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AI-Driven Predictive Customer Analytics for Forecasting Behavior, Churn and Future Buying Patterns

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Abstract. *Predictive customer analytics has experienced rapid growth with the integration of Artificial Intelligence (AI) techniques, enabling businesses to forecast customer behavior, churn probability, and future purchasing patterns with significant accuracy. This paper presents a bibliometric analysis of relevant literature from 2021 to 2024, sourced from Scopus database. Results indicate a surge in publications addressing advanced machine learning (ML) algorithms, deep learning architectures, and hybrid modeling techniques. Key themes revolve around customer retention, demand forecasting, data privacy, and ethical considerations. This study synthesizes the latest developments, underscores emerging trends, and identifies research gaps, providing a foundation for future explorations in this domain.*

Keywords: artificial intelligence, customer, future buying patterns, consumption behavior, sustainable development.

Introduction

The rapid evolution of Artificial Intelligence (AI) has significantly reshaped how organizations analyze, predict, and influence customer behavior. Unlike traditional statistical and regression-based methods, AI-driven approaches leverage large-scale data processing, machine learning (ML), and deep learning (DL) algorithms to derive more granular, actionable insights into customer actions (Özkurt, 2025). These AI-powered predictive analytics tools enable companies to forecast customer churn rates, anticipate buying patterns, and model behavior dynamics, all of which are critical for optimizing marketing strategies and enhancing customer retention.

The rise of digital transformation has intensified interest in AI-based solutions for customer analytics, as businesses seek faster, data-driven decision-making processes (Volkmar et al., 2022). In today's hypercompetitive markets, organizations are accumulating vast amounts of customer data from purchase histories, online interactions, social media engagement, and behavioral tracking. Extracting value from this data, however, requires sophisticated AI-driven systems that can process unstructured datasets, detect patterns, and generate precise predictions. Research has shown that businesses utilizing AI in customer analytics achieve higher conversion rates, improved retention, and better segmentation of target audiences (Pham et al., 2024).

One of the core areas of AI-driven predictive analytics is customer churn analysis. Losing customers significantly impacts revenue and profitability, making churn prediction models essential for businesses. AI-based customer retention strategies employ predictive models, natural language processing (NLP), sentiment analysis, and behavioral analytics to identify at-risk customers and implement proactive intervention strategies (Özkurt, 2025). These AI models

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integrate historical transaction data, customer service interactions, and engagement metrics to detect early signs of disengagement and optimize retention efforts (Khneyzer et al., 2024).

Another critical area of AI in customer analytics is forecasting future buying patterns. With the advancement of big data analytics, neural networks, and recommender systems, AI enables businesses to predict demand trends, personalize product recommendations, and refine pricing strategies (Reeyazati & Samizadeh, 2025). AI-powered recommendation engines, used by platforms such as Amazon and Netflix, process billions of consumer interactions to deliver personalized content, enhancing user satisfaction and increasing sales (Joshi et al., 2024). Additionally, AI-driven targeted marketing strategies have become more effective, leveraging customer insights to design customized advertising campaigns and promotional offers that resonate with individual preferences (Okorie et al., 2024).

As organizations increasingly integrate AI into customer analytics, several challenges and ethical concerns have emerged. AI-driven decision-making processes must address issues of data privacy, algorithmic transparency, and bias mitigation (Volkmar et al., 2022). Businesses must comply with data protection regulations, such as GDPR and CCPA, while ensuring that AI algorithms produce fair, unbiased, and explainable outcomes. Research in explainable AI (XAI) has focused on developing interpretable models that provide human-readable explanations for AI-generated insights, thereby enhancing trust and accountability in customer analytics (Özkurt, 2025).

This paper systematically reviews the current state of AI-driven predictive customer analytics, emphasizing its role in behavior forecasting, churn prediction, and future purchasing trends. It synthesizes findings from recent research to highlight key methodologies, influential studies, and industry applications in AI-driven marketing. Additionally, this review examines trends in research output, thematic clusters, and the technological advancements shaping AI-powered customer analytics. By analyzing the convergence of AI, big data, and predictive modeling, this paper provides a comprehensive understanding of how AI is transforming consumer analytics and shaping the future of business intelligence.

