems and promotes a redefinition of the notion of responsibility in personalized digital environments. This theoretical reflection requires articulating data governance frameworks with intersectional approaches that recognize the social, political, and cultural implications of digital personalization processes.

These three areas form a basis for the development of a critical research agenda that articulates technology, communication and society from an integral perspective.

### **7.3. Practical Implications**

From an operational perspective, the results of the bibliometric study reveal three critical areas with practical implications:

- a) Algorithmic transparency and operational governance: The integration of algorithmic transparency mechanisms and informed consent is not merely an ethical recommendation, but a structural necessity stemming from the intensive use of automated systems in advertising processes. The discovery of key terms such as “privacy” and “ethics” in the analyzed clusters reveals an operational concern about the control users have over their personalized advertising experience, which demands design practices focused on explainability and algorithmic accountability. Studies such as those by Lambrecht and Tucker (2019) have documented how a lack of transparency can generate discriminatory effects, highlighting the urgency of implementing robust algorithmic audits.
- b) Transformation of professional skills: The analysis of thematic maps showed a consolidation of topics related to artificial intelligence and automated segmentation (deep learning, neural networks), indicating a significant shift in the skills required in the field of digital marketing. This transformation involves not only acquiring technical skills in statistical modeling and data science, but also the ability to assess algorithmic biases, apply data governance principles, and design user-centered experiences. This convergence between technical and communication skills redefines work environments, increases knowledge asymmetries between actors with and without algorithmic literacy, and poses substantial challenges in academic training. To address this gap, it is recommended to develop interdisciplinary curricula that strengthen the critical thinking, social responsibility, and technological adaptability of future professionals (Fan & Chang, 2010; Nesterenko et al., 2023).
- c) Regulatory framework and operational risk: The lack of transnational

collaborations observed in co-authorship networks highlights a fragmentation of operational knowledge regarding the regulation of personalized digital advertising. This geographical disparity is also reflected in regulatory disparities that affect the consistency of advertising practices in globalized contexts. Consequently, it becomes imperative to promote comprehensive regulatory frameworks that articulate advertising effectiveness, digital rights, and algorithmic sovereignty. Recent research (Calo, 2014; Guzman & Lewis, 2019) emphasizes the need for legal structures that ensure accountability in the use of high-precision programmatic advertising systems.

These three dimensions require coordinated action among actors in the advertising ecosystem, technology developers, public policy makers, and academics to shape digital environments that balance innovation, communication effectiveness, and fundamental rights.

#### **7.4. Limitations of the Study and Future Lines of Research**

Among the notable limitations is the exclusive use of the Scopus and Web of Science databases, which may have restricted the inclusion of relevant literature indexed in other sources such as Google Scholar. Furthermore, the analysis was limited to publications in English, thereby limiting linguistic diversity. As future lines of research derived from the results, we suggest expanding the document corpus to include other databases and languages, as well as conducting a more in-depth analysis of content and altmetrics to complement the bibliometric findings.

#### **7.5. Suggested Future Actions**

Based on the bibliometric analysis, the following future actions are structured in three specific areas that address empirical, theoretical and normative gaps detected in the field:

- a) **Algorithmic justice and sociotechnical inequalities:** It is imperative to explore the relationship between personalization algorithms and biases related to gender, class, and ethnicity in automated ad delivery. The finding of a weak presence of terms associated with intersectionality in co-occurrence clusters suggests a lack of critical problematization in the literature regarding how algorithmic infrastructures reproduce structural inequalities. Future research should adopt mixed methodologies that integrate algorithmic design analysis with empirical reception studies in vulnerable populations.
- b) **Cultural diversity and linguistic localization:** The predominance of English-speaking studies identified in the analysis limits the understanding of the contextual impact of personalized digital advertising. It is proposed to examine this phenomenon in non-English-speaking contexts, especially in regions of the Global South, to identify variations in personalization patterns, technological adaptability, and cultural reception of personalized messages.
- c) **Regulatory comparison and regulatory impact analysis:** Given the geographical fragmentation of co-authorship networks, there is a lack of global dialogue on regulatory frameworks for personalized digital advertising. It is recommended that comparative studies of privacy regulations in different jurisdictions be

developed, evaluating not only their legal adequacy but also their operational and communicational effects on the implementation of algorithmic segmentation systems.

## 7.6. Implications for a Critical and Interdisciplinary Research Agenda

The observed thematic configuration demands a research agenda that integrates knowledge from communication, computer science, ethics, and law. Emerging lines of inquiry regarding privacy, algorithms, and segmentation indicate that personalized digital advertising cannot be addressed from a single discipline, but rather requires integrated approaches that simultaneously consider communicative effectiveness, algorithmic fairness, and citizens' rights.

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