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BEYOND TRADITIONAL MARKETING: A SYSTEMATIC LITERATURE REVIEW OF AI AND NEUROMARKETING IN CONSUMER BEHAVIOR*

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ABSTRACT

This study explores the integration of artificial intelligence (AI) and neuromarketing in consumer behavior research. By combining AI-driven analytics with neuromarketing techniques, it aims to improve marketing precision and deepen understanding of consumer decision-making. A systematic literature review was conducted, in accordance with PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines, analyzing 43 peer-reviewed articles published between 2015 and 2024, following a defined elimination process. Articles were retrieved from Scopus using predefined keywords. The content analysis focused on four dimensions: thematic areas and research topics, theoretical foundations, research design, and methodological patterns. The findings reveal a marked increase in publications after 2018, with a notable peak in 2024 at 32.56%. Three dominant themes were identified: neuromarketing techniques in consumer behavior (44.2%), AI applications in marketing and engagement (27.9%), and ethical concerns in AI-driven research (27.9%). While psychological and cognitive theories are frequently used, most studies rely on primary data. The growing use of EEG, machine learning, and sentiment analysis signals a methodological shift. This review addresses a gap in the literature by mapping the contribution of AI to neuromarketing. It provides a structured agenda for future research, illustrating how AI can enhance traditional methods and generate new insights into consumer behavior.

Keywords: *Neuromarketing, Artificial Intelligence, Consumer Behavior, Marketing Analytics, Systematic Literature Review*

JEL Classification: *M31, M37*

GELENEKSEL PAZARLAMANNIN ÖTESİNDE TÜKETİCİ DAVRANIŞLARI: YAPAY ZEKÂ VE NÖROPAZARLAMAYA YÖNELİK SİSTEMATİK BİR LİTERATÜR İNCELEMESİ

ÖZ

Bu çalışma, tüketici davranışları araştırmalarında yapay zekâ ile nöropazarlamanın entegrasyonunu incelemektedir. YZ temelli analiz teknikleri ile nöropazarlama yöntemlerinin bir araya getirilmesi yoluyla pazarlama doğruluğunun artırılması ve tüketici karar süreçlerinin daha derinlemesine anlaşılması amaçlanmıştır. Bu amaç doğrultusunda, 2015–2024 yılları arasında yayımlanmış, Scopus veri tabanından belirlenen anahtar kelimelerle erişilen 43 hakemli makale, PRISMA (Sistemik Derlemeler ve Meta-Analizler için Tercih Edilen Raporlama Maddeleri) ilkeleri doğrultusunda yürütülen sistematik literatür taraması yöntemiyle analiz edilmiştir. Çalışmada dört ana boyuta odaklanan bir içerik analizi gerçekleştirilmiştir: tematik alanlar, teorik temeller, araştırma desenleri ve yöntemsel yaklaşımlar. Bulgular, 2018 sonrası yayınlarda belirgin bir artış olduğunu ve 2024 yılında %32,56 ile zirveye ulaşıldığını göstermektedir. İncelenen çalışmalar üç ana tema altında toplanmıştır: nöropazarlama tekniklerinin tüketici davranışlarına etkisi (%44,2), yapay zeka uygulamalarının pazarlama ve müşteri etkileşimindeki rolü (%27,9) ve yapay zeka temelli araştırmalarda etik kaygılar (%27,9). Psikolojik ve bilişsel teorilerin sıklıkla tercih edildiği, veri kaynaklarında ise çoğunlukla birincil verilerin kullanıldığı görülmüştür. EEG, makine öğrenmesi ve duygu analizi gibi ileri tekniklerin artan kullanımı, yöntemsel bir dönüşüme işaret etmektedir. Bu çalışma, yapay zekanın nöropazarlamaya katkısını haritalayarak alandaki boşluğu doldurmakta ve gelecekteki araştırmalar için yapısal bir çerçeve sunmaktadır.

Anahtar Kelimeler: *Nöropazarlama, Yapay Zeka, Tüketici Davranışı, Pazarlama Analitiği, Sistemik Literatür İncelemesi*

JEL Sınıflandırılması: *M31, M37*

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1. INTRODUCTION

Consumer behavior and decision-making processes topics have always been questioned areas in both the academic and industrial worlds. Improvements in data access and radical changes in technology help answer this question by gathering consumer insights. Thus, strategic decisions can be made in a more accurate way and based on real consumer expectations. Thanks to new techniques and approaches in this area, brands now have the opportunity to reach consumers in a much more effective and personalized way. The integration of artificial intelligence and neuromarketing is a topic of great interest to both academic circles and practitioners. However, the theoretical and methodological foundations of this integration are not yet holistic and are scattered. The intersection of these two disciplines creates a new paradigm in marketing research, bringing about a transformational change in approaches to consumer analysis.

Recent advancements in AI and intense learning have significantly enhanced consumer behavior analysis by integrating convolutional neural networks (CNNs) for emotion recognition. However, challenges remain in accurately interpreting complex human emotions through artificial intelligence, particularly in varying cultural and contextual settings (Alipour et al., 2024). There is a significant research gap about how AI-driven neuromarketing can be systematically applied across various industries and consumer segments. Eye tracking, electroencephalography (EEG), and galvanic skin response (GSR) are among the primary neuromarketing tools used to uncover consumers' subconscious reactions (Cuesta et al., 2019). Artificial intelligence-supported data analytics and predictive modeling techniques are used in the analysis of this physiological data, increasing both the accuracy and applicability of neuromarketing research to a broader audience (Gill & Singh, 2020). When used in conjunction, these technologies enable a deeper understanding of consumer preferences, resulting in more personalized and effective marketing strategies (Harris et al., 2018). As neuromarketing and AI continue to evolve, businesses will be able to leverage more profound insights into consumer behavior, resulting in more meaningful interactions and data-driven strategic decision-making (Lee et al., 2018). The purpose of this study is to present an overview of the combined use of neuromarketing and artificial intelligence (AI) in research. In terms of data gathering and analysis, this study focuses on recent literature exploring the interplay between artificial intelligence and neuromarketing in marketing applications.

Although AI applications in marketing have been widely explored, their integration with neuromarketing methodologies remains underdeveloped due to methodological inconsistencies and the absence of standardized frameworks (Fortunato et al., 2014; Razbadauskaitė Venskė, 2024). Current research predominantly focuses on isolated neuromarketing techniques, such as eye tracking, EEG, and GSR, rather than establishing a cohesive framework that systematically incorporates AI-driven approaches (Kusá et al., 2023). Furthermore, the challenge of comparing the findings of different studies due to the absence of standard evaluation criteria has resulted in a fragmented methodology (Nesterenko & Olefirenko, 2023; Varghese, 2022). Differences in the machine learning models used, as well as biometric measurement methods and experimental conditions, also contribute to these inconsistencies (Bansal & Gupta, 2022). Such difficulties make it challenging to reach generally accepted conclusions in the field and prevent the formation of a common theoretical framework (Peyravi et al., 2020). Although existing literature reviews have made significant contributions to integrating neuromarketing with artificial intelligence, they are generally insufficient to address the overall development of the field from a holistic

perspective, as they often focus on specific application areas (Rawnaque et al., 2020). Therefore, a systematic examination of the methodological and conceptual applications of artificial intelligence and neuromarketing is lacking (Kusá et al., 2023).