Furthermore, the study utilized bibliometric analysis to illustrate the relationships between key concepts through visual representations. These visualizations enable researchers to comprehend the evolution of a specific field, the interconnections between fundamental ideas, and potential future directions. Within this context, the present study explores the following aspects:

Research questions (RQs):

RQ1: What are the most relevant articles by the number of citations for this research field?
RQ2: What are the most dominant publishers in Scopus database in this research field?
RQ3: Which Scopus-indexed journals in the field are currently the most influential?
RQ4: What are the most common keywords that appear together?
RQ5: Which countries contribute the most publications in this research field?
RQ6: Who are the most influential authors in the field up to the present date?

Literature review

AI in predictive customer analytics

Artificial intelligence (AI) has revolutionized customer analytics by enabling businesses to extract meaningful insights from vast datasets and predict consumer behaviors with unprecedented accuracy. Traditional analytics methods relied on descriptive statistics and regression models, which, while useful, often failed to capture complex behavioral patterns. AI, by contrast, leverages machine learning (ML) and deep learning (DL) to analyze structured and unstructured data,

revealing hidden trends that drive personalized marketing strategies, customer segmentation, and behavioral forecasting (Pham et al., 2024).

One of the most impactful AI-driven approaches in predictive analytics is big data processing, where algorithms analyze massive consumer datasets from multiple sources, including online transactions, browsing history, social media activity, and customer service interactions (Ebrahimi et al., 2022). AI-powered models can correlate thousands of variables to detect subtle behavioral changes, providing businesses with a clearer picture of customer needs, preferences, and potential churn risks (Volkmar et al., 2022).

Furthermore, neural networks and natural language processing (NLP) are widely used to analyze customer sentiments, uncover purchasing intentions, and refine advertising strategies. For instance, sentiment analysis using AI allows companies to monitor customer feedback, reviews, and social media discussions in real time, identifying shifts in public perception and emerging market trends (Joshi et al., 2024). Additionally, AI-based recommendation engines employ collaborative filtering and deep learning to suggest products based on user behavior, increasing engagement and sales conversion rates (Reeyazati & Samizadeh, 2025).

Recent studies highlight the role of AI in hyper-personalization, where predictive analytics tailors marketing messages at an individual level. Unlike traditional segmentation, AI dynamically adjusts offers, content, and product recommendations based on real-time user interactions, enhancing customer engagement and brand loyalty (Okorie et al., 2024). This shift from static to dynamic personalization is particularly evident in e-commerce and digital marketing, where AI-driven insights continuously refine customer experiences (Khneyzer et al., 2024).

AI-driven customer churn prediction and retention strategies

Customer churn remains a significant challenge for businesses, particularly in industries with intense competition such as telecommunications, banking, and e-commerce. AI-powered churn prediction models have emerged as an essential tool for identifying at-risk customers and implementing proactive retention strategies (Özkurt, 2025).

Machine learning models, including random forests, gradient boosting, XGBoost, and deep neural networks, are commonly used to detect early indicators of customer disengagement. These models analyze various factors such as frequency of purchases, interaction history, service complaints, and engagement with marketing campaigns to assess the likelihood of churn (Özkurt, 2025). One key advantage of AI in churn prediction is its ability to continuously learn from new data, refining predictions over time to enhance accuracy (Pham et al., 2024).

Explainable AI (XAI) has also gained prominence in churn prediction, as businesses seek greater transparency in algorithmic decision-making. Techniques such as SHAP (Shapley Additive Explanations) and LIME (Local Interpretable Model-Agnostic Explanations) allow companies to understand why specific customers are predicted to churn, enabling more targeted interventions (Özkurt, 2025).

Beyond prediction, AI-driven personalization plays a crucial role in churn mitigation. Companies use AI to craft customized loyalty programs, recommend tailored incentives, and automate customer outreach through intelligent chatbots (Khneyzer et al., 2024). AI-powered chatbots and virtual assistants, utilizing NLP and sentiment analysis, can engage with at-risk customers, address concerns in real time, and offer personalized discounts or rewards to encourage retention (Joshi et al., 2024).

A growing body of research highlights customer emotion detection as a novel approach to churn prevention. AI-driven sentiment analysis tools assess customer emotions in emails, chat

transcripts, and voice interactions, allowing businesses to gauge dissatisfaction and intervene before a customer decides to leave (Reeyazati & Samizadeh, 2025). This approach has been particularly beneficial in financial services and telecommunications, where proactive customer service is key to maintaining loyalty (Ebrahimi et al., 2022).

