

AI for Audience Targeting and Segmentation: Emerging Trends in Data Analytics

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Abstract— The proliferation of digital touchpoints has produced volumes of behavioral, transactional, and contextual data that traditional rule-based marketing segmentation methods are increasingly unable to process effectively. Artificial intelligence has emerged as the dominant paradigm for transforming this data deluge into actionable audience insight, enabling marketers to move from static demographic segments toward dynamic, behavior-driven clusters that update continuously as new signals arrive. This paper examines emerging trends in AI-based audience targeting and segmentation, synthesizing findings from recent literature on machine learning clustering techniques, predictive analytics, natural language processing, and autonomous agentic systems applied to marketing. The paper presents a structured framework that categorizes AI-driven segmentation approaches into descriptive, predictive, and prescriptive layers, and discusses how unsupervised algorithms such as K-means and DBSCAN are combined with supervised predictive models to generate segments that are both statistically coherent and commercially actionable. A comparative analysis of AI-driven and traditional segmentation approaches, informed by patterns reported across the reviewed studies, indicates measurable gains in targeting precision and campaign conversion outcomes. The discussion addresses data quality, algorithmic bias, interpretability, and privacy regulation as recurring constraints on responsible deployment, and situates the rise of autonomous AI agents within a broader trajectory toward hyper-personalized, real-time marketing systems.

The paper concludes that while AI substantially improves the precision and adaptability of audience targeting, its long-term value depends on organizations pairing technical capability with interpretability safeguards and privacy-conscious data governance.

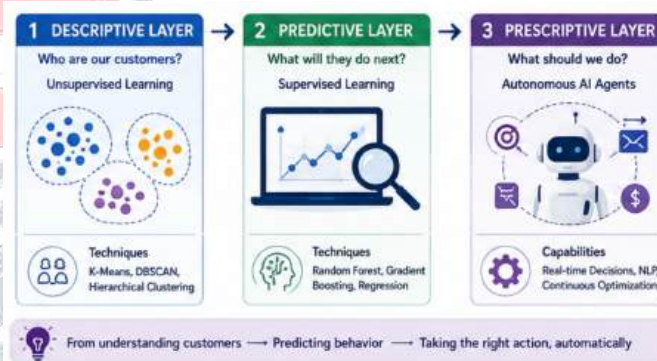
Keywords— artificial intelligence, audience segmentation, targeted marketing, predictive analytics, machine learning, data analytics, personalization

INTRODUCTION

Marketing organizations have long relied on segmentation to divide heterogeneous customer bases into more manageable and addressable groups, historically using demographic and geographic variables that were straightforward to collect but only loosely correlated with actual purchasing behavior. As digital channels multiplied and customer interactions generated continuous streams of behavioral, transactional, and contextual data, the limitations of static, manually defined segments became increasingly apparent. Customers who share a demographic profile frequently exhibit divergent purchasing intent, and campaigns built on such coarse groupings routinely underperform relative to the granularity that modern data actually permits.

LITERATURE REVIEW

Research on AI-driven audience segmentation has expanded rapidly since the early 2020s, moving from broad conceptual treatments of AI's marketing potential toward increasingly specific technical frameworks. The 2022 literature-based study by Haleem, Javaid, Qadri, Singh, and Suman remains a widely cited reference point for cataloguing the breadth of AI marketing applications, documenting how AI systems support demand generation, customer engagement, and automated campaign optimization while noting that marketers use AI to increase client demand and that data is critical for improving the patterns of material recommended to customers by machine learning algorithms. This study is useful as a scoping reference because it maps the wider landscape within which audience segmentation and targeting sit, situating segmentation as one application among several AI-enabled marketing functions rather than an isolated technique.



More recent work has examined the specific machine learning techniques underlying modern segmentation systems. A 2025 study applying K-means clustering and Local Interpretable Model-Agnostic Explanations to the Mall Customer Dataset developed a segmentation framework that incorporated purchasing behavior during specific events, individual preferences, and demographic norms, using the Elbow Method and Silhouette Score to determine the optimal number of clusters. This study is notable for pairing an unsupervised clustering technique with an explainability method, directly addressing the interpretability concerns that recur throughout the broader literature on AI-driven decision systems.

