

How AI and Machine Learning Are Changing Marketing: A 25-Year Research Review

Tamer M. Alkadsh

*Department of Marketing & Media
Technologies, College of
Communication and Media
Technologies, Gulf University,
Sanad, Bahrain*
dr.tamer.alkadash@gulfuniversity.edu.
bh

Zainab Fatima Abbas

*Department of Marketing & Media
Technologies, College of
Communication and Media
Technologies, Gulf University,
Sanad, Bahrain*
230104100418@gulfuniversity.edu.bh

**Dana Abdelhakim Ahmad
Abuhajir**

*Department of Marketing & Media
Technologies, College of
Communication and Media
Technologies, Gulf University,
Sanad, Bahrain*
230507100611@gulfuniversity.edu.b
h

**Khalid Jaafar Mohamed Hewaishel
Almesaiadeen**

*Department of Marketing & Media
Technologies, College of
Communication and Media
Technologies, Gulf University,
Sanad, Bahrain*
240507101554@gulfuniversity.edu.bh

Abstract— This paper presents a systematic review of how Artificial Intelligence (AI) and Machine Learning (ML) have transformed marketing practices between 2001 and 2025. Through the analysis of 439 peer-reviewed studies, we map the intellectual progression of AI/ML in marketing, identifying dominant themes, influential works, and emerging gaps in the literature. The findings reveal a significant surge in research output after 2017, with notable contributions from countries such as India, China, and the United States. Key focus areas include personalized consumer engagement, predictive analytics, programmatic advertising, and the ethical implications of automated marketing systems.

Our review highlights the prevalent use of established theoretical frameworks like the Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT), indicating a strong foundation in adoption-focused studies. However, newer innovations such as generative AI, real-time adaptive marketing, and the integration of AI in small and medium enterprises (SMEs) remain underexplored. Importantly, ethical considerations—including algorithmic transparency, data privacy, and bias mitigation—are increasingly acknowledged but require deeper empirical and practical attention.

By synthesizing 25 years of research, this study not only charts the evolution of AI/ML in marketing but also proposes actionable directions for future inquiry. These include fostering cross-cultural studies, developing scalable AI solutions for SMEs, and advancing ethical frameworks for responsible AI deployment. This review serves as an essential resource for students, academics, and marketing professionals seeking to understand the current state and future potential of AI-driven marketing in an increasingly digital and data-centric business landscape.

I. INTRODUCTION

AI has been defined as the broader concept of machines designed to perform tasks that typically require human intelligence, while ML is a subset of AI focused on algorithms that enable computers to learn from and make decisions based on data. Due to this, it matters today because customers expect personalisation and speed, AI improves efficiency, ROI, and competitive edge and unlocks new capabilities (such as content generation and real-time optimization) [1]. The advent of Artificial Intelligence (AI) and Machine Learning (ML) in digital marketing in the past couple of decades has been marked with a shift from manual reporting to automated, learning systems shaping customer experience (CX) [2]. This has been observed with move from basic rules and analytics, to big data and supervised learning, to deep learning to today's foundation models, and real time personalisation. The ever need of hyper personalisation is fuelled from the explosion of large consumer generated data and it requires optimised techniques for managing large data set to make actionable decisions. These are the enablers of the artificial intelligence, machine learning, computer vision tools in the digital marketing applications [3]. There are adoption differences across various industries including retail, finance and healthcare. North America, Europe and other developed economies there is higher adoption in large firms as compared to the smaller ones. The integration of these technologies have changed the way marketing campaign are carried out, reaching and connecting to the target audience allowing them to experience personalised offerings and overall loyalty [4]. Now it is essential for the businesses to deliver more relevant, efficient, and scalable customer experiences to remain meaningful in the current business environment, the businesses are exploiting disruptive technologies to efficiently manage the marketing programs and drive maximum outcome [5], [6].

The integration of AI and ML in marketing enhances effectiveness through data driven support, fast and more precise decision making. In addition, it enables personalisation at large scale level, yield actionable insights, and continuous optimisation.