AI in future buying patterns and market trends

One of the most powerful applications of AI in customer analytics is its ability to forecast future buying patterns, helping businesses stay ahead of evolving consumer demands. Unlike traditional forecasting methods, AI models integrate historical transaction data, economic indicators, and real-time behavioral insights to predict customer demand fluctuations, seasonal shopping trends, and emerging product preferences (Reeyazati & Samizadeh, 2025).

AI-powered demand forecasting relies on time-series models such as Long Short-Term Memory (LSTM) networks, Auto-Regressive Integrated Moving Average (ARIMA), and convolutional neural networks (CNNs) to capture complex temporal patterns in consumer purchasing behavior (Joshi et al., 2024). These models have proven highly effective in industries such as retail, fashion, and fast-moving consumer goods (FMCG), where accurate demand forecasting is critical for inventory optimization and supply chain efficiency (Okorie et al., 2024).

Another emerging trend is the use of generative AI in synthetic data creation for predictive modeling. Generative AI can simulate potential customer behaviors based on historical trends, allowing businesses to test marketing strategies in a virtual environment before implementing them in real markets (İşgüzar et al., 2024). This innovative approach reduces risk and enhances strategic planning by providing insights into how consumers might react to new product launches, pricing changes, and promotional campaigns (Volkmar et al., 2022).

AI-driven dynamic pricing strategies have also transformed how businesses optimize revenue. Using reinforcement learning and real-time analytics, AI models adjust pricing based on competitor pricing, demand fluctuations, customer willingness to pay, and external market conditions (Okorie et al., 2024). This approach, commonly used by companies like Uber, Amazon, and airline ticketing platforms, enhances profitability while maintaining competitive pricing structures (Khneyzer et al., 2024).

Furthermore, AI is increasingly influencing personalized advertising and customer engagement. AI-driven programmatic advertising platforms analyze user behavior and segment audiences in real time, delivering highly targeted ads that resonate with individual consumer preferences (Volkmar et al., 2022). Social media platforms leverage AI-powered insights to refine ad targeting, optimize campaign performance, and increase return on ad spend (ROAS) (Pham et al., 2024).

Methodology

Figure 1 illustrates the methodology adopted for the bibliometric analysis. The study employed this analytical approach as it serves as a robust method for addressing research questions by enabling scholars to identify the most influential research and significant academic contributions within a particular field. Through performance analysis and science mapping, various indicators were examined to determine the most impactful publications, leading scholars, prominent journals, and influential nations in the domain (Broadus, 1987).

Moreover, bibliometric analysis is instrumental in assessing the impact of academic publications and their role in the dissemination of knowledge (Ellegaard et al., 2015). By

systematically analyzing a collection of documents, this method provides valuable insights into key aspects such as titles, authorship, thematic areas, sources, and citation-based interconnections. Bibliometric techniques effectively summarize and quantify literary content, making them a valuable tool for diverse applications. Its versatility extends across multiple disciplines, including academia, industry, policy-making, and technological innovation, showcasing its broad relevance (Susitha et al., 2024).

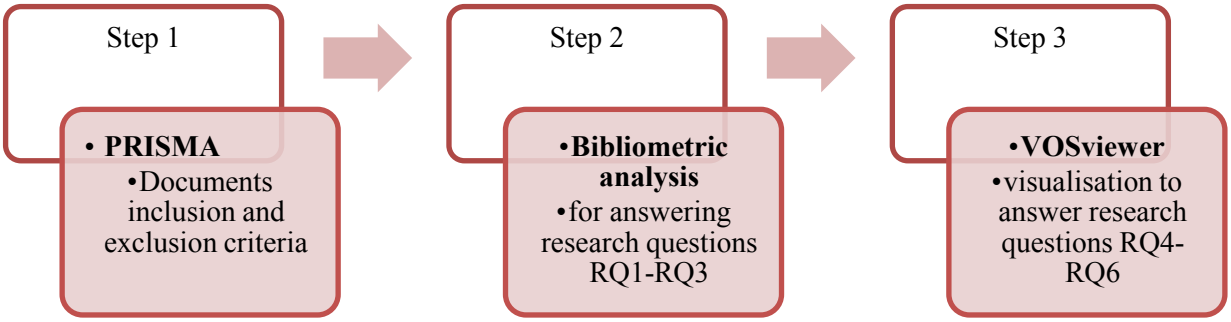

Figure 1. Methodology of the study

Source: Own processing.