A parallel line of research has examined predictive analytics as the layer that converts descriptive segments into forward-looking, actionable targeting strategies. A 2024 study on AI-driven customer segmentation reported a twenty percent higher conversion rate for AI-driven segmentation relative to traditional approaches, interpreting this result as evidence that AI-driven segmentation not only improves efficiency but also enhances accuracy, since analyzing more complex data including behavioral patterns and predictive analytics allows AI

Artificial intelligence has addressed this gap by enabling segmentation models that learn directly from behavioral signals rather than relying on predefined categories. Industry-facing analysis of AI audience segmentation describes it as the use of machine learning to group people into marketing audiences based on behavioral signals, attributes, and predicted intent, with the added capability of keeping those groupings current as new data continuously arrives. This shift from static to dynamic segmentation represents one of the more consequential changes in marketing analytics over the past decade, and it has been accompanied by a parallel shift in how targeting itself is executed, moving from broad campaign-level targeting toward individualized, real-time personalization.

Academic interest in this shift has grown accordingly. A 2022 literature-based study of AI applications in marketing observed that AI-integrated systems enable marketers to track purchase patterns and deliver customized marketing messages, positioning AI as a source of competitive advantage through automated decision-making and micromanagement of customer engagement at scale since customers experience a positive user experience through integrated applications that employ machine intelligence, which tracks purchases including where and when they occur and analyzes this data to provide customized marketing messages. This capability sits within a broader movement toward strategic use of big data analytics across organizational functions, with foundational information systems research framing analytics value creation as a socio-technical capability that extends well beyond any single tactical application.

This paper reviews recent literature on AI-driven audience targeting and segmentation, identifies the technical approaches most consistently reported across studies, and proposes a structured framework distinguishing descriptive, predictive, and prescriptive layers of AI-based segmentation. The paper then discusses emerging trends, including the rise of autonomous agentic systems for real-time segmentation, and closes with a discussion of persistent challenges around data quality, interpretability, and privacy governance.

to create more precise and relevant segments that lead to more effective targeting and higher conversions. This finding is significant because it provides one of the few quantified comparative estimates of AI-driven segmentation performance found in the reviewed literature, and it substantiates the broader claim that behavioral and predictive data outperform static demographic variables as segmentation inputs.

The most recent and architecturally ambitious contribution to this literature is a 2025 theoretical framework examining the role of autonomous, or agentic, AI in consumer segmentation and targeting. This study describes a framework integrating machine learning, natural language processing, and predictive analytics to continuously optimize segmentation models without human oversight, enabling real-time targeting and hyper-personalization through autonomous agents that dynamically manage segmentation by leveraging unsupervised learning algorithms including K-means and DBSCAN. The study further illustrates sector-specific applications, noting that in telecommunications, regression models such as Random Forest and Gradient Boosting Machines are used to predict customer churn, allowing companies to implement proactive retention strategies, while financial institutions apply predictive analytics to estimate customer lifetime value in order to identify high-value clients for personalized services. This trajectory toward autonomous, continuously self-optimizing segmentation systems represents the most advanced point in the literature reviewed for this paper and is treated as the leading edge of the emerging-trends discussion below.

Complementary research has focused on target audience identification methods more broadly, situating AI-driven segmentation within the wider discipline of big data analytics and strategic information systems. This literature draws on foundational big data analytics research showing that the strategic value of analytics depends on how organizations translate raw data capabilities into decision-relevant insight, a framing that applies directly to audience segmentation as one of the clearer commercial applications of that broader analytics value proposition. Table 1 summarizes the principal studies reviewed for this paper.