This study aims to answer the following key research questions by utilising the bibliometric techniques:

1. What are the intellectual foundations such as annual publication, most influential documents, most prolific authors, most contributing country etc. and emerging themes in artificial intelligence (AI) marketing literature?

2. What are the key theoretical, contextual, characteristic and methodological dimensions of the research in artificial intelligence (AI) in marketing applications?

3. What are the probable research directions for future expansion of the understanding of artificial intelligence (AI) in marketing applications?

II. RESEARCH METHODOLOGY

To understand the current situation and forecast likely future research exploration on the adoption of machine learning techniques in marketing applications this study used a variety of approaches. In order to understand the current state of the field we performed a state-of-the-art bibliometric analysis and a network analysis to identify evolving clusters that indicated emerging research themes.

A. Search Strategy and Screening Protocol

This review adhered to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA 2020) guidelines to ensure methodological transparency and replicability [7]. The literature search was conducted on March 10, 2025, using the Scopus database, a robust and comprehensive source for social science and interdisciplinary research, indexing over 90,000 peer-reviewed journals [8].

This review utilized Scopus as the sole database due to its extensive coverage of peer-reviewed journals in marketing and technology fields, robust and exportable metadata structure essential for bibliometric and network analysis, and established reliability in high-impact systematic reviews. Scopus provides a comprehensive, curated, and reproducible dataset that aligns with PRISMA 2020 guidelines, ensuring methodological rigor while managing the scope of a 25-year interdisciplinary mapping study.

The following Boolean search string was applied to the TITLE-ABS-KEY fields:

("machine learning" OR "deep learning" OR "supervised learning" OR "unsupervised learning" OR "reinforcement learning" OR "neural networks" OR "artificial intelligence" OR "predictive analytics")

AND

("marketing" OR "digital marketing" OR "consumer behavior" OR "customer experience" OR "customer segmentation" OR "targeted marketing" OR "marketing analytics" OR "marketing strategy" OR "brand management" OR "advertising")

Inclusion Criteria

- Peer-reviewed journal articles, conference papers, and book chapters.
- English language only.
- Publication date range: 2001–2025.
- Primary focus on the adoption, application, or impact of ML/AI in marketing contexts.

Exclusion Criteria

- Non-English publications.
- Document types such as editorials, notes, short surveys, letters, and errata.
- Studies focused solely on technical/algorithmic aspects without clear marketing application or relevance.
- Duplicate records.

Screening Procedure

- Identification: All records retrieved from Scopus were compiled into a master spreadsheet.
- Deduplication: Duplicates were removed using Scopus's built-in deduplication and manual verification in Excel.
- Title/Abstract Screening: Two independent reviewers screened titles and abstracts against inclusion/exclusion criteria.
- Full-Text Screening: Potentially relevant documents were assessed in full text to confirm eligibility.
- Consensus and Final Inclusion: Discrepancies were resolved through discussion between reviewers. The final dataset was validated for thematic consistency.

III. RESULTS

A. Bibliometric analysis and discussion

The bibliometric data below is based on 439 documents measured on various metrics depicted in Table 1. Following the approach for bibliometric analysis, proposed by [9], the data is explored and analysed.

TABLE I. DATA CHARACTERISTICS

Main information about data	
Timespan	2001:2025
Sources (Journals, Books, etc)	318
Documents	439
Annual Growth Rate %	13.05
Document Average Age	4.39
Average citations per doc	14.34
Keywords Plus (ID)	2564
Author's Keywords (DE)	1303
Authors	1426
Authors of single-authored docs	45
Single-authored docs	45
Co-Authors per document	3.68
International co-authorships %	17.92
article	166
book	4
book chapter	22
conference paper	245
conference review	2

In Table 1 it is observed that materials analysed cover a 24-year period from 2001 to 2025. Most notably, there are 318

sources which include but are not limited to journals and books. The annual increase of the data has been about 13% while “document average” age is just over 4 years. Furthermore, average citations per document have been about 14%. In terms of “Keywords Plus (ID)”, which are keywords extracted from cited article titles through a Web of Science algorithm, it is revealed that they amount to 2564. Stemming from a total of 1426 authors, Author’s Keywords (DE), keywords supplied by authors themselves, reached 1303 with authors of single-authored work being 45. This suggests a high level of thematic diversity and strong collaboration culture. In summary it could be inferred that the field is showing evidence of growth possibly through increased interest in the research domain except for conference reviews which appear to be relatively low. The following chart presents the publication trend of the output.