Furthermore, in literature, applications of artificial intelligence in neuromarketing have mostly been discussed in terms of technological developments and the tools used (e.g., Fahim et al., 2024). In contrast, this review goes beyond tool-focused descriptions and examines the field more holistically within the framework of thematic trends, theoretical approaches, and research designs; it reveals existing methodological gaps and offers a guiding framework for future studies.

This study aims to guide future empirical research in the field of neuromarketing by addressing these methodological and theoretical gaps. In this paper, we review the literature on neuromarketing and AI, analyze their integration in marketing studies using various technologies, and propose guiding research questions for future studies. Building on the above discussions, this study systematically addresses key gaps by exploring the following research questions: (1) What are the dominant thematic areas and key research topics in AI-driven neuromarketing studies? (2) Which theoretical frameworks are most frequently employed in AI-neuromarketing research? (3) What research designs (qualitative, quantitative, mixed methods) and methodologies (data collection, sampling, analysis) are used in empirical studies? (4) What are the emerging challenges and future directions in AI-neuromarketing integration?

This study contributes to the field of marketing by systematically examining the intersection of neuromarketing and artificial intelligence from thematic, methodological, and theoretical perspectives. This study compiles and analyzes existing literature systematically classifying consumer-oriented neuromarketing research through various academic databases. In this context, the study provides a theoretical and methodological foundation for future research by researchers and informs the marketing strategies of firms. To present this compilation holistically, the remaining sections of the study are structured as follows: The second section provides the theoretical background of neuromarketing and AI in the context of marketing. Thirdly, a research methodology that was employed to conduct a critical review of empirical studies are explained. In section 4, study findings and theoretical frameworks employed in the reviewed research are emphasized. Section 5 discusses the main research gaps, methodological and conceptual challenges, and outlines directions for future research. Finally, Section 6 concludes the study by summarizing the main findings and contributions.

2. LITERATURE REVIEW

2.1. The Emergence and Theoretical Foundations of Neuromarketing

In recent years, the marketing approach has evolved from traditional product-focused approaches to experience-based models that prioritize interaction with the consumer (Prahalad & Ramaswamy, 2004). In this transformation, the effect of consumers' subconscious processes on decision-making mechanisms has become increasingly important (Suomala et al., 2012). In this context, neuromarketing offers a deeper understanding of consumer behavior by employing neuroscientific methods to measure cognitive and emotional reactions that individuals may not be able to consciously express (Karmarkar & Yoon, 2016; Plassmann & Karmarkar, 2015).

Measuring neurophysiological signals with methods such as eye movements, skin conductance, heart rate, or EEG, responses to marketing stimuli such as attention, memory, preference formation, and emotional response can be analyzed, and thus stronger theoretical

inferences can be made about consumer decision processes (Dimpfel, 2015; Kroupi et al., 2014). In addition, these approaches based on neuroscience and behavioral psychology strengthen the multidisciplinary structure of neuromarketing and enhance the precision of targeted marketing efforts (Kawala-Sterniuk et al., 2021; Plassmann & Karmarkar, 2015).

Recent systematic reviews have revealed the diversity of tools and methods used in neuromarketing research, highlighting how this field has evolved in conjunction with the consumer-centric economy and how marketing activities have been reshaped through the integration of technology (Archana & Mahajan, 2023). This literature analyzes in depth the effects of neuromarketing tools on consumer reference, attention span, and emotional commitment, highlighting technology-based innovations and theoretical diversity in the field (Gill & Singh, 2020; Royo-Vela & Varga, 2022).

While neuromarketing research has significantly advanced the understanding of consumers' unconscious processes through neuroscientific methods, recent developments in data-driven technologies have reshaped how consumer insights are generated in marketing.

2.2. The Rise of Artificial Intelligence in Marketing

Artificial intelligence (AI) has undergone tremendous development over the past few decades, significantly reducing the workload of professionals across various industries. These developments include the application of technologies such as big data analytics and machine learning across a wide range of areas. AI is increasingly employed to assess customer buying patterns, purchasing behaviors, preferences, and other data (Chatterji & Toffel, 2019; Sakib, 2023)

Significant advancements in marketing literature during the 2010s have increased researchers' interest in studying artificial intelligence phenomena, particularly data searching, scanning, and learning. From this perspective, it is evident that artificial intelligence plays a significant role in various marketing-related processes. According to Roberts and Fuller (2010), some of these advancements include market research, client comprehension, segmentation, and targeting. The majority of customer contact tools in the retail industry today are backed by artificial intelligence technology, with smart customer experience campaigns built and run on the foundation of long-term customer relationships (Kotler, 2003).

The rapid developments in artificial intelligence technologies in the 2010s have had a profound impact on marketing research. Artificial intelligence has facilitated the processing of big data and analysis in the field of marketing. Also, it allows to make easier to analyze pre- and post-purchase consumer behavior (Durmuş Şenyapar, 2024). These developments contribute to significantly improving the user experience.

Through machine learning algorithms and predictive analysis techniques, artificial intelligence offers the opportunity to predict consumer expectations more accurately (Kopalle et al., 2022; Rawnaque et al., 2020). This predictive ability allows companies to gain competitive advantage by making their market positioning more effective.

As artificial intelligence increasingly shapes marketing analytics and decision-making processes, its integration with neuroscience-based approaches has attracted growing scholarly attention.

2.3. The Integration of AI and Neuromarketing

The integration of AI and neuromarketing is advancing the capacity to understand and predict consumer behavior by combining neuroscience-based consumer insights with AI-powered data analytics (Kroupi et al., 2014). Sentiment analysis and machine learning models increase the accuracy of predictions of emotional and cognitive responses by processing large-scale neurophysiological data (Kawala-Sterniuk et al., 2021). In this way, marketers can redesign advertising strategies more effectively, optimize product development processes, and increase consumer engagement. Especially with the widespread use of neuromarketing applications, artificial intelligence-supported systems have improved analysis processes to better understand consumer behavior and paved the way for data-driven strategies. By processing real-time data obtained from neuromarketing techniques using artificial intelligence, changes in consumer trends and purchasing power can be determined. Hence, businesses can dynamically adapt their pricing strategies (Bruyn, 2020).

Neuromarketing tools such as neuroimaging and physiological measurement-based ones provide in-depth insights into consumers' unconscious reactions (Banjar et al., 2024). Recently, AI has emerged as a lower-cost and more efficient alternative to traditional neuromarketing tools. These technologies, thanks to their big data processing and pattern recognition capacity, enable the development of more effective strategies, especially in areas such as advertising and product design. Thus, this integrated approach increases the overall effectiveness of marketing activities in many disciplines (Zurawicki, 2010).