VOSviewer has proven valuable in analyzing bibliographic coupling of keywords, providing an overlay visualization of the SCS trends across the study period.

In this research, the review process encompassed multiple stages, including searching, reviewing, applying screening criteria, consolidating findings, and interpreting results to ensure that readers can easily grasp key insights and develop a comprehensive understanding of the subject matter.

The subsequent sections, particularly Database and Search Strategy and Defining Appropriate Search Terms, detail the PRISMA framework followed in this study (see Figure 2).

Database and search strategy

The initial phase of bibliometric analysis involves selecting appropriate databases and search engines to collect bibliographic data. The choice of datasets should be guided by the research problem and the scope of the study, ensuring the accuracy, reliability, and comprehensiveness of the gathered information.

The selection of the Scopus database was justified by its intrinsic compatibility with bibliometric tools, enabling efficient integration within research workflows and data analysis.

For the in-depth analysis of artificial intelligence applications in customer behavior prediction, churn analysis, and forecasting future buying patterns, Scopus stands out as an ideal data source due to its extensive interdisciplinary coverage, encompassing relevant literature from the fields of computer science, business, and marketing, making it a more suitable text source compared to the Web of Science (Mongean & Paul-Hus, 2016).

To ensure a comprehensive dataset, no restrictions were imposed on publication date, journal selection, industry sector, business domain, or geographical location. Instead, the study primarily focused on the concept of "AI-driven predictive customer analytics", allowing for a broad and inclusive analysis of the literature in this domain.