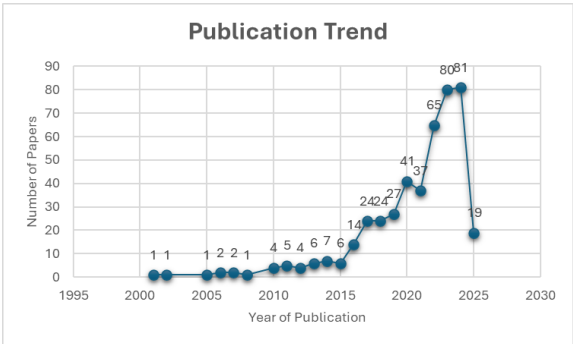


Fig. 1. Publication trend

Figure 1 illustrates the publication trend for the 2001-2025 period. It is thus observed that over a 24-year period, a steady increase in papers is evident with the highest starting from around 2017 and the greatest spike appearing just after 2020. Additionally, post 2020, possibly around 2021, the highest increase in output is observed. Then just about 2024, publication of papers becomes stagnant with the greatest decline appearing all the way up to 2025. The section that follows illustrates the top 10 scholars based on h-index, total citations and the number of papers published.

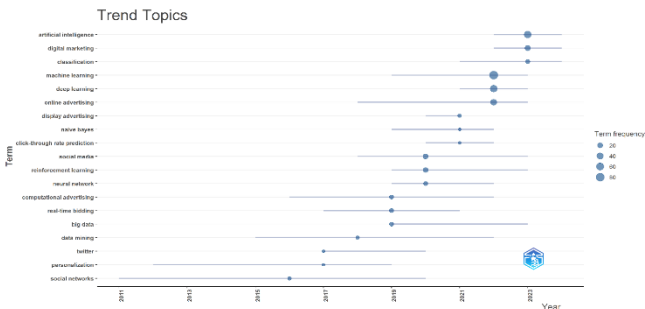


Fig. 2. Trend Topics

Figure 2 above presents the trend topics each year from 2011 to 2023. In recent years, “artificial intelligence” is observed as the most dominate trend topic and this is from around 2022. It is closely followed by “digital marketing” and “classification” also appearing within the same time.

This shows the growing interest in these topics in recent years. On the lower end of the spectrum, “social networks”, “personalization” and “twitter” all appear with frequencies of less than 20, possibly indicating a declining interest likely due to exhaustion or saturation. In summary, this visual timeline not only showcases the rise and fall of certain topics but how the research priorities have evolved over the years. The following section presents the word cloud for research themes in Fig. 5.



Fig. 3. The word cloud

This word cloud depicted in Figure 3 is based on keyword frequency extraction illustrating the most occurring terms within a particular research domain in terms of literature. The most dominant theme is marketing followed by machine learning and artificial intelligence. These are likely core themes in literature within a particular space. Other themes that appear to also be relevant but are slightly less-dominant include advertising (American English), deep learning and learning systems which likely suggests that these are emerging themes within the research domain. Lastly, commerce, machine-learning and advertising (British English).

B. Network Analysis

A network analysis was conducted to examine co-authorship structures and collaboration patterns in AI/ML marketing research to provide insights into knowledge diffusion and institutional connectivity within the field. This was done to enhance descriptive bibliometric indicators.

