E-Commerce Return Rate Reduction Analysis using Power BI

Introduction

E-commerce businesses face a significant challenge with high product return rates, which directly affect profitability, logistics, and customer satisfaction. This project aims to identify key factors influencing product returns, analyze return patterns across categories, and build a predictive model to reduce future return rates. Using analytical and visualization tools, the study provides actionable insights to enhance decision-making and improve operational efficiency.

Abstract

The project utilizes synthetic e-commerce datasets containing order, return, and product details to analyze return behavior. Data cleaning, preprocessing, and exploratory data analysis were conducted using Python. Logistic Regression was applied to predict the probability of a product being returned. A Power BI dashboard was developed to visualize return patterns, risk scores, and category-based insights. The outcome helps identify high-risk products and suggests strategies to minimize returns.

Tools Used

- Python: For data cleaning, preprocessing, and predictive modelling (logistic regression).
- SQL: Used for querying and initial data extraction.
- Power BI: For interactive visualization and dashboard development.
- Excel/CSV: Data storage and export for integration between tools.

Steps Involved in Building the Project

1. Data Cleaning & Preprocessing: Removed missing values, standardized formats, and created return indicators.
2. Exploratory Data Analysis: Studied return trends by category, payment method, and time period.
3. Model Building: Developed a logistic regression model to predict product return probability.
4. Risk Scoring: Generated return risk scores for each product and classified them into risk bands.
5. Dashboard Creation: Designed a Power BI dashboard with visuals like return distribution, category-wise risk, and drill-through product analysis.
6. Insights & Recommendations: Interpreted visual results to propose data-driven strategies for reducing return rates.

Output

Conclusion

The analysis revealed that the Clothing and Electronics categories had the highest return risks, primarily due to defective or inaccurate product descriptions. Credit card purchases showed a higher tendency for returns compared to other payment methods. Seasonal trends indicated mid-year and post-holiday peaks in returns. Implementing stricter supplier quality control, enhancing product listings, and optimizing return policies are expected to reduce return rates by 15–20%. Overall, this project demonstrates how predictive analytics and visualization tools can effectively support e-commerce return rate reduction strategies.