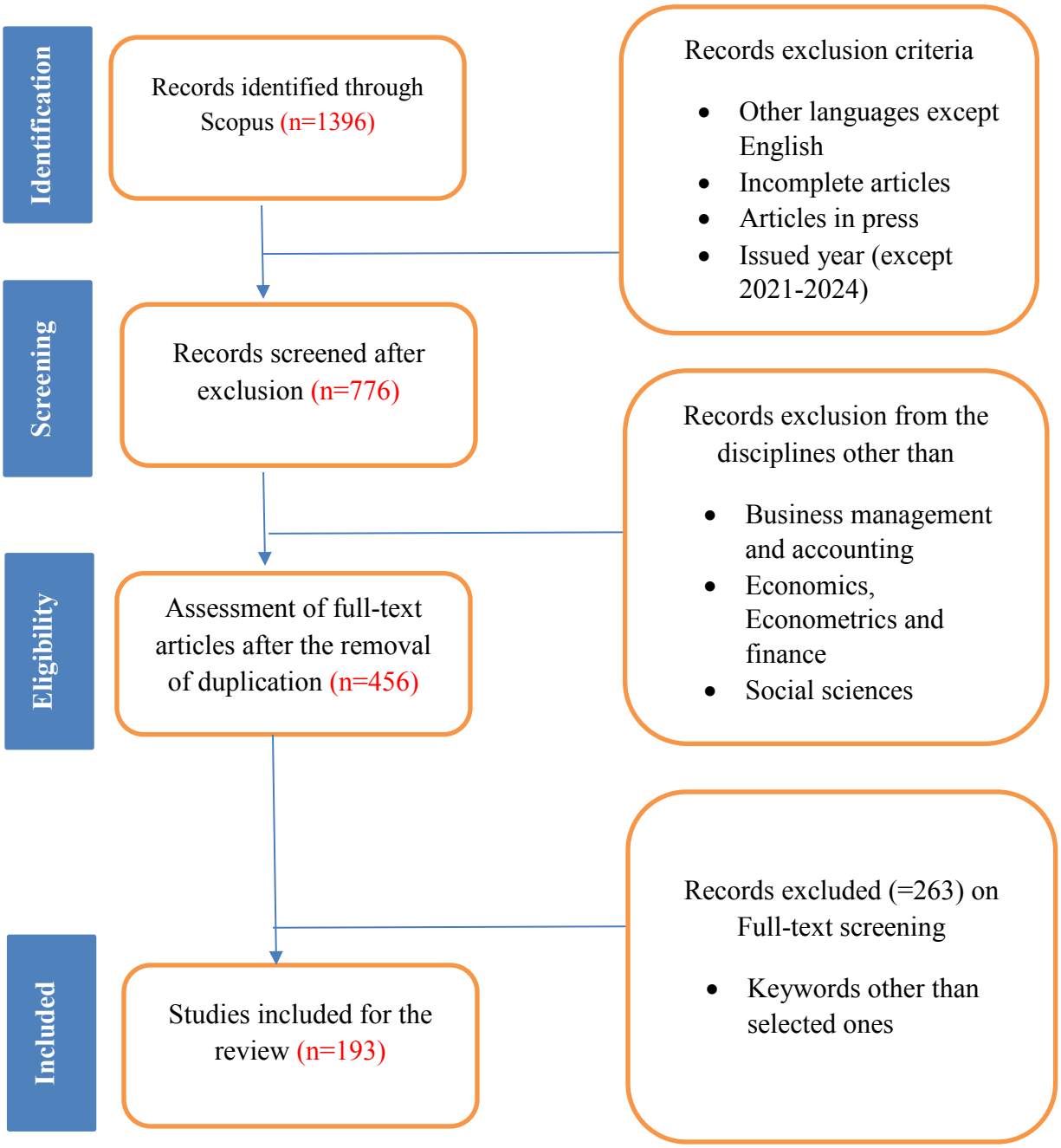

Figure 2. PRISMA Flowchart. Source: Adapted from Moher et al. (2009)

Source: Own processing.

Defining the appropriate search terms

To conduct the data collection process, the Scopus database was selected due to its comprehensive coverage of academic literature. This study specifically focuses on "AI-driven predictive customer analytics" and the data retrieval strategy involved executing a targeted search query within the title, abstract, and keywords fields. The search terms used included "Artificial intelligence," "Consumption behavior," "Deep Learning", "Social Media", "Decision Making", "Behavioral Research" and "Sustainable Development", ensuring that all relevant publications were captured.

To maximize the scope of the retrieved literature, the following keyword combinations were applied:

- "AI" OR "Predictive Analytics" AND
- "Machine Learning" OR "Future Buying Patterns"

These keyword phrases were input into the document subject field of the Scopus database. To refine the search process, the Boolean operator (AND) and wildcards were employed in accordance with Scopus' syntax, allowing for the retrieval of documents containing different combinations of the selected terms, including both singular and plural variations. The search covered articles where the selected keywords appeared in the title, abstract, author-supplied keywords, and Scopus' "Keywords Plus" field.

All publications available up to the year 2025 were included in the search, with data retrieval conducted on February, 20th 2025. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) protocol was followed to ensure a structured and transparent approach to data selection and reporting (Moher et al., 2009). The PRISMA Flowchart, detailing the document selection process, is illustrated in Figure 2.

The initial search yielded a total of 1396 results. To refine the dataset, several inclusion criteria were applied:

- Year of publication: only documents published between 2021 and 2024 were considered.
- Text category: only articles in press were included and complete articles.
- Language: the search was limited to English-language publications.

Following the application of these criteria, the dataset was reduced to 776 records. Since more recent publications may not have accumulated a sufficient number of citations, temporal constraints were introduced to facilitate meaningful comparisons during citation analysis (Massaro, Dumay & Guthrie, 2016).

To ensure relevance to the research objectives, only studies from the fields of accounting, management, economics, econometrics, finance, business, and social sciences were retained for further analysis. After eliminating duplicate entries, reviews, news articles, conference papers lacking author details, and sources other than journal articles, books, and book series, the final dataset for bibliometric analysis consisted of 193 records.

The PRISMA flowchart visually represents the record lookup and selection process. The final selection included only relevant and complete versions of research articles, with detailed inclusion and exclusion criteria outlined in Figure 2.

Results and discussions

Performance analysis

The bibliometric analysis relies on a range of performance metrics to evaluate scholarly contributions within a specific research domain. In this context, performance analysis involves the application of various indicators to assess the scientific impact of publications, authors, and journals related to a particular topic. Commonly used metrics include citation counts, dominant publishes and dominant journals, which provide valuable insights into the influence and dissemination of research findings (Van Raan, 2019). By leveraging these indicators, the study effectively addresses its research questions and offers a structured evaluation of the literature.