The interaction between artificial intelligence and neuromarketing has increasingly gained attention in the literature in recent years. These studies bring to the agenda not only the effects of these technologies on digital marketing strategies but also the ethical issues they raise. For instance, AI-supported marketing campaigns that focus on the effects of neuromarketing algorithms on consumer privacy and data security are examined. Such studies provide important contributions to understanding the ethical dilemmas and opportunities that arise at the intersection of AI and neuroscience-based marketing applications. The study in question draws attention to the increasing role of the processing of neurophysiological data through AI in targeted advertising and the ethical dilemmas that these applications bring with them (Goncalves et al., 2024).

Furthermore, some recent studies have begun to explore the role of AI in consumer behavior. Gaining a greater understanding of consumer behavior through methodological principles and developments in fundamental neuroscience, neuromarketing and consumer neuroscience will shape future marketing methods and enhance the sector (Gorgiev, 2020). Because artificial intelligence (AI) has made it possible to study customer behavior, emotions, and preferences, neuromarketing has been greatly improved. AI technologies, including support vector machines (SVM), linear discriminant analysis (LDA), and artificial neural networks (ANN), have demonstrated excellent accuracy in customer response classification and prediction (Rawnaque et al., 2020). AI-powered technologies have been utilized to develop sustainable and targeted marketing efforts, maximizing long-term strategy value and reducing environmental impact (Bolón-Canedo et al., 2024). Moreover, the integration of AI, neuromarketing, and smart retail environments has been explored, highlighting how AI-powered neuromarketing techniques are revolutionizing consumer engagement and shopping experiences (Caratù, 2022). Their study identified key trends such as real-time emotion detection and AI-driven personalized recommendations in digital retail spaces. Recent studies continue to demonstrate the

transformative impact of integrating artificial intelligence (AI) with neuromarketing techniques on consumer research and marketing strategies. To illustrate, the application of machine learning algorithms in neuromarketing has significantly improved the accuracy of predicting consumer preferences and behaviors (Yalçın et al., 2024). Research highlights how AI-driven sentiment analysis of consumer feedback can enhance personalized marketing efforts, leading to increased customer satisfaction and retention (Grewal et al., 2020). Integrating neuroimaging data with artificial intelligence analytics allows for a more accurate assessment of consumers' emotional responses to marketing messages, thus enabling more targeted and effective advertising strategies to be developed (Marques et al., 2024). These advancements emphasize the growing importance of AI in refining neuromarketing practices and shaping future marketing methodologies.

A recent systematic review examined the application of artificial intelligence in neuromarketing, highlighting both promising advancements and ongoing challenges. However, significant concerns were also highlighted, such as the limitations of standardized methods for such studies and ethical risks related to data privacy (Fahim et al., 2024).

3. METHODOLOGY

This article employs a structured approach to the methodological and theoretical analysis of existing literature, with a focus on empirical studies. Our study adopts a PRISMA-guided systematic review with content analysis approach, which allows for a more interactive and interpretative engagement with the literature particularly useful when the research topic is emerging or broad (Paul et al., 2021). However, to enhance rigor and transparency, we also integrate systematic review techniques, PRISMA guided the identification, screening, eligibility and inclusion steps; content analysis was used for synthesis. This hybrid approach leverages the strengths of both methodologies, ensuring a comprehensive and methodologically sound evaluation of the literature while maintaining the flexibility of a traditional review. Methodology is organized in two stages: study selection using PRISMA framework and content analysis for the quantitative synthesis of the studies (Okoli, 2015).

3.1. Data Collection and Study Selection (PRISMA Framework)

To explore the integration of artificial intelligence and neuromarketing in marketing literature, several criteria were applied to select articles. These criteria included the use of AI and neuromarketing approaches in marketing research, focusing on data collection or analysis methods. Studies were required to be empirical, based on either hypothetical or real-world data. The review focused on journal-published empirical articles, excluding conference papers, book chapters, and research reports. Searches were conducted using the Scopus database, which allowed for advanced searches combining keywords related to neuromarketing and AI. Within the scope of this study, no pre-date limitation was applied in the literature review; however, only studies published in 2015 and later were included in the analysis in line with the criteria of content relevance and up-to-dateness. A study dated 1998 was also encountered during the literature review; however, it was excluded because it was not directly related to the integration of neuromarketing and artificial intelligence. There are two main reasons behind this preference.

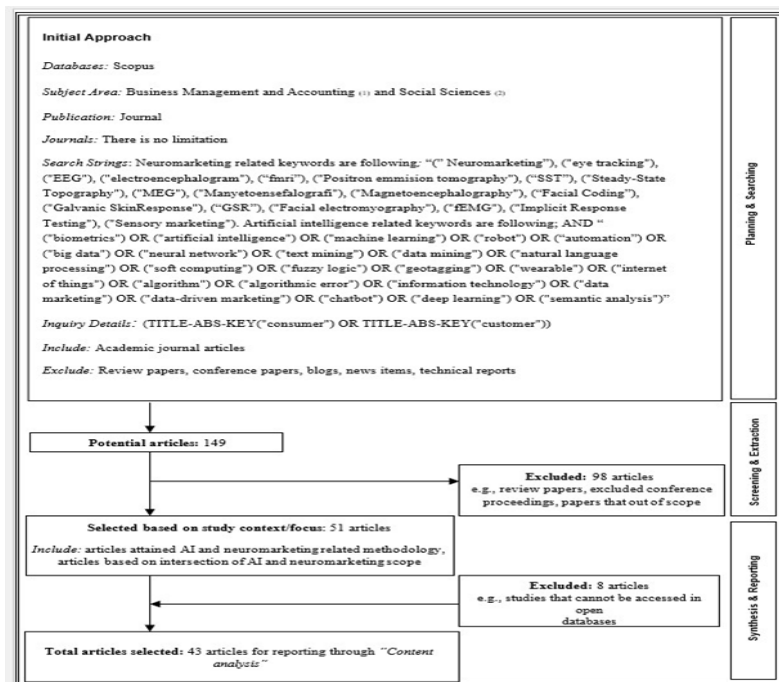
First, the concept of neuromarketing was systematically defined in the academic literature by Ariely and Berns (2002), and this study emphasized the potential of neuroimaging techniques (e.g., fMRI) in marketing research. Secondly, the systematic integration of AI technologies with

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neuromarketing has gained significant momentum in the post-2015 period, particularly with the practical application of deep learning and predictive analysis methods in the marketing context (LeCun et al., 2015; Rust & Huang, 2021). Studies prior to this period did not include comprehensive approaches to integrating AI with neuromarketing. In this context, the focus of the study on the post-2015 literature is justified in terms of both conceptual integrity and methodological up-to-dateness. Only English-language articles were included in this review.