Table 1. Summary of Reviewed Literature

Study	Focus Area	Key Technique or Contribution	Relevance to Present Work
Haleem, Javaid, Qadri, Singh, and	AI applications in marketing	Literature-based scoping of AI's role	Provides the broader context within which

Suman (2022)		across marketing functions	segmentation sites
Grover, Chiang, Liang, and Zhang (2018)	Big data analytics strategic value	Research framework for organizational value creation from analytics	Grounds segmentation within the wider big data analytics value chain
Personalized marketing via K-means and LIME (2025)	Culturally aware segmentation	Combined unsupervised clustering with explainability methods	Demonstrates a technically interpretable segmentation approach
AI-driven customer segmentation study (2024)	Predictive segmentation and retargeting	Reported measurable conversion-rate improvements from AI segmentation	Provides quantified performance comparison data
Agentic AI consumer segmentation framework (2025)	Autonomous, real-time segmentation	Integrated ML, NLP, and predictive analytics for continuous optimization	Represents the emerging trend toward autonomous targeting systems

RESEARCH GAP AND PROBLEM STATEMENT

The reviewed literature demonstrates consistent agreement that AI-driven segmentation outperforms traditional demographic-based approaches on both precision and conversion metrics, and that unsupervised clustering methods paired with predictive analytics form the technical core of most modern systems. However, several gaps persist. First, quantified performance comparisons between AI-driven and traditional segmentation remain sparse, with most studies offering qualitative or single-case improvements rather than systematic benchmarking across industries. Second, while explainability methods such as LIME have been applied to segmentation clusters, interpretability remains an underexplored dimension of the emerging agentic AI systems that operate with minimal human oversight, raising accountability questions that the literature has not yet resolved. Third, the governance and privacy implications of continuously self-optimizing segmentation systems, which by design ingest and act on granular behavioral data in real time, have received comparatively little dedicated academic attention relative to the technical architecture papers describing these systems. This paper addresses these gaps by proposing a structured framework that situates interpretability and governance

considerations alongside the technical segmentation pipeline, rather than treating them as separate concerns.

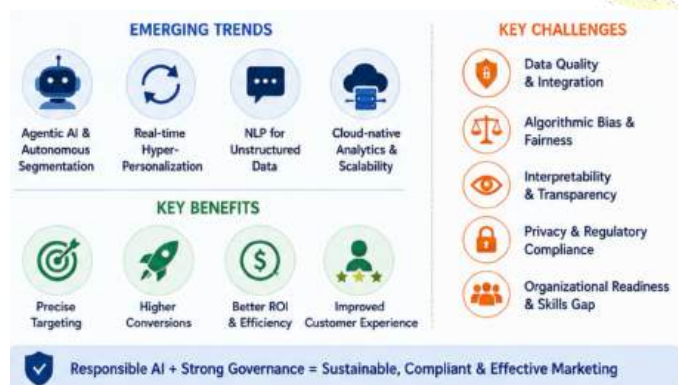
Objectives of the Study

The study pursues the following objectives:

- To synthesize recent literature on AI-driven audience targeting and segmentation across descriptive, predictive, and prescriptive analytical layers.
- To propose a structured framework distinguishing the technical components of modern AI segmentation systems, from unsupervised clustering through to autonomous, agentic targeting.
- To compare the reported performance characteristics of AI-driven segmentation against traditional demographic-based approaches using patterns drawn from the reviewed studies.
- To identify emerging trends, particularly the shift toward autonomous and real-time segmentation systems, and their implications for marketing practice.
- To examine the interpretability, data quality, and privacy governance challenges associated with these systems.

PROPOSED FRAMEWORK AND METHODOLOGY

This paper proposes a three-layer conceptual framework for organizing AI-driven audience targeting and segmentation research and practice: a descriptive layer, a predictive layer, and a prescriptive layer.



The descriptive layer corresponds to unsupervised clustering methods that group customers based on shared behavioral and attribute patterns without reference to predefined categories. Algorithms such as K-means and DBSCAN, both reported across multiple studies reviewed in this paper, form the technical foundation of this layer, with cluster validity typically

assessed through methods such as the Elbow Method and Silhouette Score.

The predictive layer builds on descriptive segments by applying supervised learning models to anticipate future behavior within each segment, such as churn likelihood, purchase propensity, or customer lifetime value. Regression-based models including Random Forest and Gradient Boosting Machines are commonly reported for this purpose, particularly in subscription-based industries such as telecommunications and financial services.