Table 1. List of top 10 relevant articles based on the total number of citations received

Authors	Title	Year	Source title	Cited by
Hermann E.	*Leveraging Artificial Intelligence in Marketing for Social Good—An Ethical Perspective*	2022	Journal of Business Ethics	125
Liu-Thompkins Y.; Okazaki S.; Li H.	*Artificial empathy in marketing interactions: Bridging the human-AI gap in affective and social customer experience*	2022	Journal of the Academy of Marketing Science	123
Bawack R.E.; Wamba S.F.; Carillo K.D.A.; Akter S.	*Artificial intelligence in E-Commerce: a bibliometric study and literature review*	2022	Electronic Markets	121
Mostafa R.B.; Kasamani T.	*Antecedents and consequences of chatbot initial trust*	2022	European Journal of Marketing	101
Tong X.; Chen Y.; Zhou S.; Yang S.	*How background visual complexity influences purchase intention in live streaming: The mediating role of emotion and the moderating role of gender*	2022	Journal of Retailing and Consumer Services	94
Nazir S.; Khadim S.; Ali Asadullah M.; Syed N.	*Exploring the influence of artificial intelligence technology on consumer repurchase intention: The mediation and moderation approach*	2023	Technology in Society	73
Ng F.Z.-X.; Yap H.-Y.; Tan G.W.-H.; Lo P.-S.; Ooi K.-B.	*Fashion shopping on the go: A Dual-stage predictive-analytics SEM-ANN analysis on usage behaviour, experience response and cross-category usage*	2022	Journal of Retailing and Consumer Services	55
Alsharif A.H.; Salleh N.Z.M.; Abdullah M.; Khraiwish A.; Ashaari A.	*Neuromarketing Tools Used in the Marketing Mix: A Systematic Literature and Future Research Agenda*	2023	SAGE Open	55

Authors	Title	Year	Source title	Cited by
Rusthollkarhu S.; Toukola S.; Aarikka-Stenroos L.; Mahlamäki T.	*Managing B2B customer journeys in digital era: Four management activities with artificial intelligence-empowered tools*	2022	Industrial Marketing Management	54
Maduku D.K.; Mpinganjira M.; Rana N.P.; Thusi P.; Ledikwe A.; Mkhize N.H.-B.	*Assessing customer passion, commitment, and word-of-mouth intentions in digital assistant usage: The moderating role of technology anxiety*	2023	Journal of Retailing and Consumer Services	48

Source: Own processing in Excel.

Table 1 presents the top 10 most relevant articles, ranked by the total number of citations received. A clear trend emerges, showcasing a strong focus on recent research, with the majority of articles published in 2022 and 2023. The subject matter prominently features artificial intelligence (AI) within the realms of marketing and consumer behavior.

Table 2. Dominant publishers ordered by the total number of publications

Publisher	Articles
Elsevier Ltd	38
Elsevier B.V.	19
MDPI	17
Elsevier Inc.	13
Emerald Publishing	12
Springer	10
Multidisciplinary Digital Publishing Institute (MDPI)	8
John Wiley and Sons Inc	8
John Wiley and Sons Ltd	8
Taylor and Francis Ltd.	7
Routledge	5
Inderscience Publishers	5
Association for Computing Machinery	4
Emerald Group Holdings Ltd.	4

Source: Own processing in Excel.

In Table 2 it can be observed an analysis of the publication data that reveals a pronounced concentration of scholarly output within a select group of publishers. For example, Elsevier, encompassing its various subsidiaries (Ltd., B.V., and Inc.), emerges as the preeminent entity, exhibiting a significantly higher volume of published articles compared to its competitors.

While MDPI and other established publishers, such as Emerald, Springer, and Wiley, maintain a presence, their contribution is comparatively less substantial. This distribution underscores the hierarchical structure of academic publishing, with Elsevier occupying a dominant position and influencing the dissemination of scholarly research within the analyzed dataset.

Table 3. Dominant journals ordered by the total number of publications

Journals	Articles
Journal of Retailing and Consumer Services	16
Sustainability (Switzerland)	15
Technological Forecasting and Social Change	9
Decision Support Systems	5
Business Strategy and the Environment	4
Journal of Cleaner Production	4
Big Data and Cognitive Computing	4
Knowledge-Based Systems	3
Artificial Intelligence Review	3
Proceedings of the ACM on Human-Computer Interaction	3
Technology in Society	3
Electronic Commerce Research	3
International Journal of Information Management	3
Telematics and Informatics	3
Tourism Management	2

Source: Own processing in Excel.