To ensure a structured and transparent selection process, this study follows the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) model by (Moher et al., 2009) and updated by (Page et al., 2021). The PRISMA framework enhances the methodological rigor of systematic reviews by providing a standardized four-phase process: (1) Identification, (2) Screening, (3) Eligibility, and (4) Inclusion. In the Identification phase, relevant studies were retrieved from the Scopus database using predefined keywords related to neuromarketing and artificial intelligence. During Screening, duplicate records and irrelevant studies were removed. The Eligibility phase involved a detailed assessment of full-text articles based on predefined inclusion criteria, focusing on empirical research with robust methodological approaches. Finally, in the Inclusion phase, 43 studies that met all selection criteria were included in the final analysis. This systematic approach minimizes bias and increases the reproducibility of the study findings.

Figure 1: PRISMA-Based Study Selection Process for the Systematic Literature Review



Source: Adapted from PRISMA guidelines, author's own work

The Scopus database was searched for articles using the "Article title, abstract, and keywords" query. Neuromarketing keywords are combined with all artificial intelligence related keywords one by one. The keywords were chosen to explore the intersection between neuromarketing and artificial intelligence comprehensively. We selected terms based on their

relevance to core concepts, frequency in recent literature, and their ability to capture the overlap between these fields. A summary of the inclusion and exclusion content of the review process is presented in Figure 1 above.

In line with these criteria, the review included peer-reviewed empirical journal articles published in English after 2015 that explicitly addressed the integration of artificial intelligence and neuromarketing; non-empirical studies and publications not directly related to this focus were excluded, as reflected in the PRISMA flow diagram (Figure 1). Following study selection, the final set of articles was analyzed using a structured content analysis and coding procedure, as described in the next section.

3.2. Data Analysis: Content Analysis and Coding Procedure

Using the structured literature review methodology explained earlier, the 43 articles were reviewed and grouped into thematic areas and key research topics. To ensure a systematic classification, qualitative content analysis was employed to identify recurring themes in AI and neuromarketing research (Schreier, 2012). The initial coding framework was developed based on a review of the abstracts, and articles were categorized into thematic areas following a deductive-inductive approach (Elo & Kyngäs, 2008). The thematic categorization was conducted by two independent researchers, and inter-coder reliability was calculated using Krippendorff's Alpha, yielding a reliability score of 76.74% (Krippendorff, 2004). This approach ensured consistency in coding and minimized subjective bias in the classification of studies. Following the application of inclusion and exclusion criteria, data collection was conducted by extracting relevant studies and their abstracts into an Excel database, forming the primary dataset for analysis. These abstracts, compiled within an Excel sheet, constituted the primary dataset for our analysis. Subsequently, each abstract is thoroughly reviewed to identify initial codes that highlight recurring themes and significant elements within each study, such as the use of AI in consumer behavior or ethical considerations in neuromarketing. These initial codes were then organized into broader thematic areas through thematic analysis. Each abstract was reviewed based on predefined coding criteria to ensure consistency and accuracy in categorization.

The thematic coding process, which involved manually reviewing abstracts to identify recurring themes, such as AI applications in consumer behavior or ethical considerations in neuromarketing. This method, though labor-intensive, ensures a comprehensive understanding of each study's focus. For instance, abstracts that mentioned using AI to enhance consumer engagement were categorized under "AI in Marketing and Consumer Engagement." Within each thematic area, specific research topics were identified. For example, under "Neuromarketing Techniques and Consumer Behavior," topics like "predicting consumer preferences" and "measuring emotional responses" were highlighted. These initial codes were categorized into broader thematic areas using an inductive thematic analysis approach, allowing themes to emerge organically from the data (Charmaz, 2006). To ensure methodological rigor, the identified themes and topics were validated against existing literature, aligning them with established theoretical frameworks (Ryan & Bernard, 2003). This validation process reinforced the robustness and credibility of the categorization.

To assess the consistency of the coding process, inter-coder reliability was evaluated as follows. Two experts with extensive knowledge in artificial intelligence and marketing conducted the coding procedure. To ensure a thorough understanding of each step, they participated in a

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coding exercise supervised by a senior scholar specializing in artificial intelligence. Each evaluator independently coded the selected studies, performing separate content analyses on all 43 articles before transferring the extracted data to a coding form. The inter-coder reliability ranged from 74.4% to 86.0% which is considered an acceptable to high agreement level in reliability assessments (Krippendorff, 2004). A senior academic supervisor intervened in disputed cases to resolve conflicts. A meeting was held to address and rectify discrepancies, aiming to improve the reliability rate. Ultimately, the consistency between the two assessors was quantified at 83%.

4. FINDINGS

This section presents the key findings derived from the systematic review, focusing on the integration of AI and neuromarketing in marketing research. The results are categorized into four dimensions: (1) thematic areas and research topics, (2) theoretical analysis, (3) research design, and (4) methodological patterns. Findings are analyzed at both individual and aggregate levels across the examined publications. The key thematic areas dimension identifies dominant research topics in AI-driven neuromarketing, highlighting emerging trends and research gaps. The theoretical analysis evaluates the frameworks employed in AI-neuromarketing studies, assessing their relevance and methodological soundness. The research design analysis examines methodological choices, including sample selection, data collection techniques, and experimental setups, identifying strengths and limitations. Lastly, the methodology section focuses on data collection and analytical techniques, evaluating their effectiveness in addressing AI-neuromarketing research objectives. Organizing the findings across these four dimensions allows for a structured overview of the existing literature and supports the identification of key patterns and research gaps.

Table 1: Journals Publishing AI–Neuromarketing Research by Publication Period

Publication Period	Journal	Number of Studies	Study Details
2015-2016	Qualitative Market Research	1	Marchini, A., Diotallevi, F., Paffarini, C., Stasi, A., & Baselice, A. (2015).
	Information Technology and People	1	Chang, H.H., Fu, C.S., Fang, P.W., & Cheng, Y.-C. (2016).
2017-2018	Technological Forecasting and Social Change	1	Wang, Y.-H., & Hsieh, C.-C. (2018).
2019-2020	International Contemporary Hospitality Management	1	Lee, M., Lee, S., & Koh, Y. (2019).
	Journal of Advanced Manufacturing Technology	1	Baharom, N.H., Aid, S.R., Amin, M.K.M., Wibirama, S., & Mikami, O. (2019).
	Foods	2	Gunaratne, N.M., Fuentes, S., Gunaratne, T.M., Torrico, D.D., Ashman, H., Francis, C., Viejo, C.G., & Dunshea, F.R. (2019); Álvarez-Pato, V.M., Sánchez, C.N., Domínguez-Soberanes, J., Méndez-Pérez, D.E., & Velázquez, R. (2020).

