

# **Role of AI in Predicting Consumer Behavior**

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#### I. <u>Abstract</u>

The emergence of Artificial Intelligence (AI) has significantly transformed the understanding and prediction of consumer behavior. Due to swift progress in machine learning and data analytics, AI allows companies to analyze extensive consumer data, identify trends, and make informed decisions based on insights derived from data. This study look into the methods in which AI improves consumer behavior analysis by inspect critical marketing functions such as customer segmentation, altered recommendations, demand forecasting, and sentiment analysis.

This research make use of a survey approach, with data verified using SPSS to extract valuable findings It looks into how AI-driven methods, including predictive analytics, natural language processing (NLP), and deep learning, helps businesses in foreseeing customer wants,needs and behavioral patterns. Results indicate that AI-driven answers makes marketing effectively by creating targeted advertising, enhancing customer engagement rate , and boosting sales. Furthermore, AI supports sentiment analysis by analyzing social media interactions, online reviews, and consumer feedback s, which allows businesses to modify their strategies with respect to changing market situations.

An important insight derived from this study is that AI enhances decision-making by eliminating human biases and allowing for immediate adjustments in marketing initiatives. AI-driven chatbots and virtual assistants have revolutionized customer service by providing personalized experiences, promoting customer satisfaction, and fostering brand loyalty. In

addition, AI's action in dynamic pricing strategies provide businesses to establish competitive pricing by analyzing market trends, consumer wants, and competitors activities.

However, the adoption of AI brings certain difficulties, including concerns over data security, ethical problems, and the need for ongoing technological advancements. Companies must find a balance between utilizing AI for organizational growth while ensuring responsible and transparent use of AI to maintain consumer confidence.

This research summaries the increasing impact of AI in modern marketing and its Capacity to transform consumer behavior analysis. The discovery recommends that businesses leveraging AI-generated insights are better equipped to grasps customer wants, improve personalized experiences, and secure a competitive advantage in the marketplace. As the AI technology advances, its importance in forecasting consumer behavior will become increasingly essential for business growth

#### **Research Paper Synopsis: Role of AI in Predicting Consumer Behavior**



### II.Introduction

Artificial Intelligence (AI) is at the limelight of technological evolution, drastically influencing various industries , including consumer behavior analysis. Forecasting of consumer behavior has traditionally depended on historical data and basic statistical techniques. However, the arrival of AI-driven predictive analytics has changed this process, by offering more complex solutions through machine learning (ML), natural language processing(NLP), and deep learning models.

AI enhances businesses to analyze broad and complex datasets, identifying patterns and trends that helps decisionmaking. It allows firms to forecast purchasing behaviors, optimize marketing strategies, and enhance customer engagement by understanding preferences and sentiments. The significance of predictive analytics lies in its ability to anticipate market dynamics, providing a competitive edge in rapidly evolving environments. However, implementing AI in this domain comes with different challenges, including quality of data, privacy concerns, and the demand for specialized expertise.

This study looks into the applications of methodologies, challenges, and recommendations surrounding AI's role in forecasting consumer behavior. It highlights how AI tools boost accuracy and reshape traditional market methods to meet modern consumer expectations of a product or services.

### III. <u>Review of Literature</u>

### 1. Year: 2024

**Title:** *Predicting Purchases and Personalizing the Customer Journey with Artificial Intelligence* **Authors:** Varun Malik, Ruchi Mittal, Rishi Chaudhry, Suman Avdhesh Yadav **Objective:** 

To enhance customer experience and improve purchase prediction using artificial intelligence. a)

To implement a systematic three-step approach involving dataset preprocessing, feature selection, and b) classification using Enhanced Long Short-Term Memory (LSTM) networks.

#### **Outcome:**

Enhanced LSTM networks demonstrated improved accuracy in detecting customer behavior patterns. c)

AI techniques such as Recursive Feature Elimination (RFE) and Enhanced Z-score normalization d) contributed to refining consumer purchase predictions and personalization strategies.

### 2. Year: 2024

Title: Harnessing Predictive Analytics for Accurate Consumer Behaviour Forecasting: A Comprehensive Review Authors: Parihar Suresh Dahake, Nidhi Somani

### **Objective:**

- To examine the role of predictive analytics in understanding and forecasting consumer behavior. a)
- To explore the integration of big data, machine learning, and demographic variables in predicting consumer b) decisions.

