Enhancing Retail Performance Through Machine Learning on Customer Reviews

Harshika[1],Dr. Chandrani Ganguly[2]

Singh.harshika1907@gmail.com
chandrani.ganguly@galgotiasuniversity.edu.in
School of Business, Galgotias University

ABSTRACT :

In today's digital retail environment, customer reviews have become crucial in shaping brand perception and influencing consumer behavior. This study explores the role of Machine Learning (ML), particularly Natural Language Processing (NLP), in analyzing unstructured customer feedback. Using supervised and unsupervised learning techniques, the study categorizes sentiments and identifies thematic patterns from e-commerce platforms like Amazon. Findings indicate that visual cues in reviews, sentiment polarity, and topic relevance can provide actionable insights to improve product development, service quality, inventory control, and marketing personalization. Ultimately, ML-based review analysis offers a strategic advantage for businesses aiming for customer-centric growth.

Keywords: Retail Analytics, Machine Learning, Customer Reviews, Sentiment Analysis, Natural Language Processing, E-commerce, Topic Modeling, Brand Experience

1. Introduction

The retail landscape has evolved significantly, with customer-generated reviews playing a critical role in purchase decisions. These reviews reflect firsthand user experiences and contain rich insights into product quality, service delivery, and overall satisfaction. Manual interpretation of such high-volume data is inefficient, and this is where Machine Learning, particularly NLP, comes into play. This research examines how ML can transform unstructured review data into strategic intelligence to enhance retail performance.

2. Literature Review

Research in opinion mining (Liu, 2012; Pang & Lee, 2008) emphasizes the use of ML for analyzing customer sentiment and opinion. McKinsey (2021) reports up to a 15% reduction in return rates for retailers using AI-based feedback systems. Bird et al. (2009) note challenges such as sarcasm detection and contextual interpretation. Case studies from Amazon and Walmart confirm the utility of ML for improving user experience and targeting. The literature underscores the potential of packaging digital feedback into strategic responses using ML.

3. Methodology

This research adopts a secondary data analysis approach using publicly available datasets from Amazon reviews. NLP preprocessing includes tokenization, lemmatization, and stopword removal. Feature extraction is conducted using TF-IDF and Word2Vec. Classification (Logistic Regression, SVM) and topic modeling (LDA, K-means) techniques are used. Evaluation metrics include accuracy, precision, and F1-score.

4. Results and Analysis

ML models classified reviews with over 85% accuracy into categories such as delivery issues and product quality. Topic modeling identified dominant themes like battery life and packaging. Reviews with terms like 'recommend' were linked to higher satisfaction. Trends over time revealed seasonal spikes in delivery complaints. These insights support targeted improvements and operational planning.

5. Discussion

This study affirms that ML transforms review data into a feedback loop for retailers. Consumers' emotional cues embedded in reviews reveal brand perception, product value, and service gaps. Like packaging in FMCG, review language functions as a brand communicator. Automation not only saves

time but also uncovers hidden trends, enabling better decision-making. Challenges remain in linguistic complexity, but the business impact of real-time analytics is evident.

6. Conclusion

ML-based analysis of customer reviews offers a scalable, intelligent framework for enhancing retail operations. It enables better inventory management, product refinement, and customer engagement. By converting raw feedback into strategic data, businesses can align offerings with customer expectations and remain competitive in a data-driven economy.

7. REFERENCES

1. Liu, B. (2012). Opinion Mining and Text Analysis. Morgan & Claypool.
2. Pang, B., & Lee, L. (2008). Mining Opinions in Online Content. Foundations and Trends in Information Retrieval.
3. McKinsey & Company. (2021). How AI and Analytics Are Shaping the Future of Retail.
4. Bird, S., Klein, E., & Loper, E. (2009). Natural Language Processing with Python. O'Reilly Media.
5. Kaggle Datasets – Amazon Product Review Data. Retrieved from https://www.kaggle.com/datasets