	Sustainability (Switzerland)	2	Alonso-Dos-Santos, M., Ulloa, R.Q., Quintana, Á.S., Quijada, D.V., & Nazel, P.F. (2019); Um, T., Kim, T., & Chung, N. (2020).
	Journal of Fashion Marketing and Management	1	Tupikovskaja-Omovie, Z., & Tyler, D. (2020).
	Psychology and Marketing	1	Simmonds, L., Bogomolova, S., Kennedy, R., Nenycz-Thiel, M., & Bellman, S. (2020).
	Journal of Hospitality Marketing and Management	1	Fan, A., Wu, L., Miao, L., & Mattila, A.S. (2020).
	Information Systems Research	1	Pfeiffer, J., Pfeiffer, T., Meißner, M., & Weiß, E. (2020).
	Social Sciences	1	Juárez-Varón, D., Tur-Viñes, V., Rabasa-Dolado, A., & Polotskaya, K. (2020).
	International Journal of Information Management	1	Fu, H., Manogaran, G., Wu, K., Cao, M., Jiang, S., & Yang, A. (2020).
2021-2022	International Journal of Research in Marketing	1	Hakim, A., Klorfeld, S., Sela, T., Friedman, D., Shabat-Simon, M., & Levy, D.J. (2021).
	International Journal of Information Management	1	Tupikovskaja-Omovie, Z., & Tyler, D. (2021).
	Psychology and Marketing	1	Yun, J.H., Lee, E.-J., & Kim, D.H. (2021).
	Journal of Interactive Marketing	1	Jai, T.-M.C., Fang, D., Bao, F.S., James, R.N., III, Chen, T., & Cai, W. (2021).
	Environment, Development and Sustainability	1	Fronza, G., Cassioli, F., Sebastiani, R., Galeone, A.B., & Balconi, M. (2021).
	Government Information Quarterly	1	Chen, T., Guo, W., Gao, X., & Liang, Z. (2021).
	Mindfulness	1	Hunkin, H., King, D.L., & Zajac, I.T. (2021).
	Behaviour and Information Technology	1	Yen, C., & Chiang, M.-C. (2021).
	Journal of Business Research	1	Esmark Jones, C.L., Hancock, T., Kazandjian, B., & Voorhees, C.M. (2022).
	International Journal of Sports Marketing and Sponsorship	1	Uhm, J.-P., Lee, H.-W., Han, J.-W., & Kim, D.-K. (2022).
	International Journal of Emerging Markets	1	Galdolage, B.S. (2022).
	Sustainability (Switzerland)	2	Ahmed, R.R., Streimikiene, D., Channar, Z.A., Soomro, H.A., Streimikis, J., & Kyriakopoulos, G.L. (2022); Chen, H.-C., Wang, C.-C., Hung, J.C., & Hsueh, C.-Y. (2022).
2023	Decision Support Systems	1	Mikalef P.; Sharma K.; Chatterjee S.; Chaudhuri R.; Parida V.; Gupta S. (2023)
2024	International Journal of Human-Computer Interaction	1	Banjar H.R.; Alsefri L.; Alshomrani A.; Hamdhy M.; Alahmari S.; Sharaf S. (2024)
	Journal of Advertising	1	Xie W.; Lee M.H.; Chen M.; Han Z. (2024)
	Big Data and Cognitive Computing	1	Šola H.M.; Qureshi F.H.; Khawaja S. (2024)
	Virtual Economics	1	Lyulyov O.; Pimonenko T.; Infante-Moro A.; Kwilinski A. (2024)

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Education Sciences	1	Šola H.M.; Qureshi F.H.; Khawaja S. (2024)
Information Processing and Management	1	Li Y.; Liu Q.; Wu J. (2024)
Humanities and Social Sciences Communications	1	Xu Z.; Liu S. (2024)
Journal of Project Management (Canada)	1	Beyari H.; Hashem T.N.; Alrusaini O. (2024)
Journal of Neuroscience, Psychology, and Economics	1	Weiß T.; Pfeiffer J. (2024)
Transportation Research Part A: Policy and Practice	1	Kuhn M.; Reit V.; Schwing M.; Selinka S. (2024)
Cogent Business and Management	1	Goncalves M.; Hu Y.; Aliagas I.; Cerdá L.M. (2024)
International Journal of Human-Computer Interaction	1	Wang P.; Feng H.; Du X.; Nie R.; Lin Y.; Ma C.; Zhang L. (2024)
Behavioral Sciences	1	Šola H.M.; Qureshi F.H.; Khawaja S. (2024)

As shown in Table 1, publications on AI–neuromarketing have increased substantially after 2019, with a pronounced concentration in the post-2021 period. The diversity of journals listed in Table 1 also indicates that AI-driven neuromarketing research spans multiple disciplines, including marketing, information systems, psychology, and sustainability-related fields. Based on these findings, the following section presents the main thematic areas that emerged from the reviewed studies, highlighting key research topics and recent trends in AI-driven neuromarketing.

4.1. Thematic Areas and Research Topics

Table 2 summarizes the thematic areas and research topics identified in the reviewed articles.

Table 2: Thematic Areas Addressed in Artificial Intelligence and Neuromarketing-Related Articles

ic Area	Research Topic	Articles	Percentage (%)
AI in Marketing and Consumer Engagement	Personalization and Virtual Agents	Esmark Jones et al. (2022), Uhm et al. (2022), Galdolage (2022), Hakim et al. (2021), Yun et al. (2021), Jai et al. (2021), Ahmed et al. (2022), Chen et al. (2022), Fronda et al. (2021), Xie et al. (2024), Mikalef et al. (2023), Šola et al. (2024)	27.9%
Neuromarketing Techniques and Consumer Behavior	Predicting Preferences and Emotional Responses	Tupikovskaja-Omovie and Tyler (2021), Tupikovskaja-Omovie and Tyler (2020), Simmonds et al. (2020), Fan et al. (2020), Pfeiffer et al. (2020), Baharom et al. (2019), Marchini et al. (2015), Chen et al. (2021), Hunkin et al. (2021), Yen and Chiang (2021), Juárez-Varón et al. (2020), Álvarez-Pato et al. (2020), Gunaratne et al. (2019), Alonso-Dos-Santos et al. (2019), Li et al. (2024), Xu and Liu (2024), Weiß and Pfeiffer (2024), Wang et al. (2024), Šola et al. (2024)	44.2%

Ethical and Acceptance Issues in AI	Ethical Guidelines and Consumer Acceptance	Tupikovskaja-Omovie and Tyler (2021), Lee et al. (2019), Wang and Hsieh (2018), Um et al. (2020), Fu et al. (2020), Chang et al. (2016), Banjar et al. (2024), Kuhn et al. (2024), Goncalves et al. (2024), Lyulyov et al. (2024), Beyari et al. (2024), Šola et al. (2024)	27.9%
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In general, the area which stimulated the greatest amount of study interest was Neuromarketing Techniques and Consumer Behavior (44.19%), indicating a strong research focus on how neuromarketing tools and methods can predict consumer preferences and measure emotional responses. The substantial portion reflects a significant interest in understanding and utilizing brain-based metrics in marketing. AI in Marketing and Consumer Engagement (27.91%) explored how AI can enhance marketing efforts and consumer interactions. Studies here examined topics such as the impact of virtual agents and the personalization of marketing experiences. A significant number of studies addressed the ethical implications and acceptance of AI in marketing (27.91%), highlighting concerns around consumer privacy and the ethical use of AI technologies in influencing consumer behavior (see Table 3).