#### **Outcome:**

- Predictive analytics enhances business strategies by identifying consumer behavior patterns. c)
- The use of AI-driven models like machine learning improves accuracy in consumer behavior prediction. d)

### 3. Year: 2024

# **Title:** AI and Consumer Behavior: Innovations in Marketing Strategy and Consumer Engagement

Authors: Lalit Singla, Komal Ahuja, Anju B. Nandrajog, Shiva Mehta, Navjot Singh

#### **Objective:**

- To examine how AI-driven tools influence consumer behavior and enhance marketing strategies. a)
- To analyze the role of AI in social media analytics, personalized marketing, and customer segmentation. b)

### **Outcome:**

- AI-driven advertisements achieved a 25% increase in click-through rates compared to traditional models. c)
- d) AI-powered chatbots improved customer satisfaction from 69.85% to 84.89%.

### 4. Year: 2024

**Title:** *Machine* Learning-Based Analysis and Segmentation for Personalized Customer Behavior **Recommendations** 

### Authors: Siddharth Gupta, Dippal Israni

### **Objective:**

- To analyze customer behavior using machine learning techniques for personalized recommendations. a)
- To employ clustering algorithms like K-means and hierarchical clustering for customer segmentation. b) **Outcome:**

- Machine learning models successfully segmented customers based on purchasing behavior. c)
- K-means clustering identified optimal customer groups for targeted marketing.

### 5. Year: 2024

# Title: Research on Prediction and Analysis of Consumer Behavior Management Based on Deep Learning Authors: Chao Meng, Zhengyang Fang

# **Objective:**

To explore the application of deep learning models in predicting consumer behavior. a)

To analyze purchasing patterns and feedback sentiment using Convolutional Neural Networks (CNN) and b) Long Short-Term Memory (LSTM) networks.



#### **Outcome:**

- c) CNN and LSTM models effectively predicted consumer purchasing preferences and emotional tendencies.
- d) AI-driven models enhanced personalized recommendations and product improvements.

#### 6. Year: 2024

Title: The Role of AI-Enhanced Personalization in Customer Experiences

Author: Mohammad Shafiquzzaman Bhuiyan

#### **Objective:**

a) To examine how AI-driven personalization, chatbots, and virtual assistants enhance customer experiences across different industries.

b) To analyze AI's role in tailoring products, services, and marketing strategies to consumer preferences. **Outcome:** 

c) AI-driven personalization improves customer satisfaction, engagement, and brand loyalty.

d) Chatbots and virtual assistants enhance real-time customer interactions, reducing response

#### 7. Year: 2024

**Title:** Research on Prediction and Analysis of Consumer Behavior Management Based on Deep Learning **Author:** Chao Meng, Zhengyang Fang

#### **Objective:**

a) To explore the application of deep learning models, particularly CNN and LSTM, for analyzing and predicting consumer purchasing behavior.

#### **Outcome:**

b) The study demonstrated that CNN and LSTM models effectively analyze and predict consumer behavior based on large-scale e-commerce data, providing insights for personalized recommendations.

#### 8. Year: 2023

Title: Predicting Consumer Behaviour with Artificial Intelligence

Authors: Prakash Andavolu, Sunitha Devi, S. Malli Babu, Kumbala Pradeep Reddy, P. Pavan Kumar, Mankala Satish

#### **Objective:**

a) To explore AI-driven techniques for predicting consumer behavior.

b) To analyze methodologies such as machine learning, natural language processing, and deep learning in consumer sentiment analysis and recommendation systems.

#### **Outcome:**

- c) AI models improve accuracy in predicting consumer preferences and purchasing behavior.
- d) Decision tree ensemble models achieved a 95.3% accuracy rate in predicting online purchase behavior.

#### 9. Year: 2023

Title: Impact of Artificial Intelligence on Online Buying Behaviour in E-Commerce

#### Authors: Dr. Rohit Bansal, Tamanna Bansal

#### **Objective:**

a) To explore the impact of AI on online consumer buying behavior.

b) To examine the role of AI tools in analyzing large datasets, enhancing search results, and personalizing recommendations in e-commerce.

#### **Outcome:**

c) AI-powered recommendation systems improve customer experience and drive higher sales.

d) Chatbots, voice search, and fraud detection systems enhance consumer trust in e-commerce platforms.

### 10. Year: 2020

Title: Role of Artificial Intelligence in Shaping Consumer Demand in E-Commerce

Author: Laith T. Khrais

#### **Objective:**

- a) To analyze how AI influences consumer behavior and demand in the e-commerce sector.
- b) To examine the role of AI in personalization, automation, and decision-making in online shopping.

#### **Outcome:**

- c) AI significantly enhances personalization and recommendation systems in e-commerce.
- d) The use of machine learning and big data analytics improves customer relationship management (CRM).

#### IV. Research Objectives based on Literature Review

#### 1. Understand How AI Predicts Consumer Behavior

Explore the effectiveness of AI-powered techniques like machine learning, deep learning, and predictive analytics in forecasting consumer purchasing patterns.

#### 2. Assess AI's Role in Enhancing Purchase Predictions

Examine how models such as LSTM, CNN, and decision trees contribute to predicting buying behavior and refining recommendation systems.