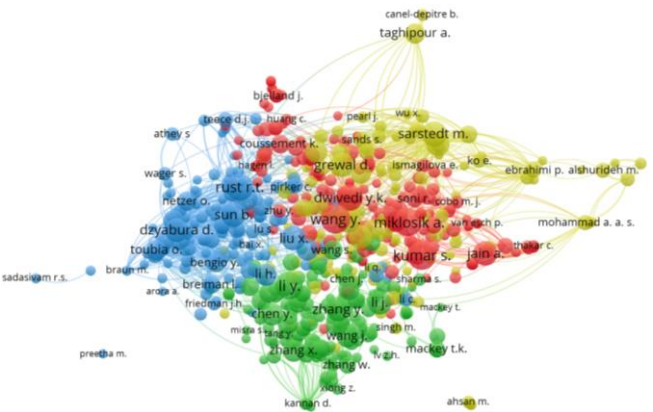


Fig. 4. Co-Authorship Analysis

Co-authorship analysis is a technique to study collaboration dynamics amongst researchers, institutions, countries etc. by counting at the combined authorship and present the patterns as a clusters [13]. We have used VOSviewer application to create and visualize the research collaboration cluster in the domain of machine learning in marketing. The analysis was conducted by keeping threshold values as number of articles per author to 3 and number of citations to 5. The network obtained is based on the four clusters as shown in Fig. 4

Cluster 1: Digital marketing and ethics (red)

This is the largest cluster of the network and made up of 181 authors. This cluster focuses on digital transformation and ethical aspects of adoption of AI. The most prominent authors of this cluster are Dwivedi Y.K., Ismagilova E., and Alshurideh M., their work investigate the important aspects of adoption of disruptive technologies in marketing and their ethical considerations such as marketing in the metaverse platform [10], [11]. This cluster investigated the important issues such as data privacy, algorithmic bias, and consumer trust in AI driven marketing applications [12].

Cluster 2: Emerging markets and cross-cultural studies (green)

This cluster is the second largest cluster of the network and contains 162 authors who focus on the technical aspects of the applications of machine learning techniques in marketing. Some of the key authors of this cluster are Wang Y., Zhang Y., and Ebrahimi P. who have published many articles on the topics of applications of local ML technologies & algorithms in emerging economies [13], [14]. This cluster further investigates the influence of cultural, economic, and infrastructural factors on the effectiveness of machine learning techniques in marketing program & applications.

Cluster 3: Applications of ML techniques in marketing (blue)

This cluster consists of 143 authors and focuses on the strategic application of machine learning techniques in marketing applications. The most prominent authors of this cluster are Bengio Y., Friedman J.H., and Huang C. they have studied and published the potential applications of the ML algorithms to leverage in various activities of marketing [15]. The scholars in this cluster have collaborated to develop, reiterate and refine ML algorithms such as neural networks, deep learning algorithms, and predictive analytics & modeling to apply in critical marketing activities [16].

Cluster 4: Consumer behavior and personalization (yellow)

The last and smallest cluster of this network contains 132 authors working on the critical aspects of the application of ML techniques in consumer behavior and hyper-personalization. The most dominant authors who collaborate to study and understand the applications of ML techniques in the consumer behavior analysis that in turn lead to unique personalization are Rust R.T., Grewal D., and Sarstedt M. Some of the important studies in this cluster shows the successful implementation of ML techniques to comprehend the complex customer preferences, behavior and predict

probable purchasing habits based on big data analytics and key insights [17].

Keywords C-occurrence analysis

The keyword co-occurrence analysis is presented in fig 5, it is generated using VOSviewer application by keeping the minimum word frequency of 10 i.e. words having frequencies less than 10 are not included in the analysis. The network is made of three clusters which show the dominant keywords in the respective domain of research in the application of ML techniques in marketing applications.