According to the findings, a total of 240 distinct keywords were identified from the 43 research articles examined in this study. Some keywords share conceptual similarities, such as neuromarketing and neuroscience. The analysis reveals that “eye tracking,” “electroencephalography,” “internet of things,” “sales,” “self-service technology,” “machine learning,” “consumer behavior,” and “artificial intelligence” appear most frequently in the selected research articles. Based on the frequency of keywords, these dominant keywords suggest that the reviewed literature predominantly explores themes related to human-computer interaction, consumer behavior, technological advancements, and data-driven decision-making in neuromarketing and artificial intelligence applications.

Table 3: Frequent Keywords by Thematic Category

Keywords	Occurrences/Frequency
Neuromarketing	Eye Tracking (13), EEG (7), Neuroscience (3) 23
AI and Technology	Internet of Things (5), Machine Learning (3), Virtual Reality (3), Artificial Intelligence (3), Tracking (3) 14
Consumer Research	Sales (5), Consumer Behavior (3), Trust (3) 11
Cross-cutting Themes	Sustainability (3), Self-service technology, Websites (3) 4

4.2. Theoretical Background

This section presents an overview of the theoretical foundations underpinning AI and neuromarketing research, highlighting the interdisciplinary nature of the field and the diverse range of conceptual frameworks employed.

Table 4: Frequent Keywords by Thematic Category

Disciplinary Root	Theoretical Paradigm	Exemplary Studies	Percentage Rate (%)
Psychology	Arousal Theory (Schachter & Singer, 1960s)	Uhm et al. (2022)	20.93%
	Refined S-O-R Theoretical Model (Jacoby, 2002)	Jai et al. (2021)	
	Cognitive Appraisal Theories of Emotion (Smith & Ellsworth, 1985)	Lee et al. (2019)	

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	Metacognition Theory (Collective, 1970s)	Yen & Chiang (2021)	
	Circumplex Model of Affect (Russell, 1980)	Banjar et al. (2024)	
	Emotional Intelligence Theory (Goleman, 1995)	Banjar et al. (2024)	
	Dual Process Theory (Collective, 2000s)	Yen & Chiang (2021)	
	Neuroaesthetic Processing Model (Chatterjee, 2004)	Wang et al. (2024)	
	Prefrontal Asymmetry Model (Davidson et al., 1979)	Xu & Liu (2024)	
	Cognitive Load Theory (Sweller, 1988)	Šola et al. (2024); Weiß & Pfeiffer (2024)	
	Emotional Processing & Memory Encoding (Schacter, 1996)	Beyari et al. (2024)	
Cognitive Psychology	Scheme Congruity Theory (Fiske, 1980s)	Esmark Jones et al. (2022)	16.28%
	Deep Learning for EEG-Based Emotion Recognition (Alhagry et al., 2017)	Wang et al. (2024)	
	Perceptual Symbol Systems Theory (Barsalou, 1999)	Li et al. (2024)	
	Event-Related Potential (ERP) Theory (Luck, 2005)	Li et al. (2024)	
	Neuroforecasting Model (Knutson et al., 2007)	Li et al. (2024)	
Consumer Behavior	Dynamic Attention Theory (Foulsham & Kingstone, 2013)	Mikalef et al. (2023)	13.95%
	Adaptive User Assistance Systems (Morana et al., 2020)	Weiß & Pfeiffer (2024)	
	Eye-Mind Hypothesis (Just & Carpenter, 1980)	Mikalef et al. (2023); Šola et al. (2024)	
Marketing & Advertising	Hierarchy-of-Effects Model (Lavidge & Steiner, 1961)	Uhm et al. (2022)	11.63%
	Sensory Marketing Theory (Collective)	Simmonds et al. (2020)	
	Customer Participation Theory (Collective)	Fan et al. (2020)	
	Personalization in Digital Marketing (Liu-Thompkins et al., 2022)	Beyari et al. (2024)	
Mathematical Logics and Computer Science	Affective Computing (Picard, 1997)	Banjar et al. (2024)	11.63%
	Ensemble Learning for Consumer Decision Prediction (Breiman, 2001)	Mikalef et al. (2023)	
	AI-Based Visual Attention Models (Tatler et al., 2011)	Šola et al. (2024)	
Behavioral Economics	Ethical Decision-Making Theory (Schwartz, 2016)	Kuhn et al. (2024)	9.30%
	Subjective Well-being Theory (Diener & Chan, 2011)	Kuhn et al. (2024)	
	Moral Machine Experiment (Awad et al., 2018)	Kuhn et al. (2024)	

The theories used are predominantly grounded in psychology (20.93%), confirming the field's strong influence on neuromarketing and AI research. This reflects the importance of understanding consumer behavior, emotional responses, and cognitive processes. Cognitive psychology follows at 16.28%, reinforcing the role of perceptual and neural mechanisms in

marketing-related decision-making. Consumer behavior theories account for 13.95%, emphasizing the study of purchase decisions, attention patterns, and consumer engagement. Marketing and advertising theories (11.63%) highlight practical applications in persuasive communication, branding, and campaign effectiveness. Mathematical logics and computer science theories (11.63%) demonstrate an increasing reliance on AI-driven techniques such as machine learning, predictive modeling, and affective computing. Meanwhile, behavioral economics (9.30%) has gained traction in understanding ethical decision-making, subjective well-being, and biases in consumer choice.

Other disciplinary roots, including social psychology, cognitive science, and communication studies, reflect the interdisciplinary nature of AI-driven neuromarketing research. These disciplines, although individually contributing smaller proportions, collectively enrich the theoretical landscape by addressing social influences, linguistic patterns, and neurocognitive mechanisms. The diversity of theoretical paradigms suggests that AI-driven neuromarketing research is still in a developmental phase, with overlapping frameworks and no single dominant theoretical lens. Notably, several studies do not explicitly rely on a theoretical framework, highlighting the need for stronger theoretical grounding in AI-driven neuromarketing research, as also reflected in Table 4.

4.3. Research Design

In addition to sampling strategies and data sources, the reviewed studies also vary in their overall research designs, particularly regarding data collection procedures and study types, which are addressed in the following subsection.

4.3.1. Sampling/dataset

Since the majority of the studies in this review are experimental or survey-based, the limitations in sample size and representativeness are noteworthy. A substantial portion of studies still relies on relatively small sample sizes, particularly those using experimental methods (e.g., Galdolage, 2022; Jai et al., 2021; Tupikovskaja-Omovie & Tyler, 2021). When artificial intelligence analysis techniques are used, the use of large-scale secondary data becomes more prominent. In this review, primary data sources dominate the research landscape, with most studies collecting experimental, survey-based, or observational data (e.g., Pfeiffer et al., 2020; Uhm et al., 2022; Yen & Chiang, 2021). However, a limited number of studies (e.g., M. Lee et al., 2019) employed large-scale secondary datasets, such as review-based analyses. Although the results indicate that only a small fraction of studies use secondary data, this trend may evolve as AI-based neuromarketing techniques advance and enable the processing of larger datasets.