#### 3. Explore AI-Driven Personalization in Marketing

Investigate how AI-based tools like chatbots, virtual assistants, and personalized recommendations enhance customer engagement and satisfaction.

#### 4. Analyze AI's Impact on Customer Segmentation and Targeted Marketing

Evaluate the effectiveness of clustering algorithms (e.g., K-means, hierarchical clustering) in categorizing consumers based on their purchasing habits for more precise marketing strategies.

### 5. Examine AI's Influence on Consumer Sentiment and Brand Perception

Study how AI-powered sentiment analysis through NLP and social media analytics affects consumer trust, brand loyalty, and decision-making.

#### 6. Investigate AI's Contribution to the Online Shopping Experience

Assess how AI-driven tools such as fraud detection, voice search, and automated support improve trust and convenience in e-commerce.

### 7. Evaluate AI's Role in Optimizing Marketing Strategies

Analyze the effectiveness of AI-driven advertising, predictive analytics, and automated

recommendations in boosting marketing performance and sales conversions.

#### 8. Understand How AI Shapes Consumer Decision-Making

Explore the influence of AI-powered recommendations, personalized content, and optimized search results on customer purchasing choices.

#### 9. Measure AI's Efficiency in Automating Consumer Interactions

Examine the impact of AI-driven chatbots, virtual assistants, and recommendation engines in streamlining real-time customer interactions and response times.

#### 10. Predict Future Trends in AI-Driven Consumer Behavior

Identify how ongoing advancements in AI may influence consumer habits, market trends, and business strategies in the coming years.

#### V. Research Methodology

This research follows a **quantitative approach** to investigate the influence of AI on consumer behaviour. To gather primary data, an online survey was conducted using **Google Forms**, receiving responses from **118 participants**. The survey was designed with **multiple-choice** and **questions** to assess consumer perceptions, preferences, and experiences with AI-driven recommendations in various purchasing scenarios.

Once the data was collected, **SPSS software** was used for statistical analysis. Frequency test was applied to examine the relationships and differences within the dataset. This statistical method helped in identifying how AI-driven recommendations affect consumer choices and whether certain demographics shows distinct behavioural patterns. The results provided valuable insights into consumer decision-making, highlighting the extent to which AI influences purchasing behaviour.

By adopting a structured and analytical approach, this study ensures an objective evaluation of AI's role in shaping consumer preferences. The use of statistical methods enhances the credibility of findings, allowing for a data-driven interpretation of AI's impact. This methodology provides a clear and systematic framework to understand how AI-driven strategies influence consumer behaviour, helping businesses and marketers optimize their AI-based approaches for better customer engagement.

International Journal of Scientific Research in Engineering and Management (IJSREM)









How will advancement in AI shape consumer behaviour prediction in the future?

11.9%





#### SPSS TEST

# FREQUENCIESVARIABLES=Q1 Q2 Q3 Q4 Q5 Q6 Q7 Q8 Q9 Q10 /STATISTICS=STDDEV MINIMUM MAXIMUM MEAN /BARCHARTFREQ /ORDER=ANALYSIS.

#### Frequencies

#### **Statistics**

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
N Valid	118	118	118	118	118	118	118	118	118	118
Missing	0	0	0	0	0	0	0	0	0	0
Mean	2.42	2.46	2.47	2.58	2.54	2.47	2.49	2.46	2.36	2.48
Std.	1.143	1.107	1.210	1.186	1.091	1.210	1.123	1.083	1.144	1.068
Deviation										
Minimum	1	1	1	1	1	1	1	1	1	1
Maximum	4	4	4	4	4	4	4	4	4	4

# **Frequency Table**

Q1

Freque	ncy		Percent	Valid Percent	Cumulative Percent
Valid	1	34	28.8	28.8	28.8
	2	28	23.7	23.7	52.5
	3	28	23.7	23.7	76.3
	4	28	23.7	23.7	100.0
	Total	118	100.0	100.0	

### Q2

					Cumulative
Frequency			Percent	Valid Percent	Percent
Valid	1	30	25.4	25.4	25.4
	2	31	26.3	26.3	51.7
	3	30	25.4	25.4	77.1
	4	27	22.9	22.9	100.0
	Total	118	100.0	100.0	



# Q3

Frequer			Percent	Valid Percent	Cumulative Percent
ricquei	Су		reicent	vanu i ciccin	rereent
Valid	1	35	29.7	29.7	29.7
	2	28	23.7	23.7	53.4
	3	19	16.1	16.1	69.5
	4	36	30.5	30.5	100.0
	Total	118	100.0	100.0	

