# Optimizing E-commerce Retention: A Detailed Study of Machine Learning Techniques for Churn Prediction

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**Abstract :** In the fiercely competitive landscape of e-commerce, understanding and mitigating customer churn has become paramount for sustainable business growth. This paper presents a thorough investigation into the application of machine learning techniques for churn prediction in e-commerce, aiming to provide actionable insights for businesses seeking to enhance customer retention strategies. We conduct a comparative study of various machine learning algorithms, including traditional statistical methods and ensemble techniques, leveraging a rich dataset sourced from Kaggle. Through rigorous evaluation, we assess the predictive performance, interpretability, and scalability of each method, elucidating their respective strengths and limitations in capturing the intricate dynamics of customer churn. We identified the XGBoost classifier to be the best performing. Our findings not only offer practical guidelines for selecting suitable modeling approaches but also contribute to the broader understanding of customer behavior in the e-commerce domain. Ultimately, this research equips businesses with the knowledge and tools necessary to proactively identify and address churn, thereby fostering long-term customer relationships and sustaining competitive advantage.

**Keywords :** customer churn, e-commerce, machine learning techniques, predictive performance, sustainable business growth
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