In addition, if a study used two separate datasets, both primary and secondary, the primary data source was considered the main data type during the coding process. This approach provides methodological consistency in classifying studies while also considering the increasing importance of big data and artificial intelligence-based methods in neuromarketing research. On the other hand, the participants in many studies were predominantly university students and young adults (e.g., Esmark Jones et al., 2022; Juárez-Varón et al., 2020; Uhm et al., 2022) which limits the generalizability of the findings to a broader consumer audience. A significant number of studies also used convenience sampling methods, including MTurk, social media platforms, and

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university-based recruitment (e.g., Chen et al., 2022; Fan et al., 2020; Yun et al., 2021), which may introduce sampling bias and limit external validity.

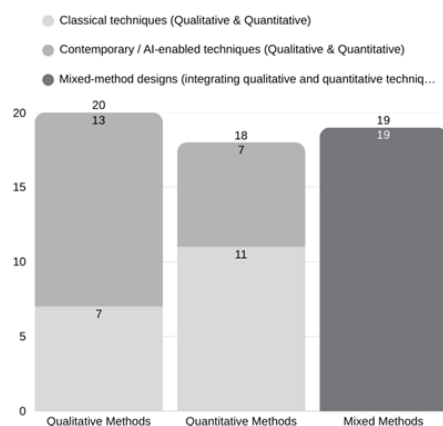
A promising trend in current studies for 2024 is the application of AI-assisted participant selection. In this method, more focused and qualified participant samples are created by using recommendation algorithms or behavioral monitoring techniques. This situation demonstrates that the trend toward artificial intelligence-based approaches in sampling processes is on the rise. This approach has the potential to increase both the representativeness of the sample and the measurement accuracy in future studies. Finally, studies such as those by Banjar et al. (2024) have begun to integrate multimodal data collection techniques, including EEG-based datasets, which highlight the growing interplay between AI, biometrics, and neuromarketing research.

Across the reviewed studies, approximately 68% employed primary datasets, while 21% combined primary and secondary sources, and only 11% relied solely on large-scale secondary data such as digital trace or review-based datasets. In sample size, nearly three-quarters of the experimental studies involved fewer than 100 participants, whereas only a handful exceeded 500 participants. Also, the most frequent recruitment channels included university-based pools (37%), online crowdsourcing platforms such as MTurk (25%), and social media users (18%), with a smaller portion targeting professionals or specific consumer segments (e.g., retail or e-commerce users). These figures confirm the dominance of convenience sampling and illustrate the limited generalizability of most existing research.

4.4. Methodological Patterns

To provide an overview of the methodological patterns identified in the reviewed studies, Figure 2 summarizes the distribution of qualitative, quantitative, and mixed research approaches. Qualitative and quantitative studies are further distinguished by classical and contemporary (AI-enabled) techniques, while mixed-method studies represent designs integrating both qualitative and quantitative approaches.

Figure 2: Distribution of Methodological Approaches and Analytical Techniques in AI–Neuromarketing Research



In Figure 2, mixed-method studies are reported as a standalone category and are not decomposed into classical or contemporary techniques, as they inherently integrate both qualitative and quantitative approaches.

The use of qualitative and quantitative research methods is not entirely balanced, with quantitative methods being slightly more prevalent (41.86%) compared to qualitative methods (37.21%) (e.g., Fan et al., 2020; Galdolage, 2022; Uhm et al., 2022). Mixed methods, which integrate both qualitative and quantitative approaches, account for 20.93% of the studies, reflecting a growing trend toward interdisciplinary research. Among the qualitative research methods, contemporary techniques such as eye tracking, text mining, AI-driven sentiment analysis, and image analysis are the most frequently used (e.g., Lee et al., 2019; Marchini et al., 2015; Tupikovskaja-Omovie & Tyler, 2021). This suggests that AI-powered tools are becoming more prominent in neuromarketing studies, providing deeper insights into consumer behavior. In the realm of quantitative research, traditional statistical methods such as ANOVA, MANOVA, regression, and structural equation modeling (SEM) remain widely used (25.6%) (e.g., Chang et al., 2016; Simmonds et al., 2020; Um et al., 2020). However, modern quantitative techniques, including fMRI, EEG, deep learning, and Bayesian statistics, represent an emerging area of interest (16.3%) (e.g., Hakim et al., 2021; Jai et al., 2021; Yun et al., 2021). This indicates a gradual shift towards AI-assisted methodologies in neuromarketing, particularly in consumer behavior prediction and decision-making models.

One of the key findings of this study is the frequent integration of qualitative and quantitative methods, particularly in neuroscientific research, where behavioral analysis is often combined with physiological data collection (e.g., EEG, fMRI) (e.g., Fronda et al., 2021; Gunaratne et al., 2019; Pfeiffer et al., 2020). This suggests that while AI and machine learning are transforming data collection, conventional statistical methods remain central in analyzing results. Furthermore, an emerging trend is the combination of AI-driven automation with human coding frameworks, particularly in studies where AI-generated data is supplemented with manual analysis to enhance accuracy and contextual depth (e.g., Fu et al., 2020; Lee et al., 2019). As AI-driven tools continue to evolve, future research may increasingly integrate fully automated AI-based analysis methods, reducing the need for human intervention in data interpretation.

On the quantitative side, classical statistics (ANOVA, MANOVA, t-tests, regression, SEM) remain prevalent (25.6% of all studies), while modern quantitative techniques such as fMRI, EEG, deep learning, and Bayesian models represent an expanding but still smaller share (16.3%).

Overall, the findings indicate a growing tendency to combine behavioral and physiological data, supported by AI-enabled analytical tools and complemented by human judgment, underscoring the continued importance of theoretical and ethical oversight.

5. DISCUSSION: GAPS, CHALLENGES, AND FUTURE RESEARCH DIRECTIONS

In line with systematic literature review guidelines, a substantial portion of SLR studies should be devoted to identifying research gaps and future research directions (Paul & Criado, 2020). This review presents findings obtained through content analysis and thematic coding methods based on publications indexed in the Scopus database. It reveals trends in application and theoretical approaches in the field. Although these tools indicate a certain level of technological maturity in the field, a closer examination reveals several methodological and conceptual gaps.

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The analysis results indicate that the most frequently employed tools in the field of neuromarketing include eye-tracking, electroencephalography (EEG), artificial intelligence-based analysis methods, self-service technologies, and the Internet of Things (IoT). These tools are beneficial for analyzing consumer behavior and interactions in digital environments, as well as for developing data-driven marketing strategies. Moreover, it is noteworthy that advanced methods, such as machine learning, artificial neural networks, functional magnetic resonance imaging (fMRI), and Bayesian statistics, are becoming increasingly used in the field. The contribution of these techniques is particularly remarkable in examining topics such as consumer decision processes, trust perception, and emotional reactions.