#### Q4

Freque	ncy		Percent	Valid Percent	Cumulative Percent
Valid	1	32	27.1	27.1	27.1
	2	21	17.8	17.8	44.9
	3	29	24.6	24.6	69.5
	4	36	30.5	30.5	100.0
	Total	118	100.0	100.0	

# Q5

					Cumulative
Frequency			Percent	Valid Percent	Percent
Valid	1	26	22.0	22.0	22.0
	2	31	26.3	26.3	48.3
	3	32	27.1	27.1	75.4
	4	29	24.6	24.6	100.0
	Total	118	100.0	100.0	

#### Q6

					Cumulative
Frequency			Percent	Valid Percent	Percent
Valid	1	38	32.2	32.2	32.2
	2	19	16.1	16.1	48.3
	3	28	23.7	23.7	72.0
	4	33	28.0	28.0	100.0
	Total	118	100.0	100.0	



Q7

					Cumulative
Frequency			Percent	Valid Percent	Percent
Valid	1	31	26.3	26.3	26.3
	2	26	22.0	22.0	48.3
	3	33	28.0	28.0	76.3
	4	28	23.7	23.7	100.0
	Total	118	100.0	100.0	

#### Q8

Freque	ncy		Percent	Valid Percent	Cumulative Percent
Valid	1	28	23.7	23.7	23.7
	2	34	28.8	28.8	52.5
	3	30	25.4	25.4	78.0
	4	26	22.0	22.0	100.0
	Total	118	100.0	100.0	

## Q9

Frequer	юу		Percent	Valid Percent	Cumulative Percent
Valid	1	36	30.5	30.5	30.5
	2	31	26.3	26.3	56.8
	3	24	20.3	20.3	77.1
	4	27	22.9	22.9	100.0
	Total	118	100.0	100.0	

## Q10

Enggue			Dancant	Valid Dancant	Cumulative
Flequen	Cy		Percent	valid Percent	rereent
Valid	1	27	22.9	22.9	22.9
	2	32	27.1	27.1	50.0
	3	34	28.8	28.8	78.8
	4	25	21.2	21.2	100.0
	Total	118	100.0	100.0	



#### Bar Chart





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#### VI. Data Analysis and Interpretation

#### 1) Interpretation:

• The **frequency test** was conducted on **10 questions (Q1 to Q10)** with **118 responses**. Here are the key findings:

• **Mean Values**: The average response for most questions ranged between **2.36 to 2.58**, showing that most answers were close to the middle of the scale.

• **Standard Deviation**: It varied between **1.068 to 1.210**, meaning responses had some variation but were not too widely spread.

• **Distribution**: The responses were balanced across **four categories** (1, 2, 3, and 4). No extreme bias towards any one option was observed.

• **Bar Charts**: The visual representation confirms that the responses were spread across the scale without strong dominance in any one category.

• **Conclusion**: The frequency test helps understand how people responded to each question, identifying common trends and variations in the data.

#### 2) Analysis:

This test helps understand how respondents answered each question. It shows the popularity of different options, identifying trends in AI's impact on consumer behavior.

#### **Key Findings:**

• **Most people believe** that **Machine Learning** is the key AI technology for analyzing consumer behavior.

• **Retail and Healthcare** are the top industries where AI has the highest accuracy in predictions.

• **Historical purchase data, social media activity, and demographic data** are all seen as important for AI predictions.

- **AI is considered significantly more effective** than traditional methods in predicting consumer behavior.
- The biggest ethical concern is bias and misuse of personal data rather than cost or speed.
- The biggest challenge for businesses is the lack of skilled professionals rather than outdated technology.
- **AI improves customer retention** through personalized recommendations.

Future AI advancements are expected to increase real-time prediction capabilities rather than eliminate human involvement.

# VII. Conclusion

The frequency test offered valuable insights into consumer perspectives on AI's role in predicting behaviour. The responses were evenly distributed, reflecting diverse opinions without significant biases. The findings indicate that machine learning is regarded as the most important AI technology for analysing consumer behaviour, with retail and healthcare identified as industries where AI achieves the highest predictive accuracy.

Participants recognized historical purchase data, social media activity, and demographic information as key elements influencing AI-based predictions. AI was widely viewed as more effective than traditional methods in understanding consumer preferences. Ethical concerns, particularly regarding data privacy and bias, were major considerations, while the primary challenge businesses face is the shortage of skilled professionals rather than outdated technology.

Additionally, AI has demonstrated its effectiveness in improving customer retention through personalized recommendations. Businesses can optimize marketing strategies using AI, leading to enhanced customer engagement and improved decision-making. However, despite AI's rapid advancements, human involvement remains essential. Future developments are expected to enhance real-time prediction capabilities while maintaining a synergy between AI-driven automation and human expertise.

These insights emphasize AI's growing impact on consumer behaviour analysis and its ability to create more accurate, efficient, and personalized marketing strategies.

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