The prescriptive layer represents the most recent development in the literature, corresponding to autonomous or agentic AI systems that not only predict behavior but actively adjust segmentation boundaries and targeting decisions in real time, integrating natural language processing to interpret unstructured signals such as customer support interactions or social media activity alongside structured behavioral data.

The methodology for this study consisted of a structured literature synthesis of recent peer-reviewed and preprint studies on AI-driven marketing segmentation, selected for their direct relevance to audience targeting, their use of identifiable and verifiable data sources, and their coverage of specific technical methods rather than purely conceptual discussion. Findings were organized according to the three-layer framework described above, and comparative performance patterns were extracted where studies reported quantified outcomes. Table 2 summarizes the framework's layers alongside representative techniques and business applications.

Table 2. Three-Layer Framework for AI-Driven Audience Segmentation

Layer	Representative Techniques	Primary Function	Example Business Application
Descriptive	K-means, DBSCAN, hierarchical clustering	Group customers by shared behavioral and attribute patterns	Identifying distinct customer segments from transaction and browsing data
Predictive	Random Forest, Gradient Boosting Machines, regression models	Forecast future behavior within identified segments	Churn prediction in telecommunications, customer lifetime value estimation in finance
Prescriptive	Autonomous AI agents	Continuously adjust	Hyper-personalized,

integrating ML, NLP, and predictive analytics	segmentation and targeting decisions in real time	real-time campaign orchestration without human oversight
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RESULTS AND DISCUSSION

The synthesis of reviewed literature indicates a clear trajectory across the three proposed layers, with earlier research concentrated primarily on descriptive and predictive techniques and more recent work, particularly from 2025, increasingly focused on the prescriptive, autonomous layer. This progression mirrors the broader trend in AI research toward greater system autonomy and continuous learning, applied here specifically to the marketing domain.

Where quantified comparisons were available, AI-driven segmentation consistently outperformed traditional approaches. The reported twenty percent improvement in conversion rate for AI-driven segmentation over traditional methods provides one concrete data point supporting this pattern, though the literature as a whole would benefit from more systematic cross-industry benchmarking. Table 3 summarizes the comparative characteristics of traditional and AI-driven segmentation approaches as described across the reviewed studies.

Table 3. Comparative Overview of Traditional and AI-Driven Segmentation Approaches

Characteristic	Traditional Demographic Segmentation	AI-Driven Behavioral Segmentation
Segmentation basis	Static demographic and geographic variables	Behavioral signals, attributes, and predicted intent
Update frequency	Periodic, manually revised	Continuous, automatically updated
Granularity	Coarse, group-level	Fine-grained, individual-level
Predictive capability	Limited	Embedded through supervised learning models
Personalization scope	Campaign-level	Real-time, individualized
Human oversight requirement	High	Variable, decreasing with agentic systems
Reported conversion impact	Baseline	Up to twenty percent higher in reported studies

The emergence of agentic AI systems represents the most significant trend identified in this review. These systems extend beyond static predictive modeling by combining unsupervised segmentation, supervised prediction, and natural language understanding into a continuously operating pipeline capable of adjusting targeting decisions without direct human intervention. The sector-specific applications described in the reviewed agentic AI framework, including churn-focused regression modeling in telecommunications and customer lifetime value estimation in financial services, illustrate that this trend is not confined to a single industry but is being adapted across sectors with distinct data characteristics and regulatory environments.

At the same time, the shift toward greater autonomy amplifies concerns that were already present in earlier, less autonomous systems. Interpretability, addressed directly in the K-means and LIME-based segmentation study through explainability tooling, becomes considerably more difficult to maintain as systems incorporate natural language processing and continuously updating models, since the basis for any given targeting decision may shift from one moment to the next. This tension between technical sophistication and explainability is a central theme running through the discussion of challenges below.