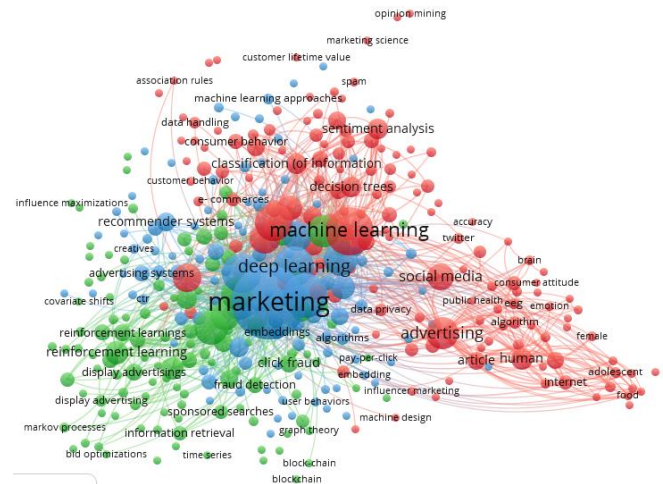


Fig. 5. Keywords C-occurrence Analysis

Cluster 1: ML applications in consumer behavior research (Red)

The largest cluster of this network is made up of 144 keywords and focuses on the use of machine learning techniques for gaining deeper consumer insights that can help in better product and services offerings and managing the customers efficiently. Some of the prominent keywords in this cluster include customer lifetime value, consumer behavior, sentiment analysis, decision trees, classification, deep learning, social media, twitter, and consumer behavior etc. This cluster also includes keywords like Predictive modeling that specify the application of ML techniques in categorizing customer segments [18], predicting churn [19]; Behavioral analysis such as sentiment analysis of reviews [20], decision trees for purchase patterns [21] and Value optimization such as calculating customer lifetime value (CLV) [22]. This cluster is depicting the exploitation of machine learning techniques to solve the complex marketing problems and manage the customers profitably [23].

Cluster 2: Application of ML in digital advertising (green)

This is the second largest of this network and contains 115 keywords such as machine learning, reinforcement learning, recommender systems, display advertising, and bid optimizations. It focuses on the application of machine learning techniques in advertising and marketing [24], [25]. The applications include ad placements optimization, content design, and help in better user engagement through evolutionary algorithms [26]. This cluster also focuses on a very important aspect of digital advertising i.e. fraud

detection techniques for ads by identifying click fraud in pay-per-click campaigns.

3.4.3 Cluster 3: Marketing and data protection (blue)

This cluster is the smallest cluster of this network and contains 111 keywords, some of the most dominant keywords includes marketing science, data privacy, pay-per-click, influencer marketing, and customer lifetime value, covariate shifts, embeddings, algorithms, global media etc. that focuses on the growing importance of data privacy while adopting the modern ML techniques for marketing success and better customer satisfaction [20], [27]. This cluster also shed light on the technical aspects such as data quality for handling covariate shifts in dynamic markets, privacy-preserving ML for embeddings of anonymized user data and algorithmic accountability for combating bias in ad delivery [20], [27], [28].

IV. FUTURE RESEARCH DIRECTIONS

In the current study, we encourage future researchers to use alternative methodologies to address and answer relevant questions in the area. Focusing on hyper personalization using Deep Learning (DL) for enhancing individual targeting with transformer-based models related to adjusting and modifying real time to user behaviour. Emotional aware marketing such as using Artificial Intelligence (AI) to evaluate customer emotions from multimodal data and tailor making marketing content. Further to this, zero party data can be investigated with a clear focus on how Artificial Intelligence (AI) will be used to infer preferences to data privacy. This may include using next-best-action models to develop Machine Learning (ML) algorithms which optimize sequential customer decision making across different customers' lifecycles. Marketing interventions using causal inferences can be actioned through Machine Learning (ML) to enhance the treatment of effects of campaigns.

Artificial intelligence ethics, privacy and fairness in marketing, thus using bias detection methodologies in digital advertising algorithms, which may include how Machine Learning (ML) reinforces societal biases and how to reduce them in digital advertising efforts and digital marketing campaigns. To add to this, federated learning for privacy-conscious personalization, and explainable artificial intelligence for marketing decision making using black box models interpretable to managers and compliance with regulation. Conversational Artificial Intelligence and customer engagement need to be adopted, by checking on how advanced chatbots and virtual assistants can be used for automated customer service and product discovery in electronic commerce and digital marketing. Image and voice search optimization for more enhanced customer interaction, and human-Artificial Intelligence (AI) in sales mainly focusing on trust, persuasion, and effectiveness.

