Big Data Descriptive Statistics and Unsupervised Clustering into Customer Segmentation

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Abstract

The rapid growth of e-commerce has transformed consumer purchasing behavior, generating vast amounts of transactional and behavioral data. Understanding this behavior is crucial for businesses aiming to enhance customer engagement, retention, and profitability. Traditional segmentation approaches, often based on surveys or demographic attributes, fail to capture the complexity of consumer actions in digital environments. Leveraging big data analytics offers an opportunity to uncover patterns of behavior, enabling firms to identify distinct customer segments and tailor marketing strategies effectively. The depth of customer interactions is frequently missed by traditional segmentation techniques, which rely on sparse survey data or demographic characteristics. The creation of tailored marketing tactics is hampered by this lack of actionable data, which results in suboptimal consumer engagement and retention.

This study explores the use of descriptive statistics and unsupervised clustering to identify distinct consumer behavior patterns in e-commerce by collecting data of 2500 transactions in order to find hidden behavioral patterns and significant consumer segments using a data-driven approach. Using behavioral and transactional data, descriptive summaries, principal component analysis (PCA), and K-means clustering were applied to extract meaningful customer segments. Results reveal three main consumer groups differing significantly in purchase frequency, spending, and loyalty behavior. The findings contribute to marketing analytics by demonstrating the role of descriptive big data analysis in practical segmentation and provide actionable insights for personalized marketing strategies.

Keywords

Big data analytics, Customer segmentation, E commerce, Implications, Unsupervised clustering.