The data provided in Table 3 illustrates a hierarchical pattern in the publication frequency across academic journals, highlighting distinct research areas within the analyzed corpus. Journals such as *Journal of Retailing and Consumer Services* and *Sustainability (Switzerland)* stand out as the primary platforms, with a significantly higher number of publications. This indicates a strong emphasis on consumer behavior and sustainability research within the dataset.

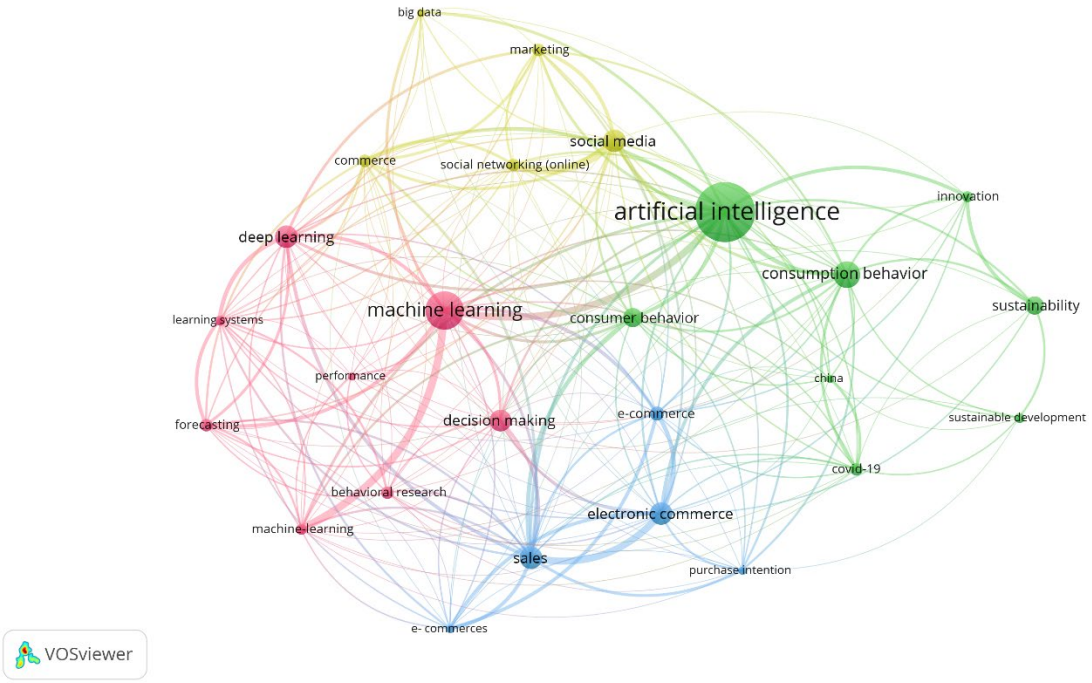

Figure 3. Keywords bibliometric map

Source: Own processing in VOSviewer.

Figure 3 presents a map of the relationships between key terms related to artificial intelligence, highlighting the central importance of AI and related concepts, such as machine learning and deep learning, and their impact in various fields, including commerce, marketing, and consumer behavior.

There are four clusters present. The first cluster, the green one, revolves around artificial intelligence, which has in its structure keywords such as "innovation", "sustainable development", "sustainability", "consumer behavior", which may suggest that artificial intelligence is desired to be used in this sustainable direction. The second cluster, the pink one, refers to machine learning, focusing on words such as "performance", "decision making", "forecasting", "deep learning", which may express the fact that automation of performance and decision-making is desired in the long term.

Cluster three, highlighted in blue, is represented by e-commerce, and the main keywords are "sales" and "purchase intention". Cluster four, the yellow one, focuses on big data, marketing, social media, and commerce.

So, from this representation we can see strong links between AI, machine learning, and deep learning, which indicates a close relationship between these concepts. There are also strong links between AI and areas such as consumer behavior, e-commerce, and social media, which indicates the significant impact of AI in these areas.