Future researchers can go an extra mile in investigation of Artificial Intelligence (AI) generated ads, slogans, and visuals can influence customer perceptions and brand equity. A/B testing of synthetic content for generation and optimization of multiple content variations autonomously, as well as managing and identifying virtual brand ambassadors vs synthetic influencers. Using Natural Language Processing (NLP) for social listening to detect shifting sentiments, brand threats and emerging trends from unstructured online data. Mapping, classifying and clustering ecosystems of

competitors using unsupervised public open data, and scenario simulation application to test digital marketing strategies. Decision support for Artificial Intelligence-augmented marketing. This may include but is not limited to campaign planning using cognitive automation for designing, executing and refining strategies, modelling digital twin of the customer for insights and experimentation, examining Artificial Intelligence (AI) and human decision synergy. Application of multimodal Machine Learning (ML) for unified customer reviews, cross channel attribution, Internet of Things (IoT) and smart environments (smart homes and digital retailing). Promotion and dynamic pricing through Reinforcement Learning (RL), real time customer segmentation and context-aware (location, time, device and mood) marketing

V. CONCLUSION AND LIMITATIONS

To wrap up, bibliometric techniques offer a descriptive strategy to evaluate research productivity, influence, and thematic clusters, Theories, Contexts, Characteristics, and Methodologies (TCCM) framework provides a comprehensive tool to evaluate theoretical development, contextual relevance, specific characteristics, and methodological consistency. Potential limitations of the currently used integrated methodology include data source limitations, citation-based biases, limited theoretical insights and superficial engagement, underemphasis on practical relevance and overly prescriptive structures. However, no matter if there is so much priorly published work on integrated Artificial Intelligence (AI), Machine Learning (ML) and marketing applications based on common primary and secondary research methodologies, some of the least used approaches can be used predictively in future to explore deeper insights in this domain. Researchers can apply scientometrics, altimetrics, content analysis and topic modelling, citation analysis, co-authorship and collaboration analysis, text mining, network analysis, bibliographic coupling, temporal or evolutionary analysis, and these can be achieved using relevant tools such as Dimensions.ai, LDA, BERT, Gephi, Pajek etc. On the other hand, the TCCM approach can help map out the growth of the research area, showing which topics, theories, and authors are shaping the field and help explore the new avenues in this domain.

REFERENCES

- [1] M. Wasiq, A. Bashar, B. Nyagadza, and A. Johri, "Deciphering the evolution of metaverse-A techno-functional perspective in digital marketing," *Int. J. Inf. Manag. Data Insights*, vol. 4, no. 2, p. 100296, 2024.
- [2] M. Wasiq *et al.*, "Adoption and applications of blockchain technology in marketing: A retrospective overview and bibliometric analysis," *SUSTAINABILITY*, vol. 15, no. 4, p. 3279, 2023.
- [3] L. Ma and B. Sun, "Machine learning and AI in marketing – Connecting computing power to human insights," *Int. J. Res. Mark.*, vol. 37, no. 3, pp. 481–504, 2020, doi: 10.1016/j.ijresmar.2020.04.005.
- [4] L.-T. Nguyen, T.-Q. Dang, and D. T. V. Duc, "The Dark Sides of AI Advertising: The Integration of Cognitive Appraisal Theory and Information Quality Theory," *Soc. Sci. Comput. Rev.*, vol. 43, no. 2, pp. 397–424, 2025, doi: 10.1177/08944393241258760.