CHALLENGES AND LIMITATIONS

Several challenges recur across the reviewed literature and merit attention for organizations considering adoption of AI-driven segmentation systems. Data quality remains foundational, since clustering and predictive models are only as reliable as the behavioral and transactional data feeding them, and incomplete or biased data can produce segments that reinforce rather than correct existing marketing blind spots. Algorithmic interpretability is a related concern, particularly as systems move toward the prescriptive, autonomous layer described above, where the rationale behind a specific targeting decision may be difficult to reconstruct after the fact even when explainability tools such as LIME are applied to underlying cluster models.

Privacy governance represents a further significant constraint. Systems that continuously ingest granular behavioral signals to power real-time segmentation operate under increasing regulatory scrutiny in many jurisdictions, and the shift toward autonomous agentic systems, which by design reduce human oversight of individual targeting decisions, raises accountability questions that current governance frameworks have not fully addressed. Finally, organizational readiness is a practical barrier distinct from the underlying technology, since deploying AI-driven segmentation effectively requires data infrastructure, cross-functional coordination between marketing and data science teams, and a willingness to shift

budget allocation away from established campaign-level targeting practices toward continuously adaptive systems.

CONCLUSION

This paper has reviewed emerging trends in AI-based audience targeting and segmentation, proposing a three-layer framework distinguishing descriptive, predictive, and prescriptive analytical approaches drawn from recent literature. The evidence reviewed indicates that AI-driven segmentation consistently outperforms traditional demographic-based approaches in precision and conversion outcomes, with the most significant recent development being the emergence of autonomous, agentic AI systems capable of continuously adjusting segmentation and targeting decisions with minimal human oversight. These systems integrate unsupervised clustering, supervised predictive modeling, and natural language processing into pipelines applied across sectors including telecommunications and financial services. At the same time, the shift toward greater autonomy intensifies existing concerns around data quality, interpretability, and privacy governance, and the literature has not yet fully resolved how organizations should balance the commercial advantages of continuously self-optimizing targeting systems against the accountability and transparency expectations increasingly placed on AI-driven decision-making.

FUTURE SCOPE

Future research should prioritize systematic, cross-industry benchmarking of AI-driven segmentation performance against traditional approaches, since the quantified comparisons currently available in the literature remain limited in number

and scope. Further work is also needed on interpretability methods specifically designed for autonomous, continuously updating segmentation systems, extending beyond the cluster-level explainability techniques currently applied to more static models. Finally, research at the intersection of marketing analytics and data protection law would meaningfully extend this literature, particularly regarding how autonomous targeting systems can be designed to remain compliant with evolving privacy regulation while preserving the real-time responsiveness that gives them their commercial advantage.

REFERENCES

1. Grover, V., Chiang, R. H. L., Liang, T. P., & Zhang, D. (2018). Creating strategic business value from big data analytics: A research framework. *Journal of Management Information Systems*, 35(2), 388–423. <https://doi.org/10.1080/07421222.2018.1451951>
2. Haleem, A., Javaid, M., Qadri, M. A., Singh, R. P., & Suman, R. (2022). Artificial intelligence (AI) applications for marketing: A literature-based study. *International Journal of Intelligent Networks*, 3, 119–132. <https://doi.org/10.1016/j.ijin.2022.08.005>
3. Personalized marketing: Leveraging AI for culturally aware segmentation and targeting. (2025). *ScienceDirect* (Journal of Materials Research and Technology imprint). <https://www.sciencedirect.com/science/article/pii/S110016825000997>
4. AI-driven customer segmentation: Targeting and retargeting strategies. (2024). *Journal of Digital Marketing Innovations*, 8(8), 400–415. <https://jodac.org/wp-content/uploads/2024/08/JoDaC-8-8-400-415.pdf>
5. AI-powered consumer segmentation and targeting: A theoretical framework for precision marketing by autonomous (agentic) AI. (2025). *International Journal of Science and Research Archive*, 14(2), 401–424. <https://doi.org/10.30574/ijrsra.2025.14.2.0370>
6. Advanced methods for target audience identification: Enhancing marketing strategies through machine learning and data analytics. (2024). *Journal of Modern Science*, 57(3). <https://www.jomswsge.com>