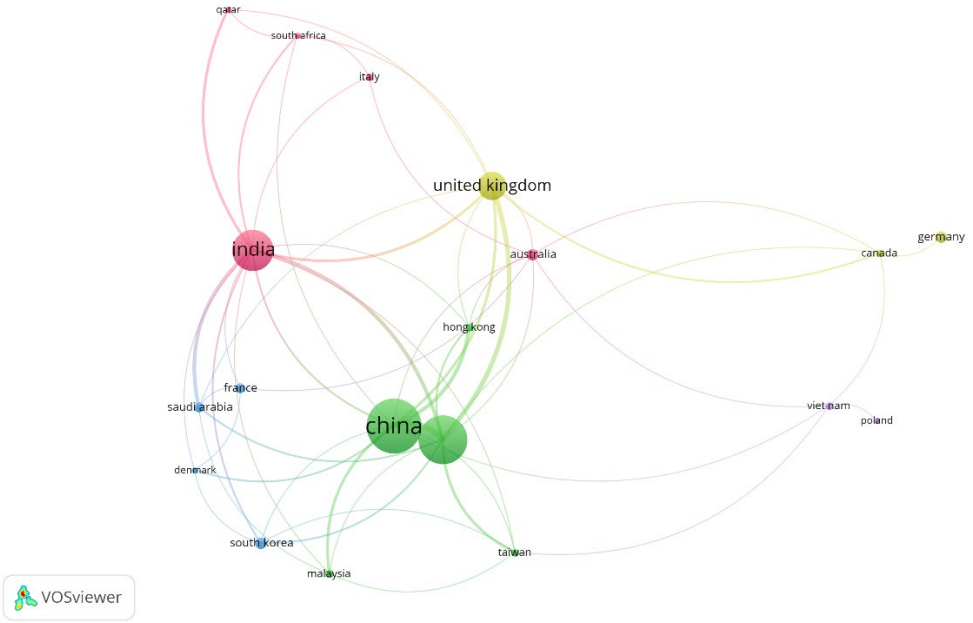

Figure 4. Countries with highest publication output
Source: Own processing in VOSviewer.

Figure 4 depicts the geographical distribution of research regarding the impact of AI on consumer behavior analysis highlighted by five clusters, with 54 links from where it can be observed a strong alignment of values, culture, and perspectives.

Despite a surge in publications, particularly from nations like China, India, and the United Kingdom, worldwide interest in the subject continues to be strong.

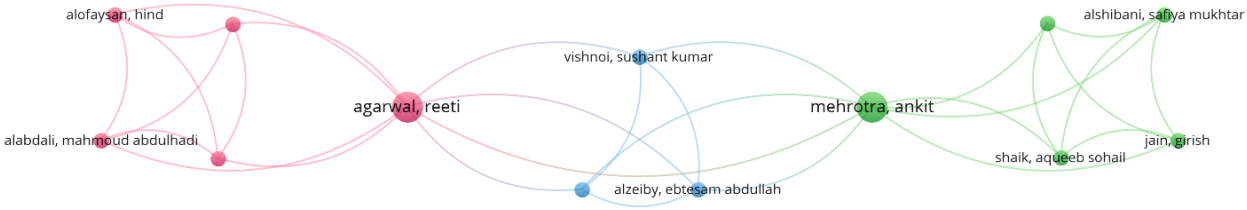

Figure 5. Top authors making notable contributions on AI and consumer behavior analysis
Source: Own processing in VOSviewer.

Figure 5 identifies key authors driving AI and consumer behavior research, highlighting their collaborative relationships. The network reveals three clusters with 30 links, indicating active collaboration and potential for sustained growth in this area.

Conclusion

In conclusion, the data analysis shows an interconnection between artificial intelligence (AI), machine learning and deep learning, expressing a strong conceptual relationship. The strong links between AI and areas such as consumer behavior, e-commerce and social media highlight the transformative impact of AI in these critical sectors.

These findings, combined with publication and citation analysis, indicate a rapidly evolving field. There is a clear focus on practical applications of AI in consumer and business contexts, reflected in both the themes of the most-cited articles and the journals with the most publications.

The dominance of certain publishers, such as Elsevier, underlines their influence in disseminating knowledge in this field. The journals "Journal of Retailing and Consumer Services" and "Sustainability (Switzerland)" stand out for their large volume of publications, indicating increased relevance in the dissemination of research in the fields of consumer behavior and sustainability.

Overall, the data highlight a dynamic and evolving field of research with a strong focus on AI applications in consumer and business contexts.

Also, as the use of artificial intelligence in marketing becomes increasingly widespread, it is imperative to address concerns related to ethics and transparency. In this regard, a priority research direction consists of investigating the impact of transparency on customer trust in the use of AI in marketing. Future studies should explore how the interpretability of predictive models and the transparent communication of personal data usage can influence customer perception and contribute to building a trustful relationship.

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