- [5] F. Li and G. Xu, "AI-driven customer relationship management for sustainable enterprise performance," *Sustain. Energy Technol. Assessments*, vol. 52, 2022, doi: 10.1016/j.seta.2022.102103.
- [6] B. Frank, B. Herbas-Torrico, and S. J. Schvaneveldt, "The AI-extended consumer: Technology, consumer, country differences in the formation of demand for AI-empowered consumer products," *Technol. Forecast. Soc. Change*, vol. 172, 2021, doi: 10.1016/j.techfore.2021.121018.
- [7] D. Adams, "Virtual Retail in the Metaverse: Customer Behavior Analytics, Extended Reality Technologies, and Immersive Visualization Systems," *Linguist. Philos. Investig.*, vol. 21, pp. 73–88, 2022, doi: 10.22381/lpi2120225.
- [8] M. R. Rabbani, A. Bashar, I. T. Hawaldar, M. Shaik, and M. Selim, "What do we know about crowdfunding and P2P lending research? A bibliometric review and meta-analysis," *J. Risk Financ. Manag.*, vol. 15, no. 10, p. 451, 2022.
- [9] M. Wasiq, A. Bashar, B. Nyagadza, and A. Johri, "Deciphering the evolution of metaverse," *Int. J. Inf. Manag. Data Insights*, vol. 4, no. 2, p. 100296, 2024, doi: 10.1016/j.ijime.2024.100296.
- [10] V. Arya, R. Sambyal, A. Sharma, and Y. K. Dwivedi, "Brands are calling your AVATAR in Metaverse—A study to explore XR-based gamification marketing activities & consumer-based brand equity in virtual world," *J. Consum. Behav.*, 2023, doi: 10.1002/cb.2214.
- [11] Y. K. Dwivedi *et al.*, "Metaverse beyond the hype: Multidisciplinary perspectives on emerging challenges, opportunities, and agenda for research, practice and policy," *Int. J. Inf. Manage.*, vol. 66, 2022, doi: 10.1016/j.ijinfomgt.2022.102542.
- [12] A. M. K. Alkhazaleh and M. Al-Dwiry, "To what extent does financial leasing has impact on the financial performance of Islamic Banks: A case study of Jordan," *Acad. Account. Financ. Stud. J.*, vol. 22, no. 1, 2018, [Online]. Available: <https://www.scopus.com/inward/record.uri?eid=2-s2.0-85042637749&partnerID=40&md5=7fe41cebad94cf00395fe36b967f80b3>
- [13] E. Christodoulou and A. Gregoriades, "Applying Machine Learning in Personality-based Persuasion Marketing," in *IEEE International Conference on Data Mining Workshops, ICDMW*, W. J., H. Y., D. T.N., G. C., Q. M., and P. W., Eds., Cyprus University of Technology, Department of Management, Entrepreneurship and Digital Business, Limassol, Cyprus: IEEE Computer Society, 2023, pp. 16–23. doi: 10.1109/ICDMW60847.2023.00010.
- [14] S. Chattopadhyay, C. Kayal, and S. Abrol, "VAM: Value Propensity Score For User Acquisition Marketing Campaign," in *IEEE International Conference on Data Mining Workshops, ICDMW*, W. J., H. Y., D. T.N., G. C., Q. M., and P. W., Eds., Rakuten Institute of Technology, Bangalore, India: IEEE Computer Society, 2023, pp. 8–15. doi: 10.1109/ICDMW60847.2023.00009.
- [15] B. Youngmann, E. Yom-Tov, R. Gilad-Bachrach, and D. Karmon, "Algorithmic copywriting: automated generation of health-related advertisements to improve their performance," *Inf. Retr. J.*, vol. 24, no. 3, pp. 205–239, 2021, doi: 10.1007/s10791-021-09392-6.
- [16] J. Radesky *et al.*, "Digital advertising to children," *Pediatrics*, vol. 146, no. 1, 2020, doi: 10.1542/peds.2020-1681.
- [17] M. A. Naeem, S. Karim, M. R. Rabbani, A. Bashar, and S. Kumar, "Current state and future directions of green and sustainable finance: A bibliometric analysis," *Qual. Res. Financ. Mark.*, vol. 15, no. 4, pp. 608–629, 2023.