The increasing accessibility of AI-powered analysis tools enables researchers to produce in-depth consumer insights both in laboratory settings and on digital platforms. However, issues such as the ethical use of data, privacy, and transparency stand out as fundamental challenges in implementing these technologies. The ability of AI-based systems to interact with users not only in technical but also emotional and social contexts (Pentina et al., 2023), is giving rise to new types of consumer-AI relationships in the context of neuromarketing. Since these relationships are shaped by AI systems that are always responsive, non-judgmental, and produce personalized responses, users are more likely to develop emotional attachments to AI technologies (Brandtzaeg et al., 2022). While this situation presents opportunities for marketing strategies, it also raises ethical concerns.

Moreover, many studies remain largely tool-driven, offering limited theoretical integration beyond descriptive insights. Some suggestions for future studies can be made in light of the research findings. First, studies on the combined use of multiple methods (e.g., integration of EEG and sentiment analysis) can be developed. Second, the effects of new technologies, such as generative artificial intelligence and large language models (LLMs) in the marketing context, should be investigated more comprehensively. Third, emphasis should be placed on interdisciplinary studies that address not only the technical but also the psychological and ethical aspects of human-AI interactions. In line with these recommendations, it is possible to establish AI-supported neuromarketing research on a more holistic, ethically based, and theoretically sound basis.

This study presents a focused literature review to examine how these two disciplines are addressed together, specifically at the intersection between neuromarketing and artificial intelligence applications. However, researchers should consider some limitations. Firstly, this study only covers publications indexed in the Scopus database. Including other reputable databases, such as Business Source Complete and Web of Science (WOS), in the analysis could provide a more holistic and diverse view of the field. In addition, only published or accepted studies were examined; current studies in the preprint or peer-review process were excluded from the analysis. Although this study has several limitations, it makes a valuable contribution to future research on neuromarketing and artificial intelligence in the field of marketing. Also, it provides comprehensive literature for future studies in this field.

Although these technologies are commonly used in various marketing areas, including sales management, customer experience analysis, and chatbot applications, some techniques, such as EEG and IoT, are less studied in the literature. However, these areas may become important research focuses on the future (Plassman et al., 2015). While advanced AI methods enable the processing of large data sets and the analysis of complex consumer behavior patterns in greater

detail, most existing studies still rely on traditional statistical analysis methods. Thus, research efficiency and more accurate insights for marketing applications can be achieved by adopting contemporary techniques such as deep learning, Bayesian analysis, and hybrid methods that combine human-AI interaction.

It is essential that future research delves deeper into the application of theoretical frameworks in neuromarketing and AI research. Furthermore, integrating neuroscientific tools such as EEG with other AI-based methods, including sentiment analysis, to predict consumer behavior will contribute to the development of more accurate models. On the other hand, investigating the impact of generative AI and large language models (LLMs) on consumer interactions will also contribute to new insights. Although neuromarketing and AI research have yielded important findings on consumer decision-making processes, this area still has potential for further expansion.

The future research recommendations presented in this study are based on the findings of studies published over the last decade, in particular. Although older publications were also evaluated, the majority of the recommendations were structured on the trends and gaps in the current literature. Accordingly, the research topics suggested in Table 4 are classified according to thematic areas, usable tools, theoretical frameworks, and disciplinary origins. The framework in question was developed to guide systematic AI-supported neuromarketing research. Cognitive and attitude-related themes are most prominent, often drawing on Information Processing Theory (Atkinson & Shiffrin, 1968), and the Technology Acceptance Model marketing (Davis, 1989), to explain perception, memory, and user acceptance of AI-based. These theoretical lenses not only deepen our understanding of consumer engagement but also support the development of more effective AI-driven marketing strategies. In constructing these future research directions, a comprehensive approach was used, integrating both established theories and emerging trends. The suggested thematic areas and research topics are derived from a detailed literature review, as well as future recommendations by authors in the field. Accordingly, Table 5 synthesizes future research directions by aligning thematic areas, methodological tools, and theoretical frameworks derived from the identified gaps.

Table 5: Future Directions and Theories for Research on Ai and Neuromarketing

Thematic Area	Research Topics	Suggested Tools	Potential Theories	Reason for Use
Cognition	Memory, Perception	Neuroscientific tools	Information Processing Theory	To understand how consumers process and retain marketing information.
Attitude	Attitude change, Attitude-behavior relationships	AI tools for data analysis	Technology Acceptance Model (TAM)	Essential for understanding user acceptance of AI technologies in marketing.
Robotics	Human-robot interaction, Humanoid robots	AI algorithms	Social Cognitive Theory (SCT)	Analyzes how consumers learn about and adopt new technologies through social interactions and media.
Internet of Things	Automation of systems, Patient monitoring	IoT devices	Diffusion of Innovations Theory	Guides effective communication and implementation strategies for AI technologies and marketing innovations.

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AI Marketing and Consumer Engagement	Enhancing consumer engagement, Personalization	AI for data analysis, virtual agents	Technology Acceptance Model (TAM)	Essential for understanding user acceptance of AI technologies in marketing.
Neuromarketing Techniques and Consumer Behavior	Predicting consumer preferences, Measuring emotional responses	EEG, Eye tracking tools	Theory of Mind (TOM)	To gain deeper insights into consumers' subconscious reactions to marketing stimuli.

While this study provides an initial assessment of neuromarketing and AI on consumer behavior, the actual impact of these tools in the marketing literature remains limited. Thus, more research is needed to comprehensively understand the impacts of neuromarketing and AI on consumer behavior research. Despite these limitations, this review provides a structured and forward-looking synthesis of AI and neuromarketing research.

6. CONCLUSION

This systematic literature review examines studies that investigate the application of artificial intelligence (AI) and neuromarketing techniques in marketing research. This study highlights the significant influence of AI on neuromarketing research and digital consumer analytics and its potential to reshape the future of marketing literature. By offering a structured synthesis and forward-looking research agenda, this review contributes to the consolidation of AI-driven neuromarketing as a theoretically grounded and ethically informed research domain.

The main contribution of this study is to systematically analyze the artificial intelligence and neuromarketing literature and provide a structural synthesis of the current state of the field. First, thematic areas, methodological approaches, and theoretical frameworks addressed in previous studies were determined; thus, a general map of the literature was presented to researchers. Secondly, the research designs, data collection methods, and analysis techniques used in AI-focused neuromarketing research have been thoroughly evaluated; thus, the strengths and limitations of current applications have been identified. Thirdly, new conceptual expansions and research gaps have emerged in the field, aiming to guide future research by considering both classical and contemporary approaches together. Finally, thematic trends and topics that have emerged at the intersection of neuromarketing and AI have been identified; thus, an interdisciplinary roadmap has been presented for researchers interested in the field.

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