- [18] A. Thakkar, "The intriguing possibilities of generative AI in marketing," in *Advances in Business and Management*, vol. 23, Faculty of Management Studies, Parul University, Waghodia, Vadodara, India: Nova Science Publishers, Inc., 2024, pp. 161–178. [Online]. Available: <https://www.scopus.com/inward/record.uri?eid=2-s2.0-85198419697&partnerID=40&md5=34a19aa9104407c123bb9f2f6e81df93>
- [19] B. Gulnara, S. Guldana, and A. Yerassyl, "Application of Recommended Systems for E-commerce," in *Procedia Computer Science*, S. E., Ed., Dept. of Computer engineering, IITU, Almaty, Kazakhstan: Elsevier B.V., 2024, pp. 329–334. doi: 10.1016/j.procs.2023.12.212.
- [20] I. Sharma and S. Sharma, "Cognitive Privacy of Personalized Digital Finance Images on Social Media Platforms Using Artificial Neural Networks," in *2023 4th International Conference for Emerging Technology, INCET 2023*, Graphic Era Deemed to Be University, Department of Computer Science and Engineering, Dehradun, India: Institute of Electrical and Electronics Engineers Inc., 2023. doi: 10.1109/INCET57972.2023.10170426.
- [21] B. Alexander, M. Blazquez, and C. Chrimes, "Metaverse retailing and the customer experience journey: a case study approach," *Int. J. Retail Distrib. Manag.*, vol. 53.0, no. 4, 2025.
- [22] L. Abidar, D. Zaidouni, I. El Asri, and A. Ennouaary, "Predicting Customer Segment Changes to Enhance Customer Retention: A Case Study for Online Retail using Machine Learning," *Int. J. Adv. Comput. Sci. Appl.*, vol. 14, no. 7, pp. 910–920, 2023, doi: 10.14569/IJACSA.2023.0140799.
- [23] Q. Wang, X. Li, X. Yan, and R. Li, "How to enhance consumers' purchase intention in live commerce? An affordance perspective and the moderating role of age," *Electron. Commer. Res. Appl.*, vol. 67, 2024, doi: 10.1016/j.elerap.2024.101438.
- [24] A. Verma, A. Singh, G. Verma, A. Yadav, and A. Sharma, "A Performance Study of the Naive Bayes Classifier in Advertisement Analysis," in *Proceedings of International Conference on Communication, Computer Sciences and Engineering, IC3SE 2024*, Ajay Kumar Garg Engineering College, Department Of It, Uttar Pradesh, Ghaziabad, India: Institute of Electrical and Electronics Engineers Inc., 2024, pp. 618–624. doi: 10.1109/IC3SE62002.2024.10593497.
- [25] S. E. V. S. Pillai, "Identifying Sponsored Content and Misleading Information in Native Advertising," in *IEEE International Conference on Data Engineering and Communication Systems, ICDECS 2024*, University of North Dakota, School of Electrical Engineering and Computer Science, Grand Forks, United States: Institute of Electrical and Electronics Engineers Inc., 2024. doi: 10.1109/ICDECS59733.2023.10502608.
- [26] M. A. M. Ali, A. Basahr, M. R. Rabbani, and Y. Abdulla, "Transforming Business Decision Making with Internet of Things (IoT) and Machine Learning (ML)," *Institute of Electrical and Electronics Engineers (IEEE)*, Jan. 2021, pp. 674–679. doi:

10.1109/dasa51403.2020.9317174.

- [27] A. White *et al.*, “Privacy-Friendly ID-Free Digital Ad Targeting using URL Embeddings,” in *Proceedings - 2020 IEEE International Conference on Big Data, Big Data 2020*, W. X., J. C., X. L., H. X.T., K. O., L. S., X. W., A. S., Z. C., A.-M. E., C. Z., and S. J., Eds., Dstillery, New York City, United States: Institute of Electrical and Electronics Engineers Inc., 2020, pp. 1720–1725. doi: 10.1109/BigData50022.2020.9378394.
- [28] L. M. de Cosmo, L. Piper, and A. Di Vittorio, “The role of attitude toward chatbots and privacy concern on the relationship between attitude toward mobile advertising and behavioral intent to use chatbots,” *Ital. J. Mark.*, vol. 2021, no. 1–2, pp. 83–102, 2021, doi: 10.1007/s43039-021-00020-1.