

## E-Commerce Product Return Prediction

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### Introduction

Returns impact both **profit margins** and **customer satisfaction** in e-commerce. This project aims to **predict product returns** using the **Brazilian Olist dataset**, enabling sellers to proactively manage high-risk items and improve operational decisions.

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### Summary

We analyzed historical order, product, and review data from the Olist dataset to identify **patterns behind customer returns**. Orders with review scores  $\leq 2$  were treated as likely returns. A **Logistic Regression model** was trained to estimate the return probability for each item. The project concludes with an **interactive Power BI dashboard** that visualizes return trends by product category, seller, and region.

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### Tools Used

- Python: Data cleaning, predictive modeling
  - Power BI: Visual analytics and interactive dashboard creation
  - Dataset Source: Olist E-commerce Dataset on Kaggle
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### Project Steps

#### 1. Data Preparation

- Merged key CSV files (orders, order\_items, products, reviews, etc.).
- Labeled returns using customer review scores ( $\text{review\_score} \leq 2$ ).
- Encoded categorical variables like product\_category\_name.

#### 2. Exploratory Analysis

- Analyzed return rates by:
  - **Product category**: Identified categories with high return rates.
  - **Sellers**: Flagged sellers with poor performance metrics.

#### 3. Model Building

- **Features Used**: Product price, freight value, product category.
- **Algorithm**: Logistic Regression with balanced class weights.
- Predicted **return probability** for each order item.
- Filtered and exported **high-risk products** (return probability > 70%).

#### 4. Power BI Dashboard

- Built KPIs:
    - Total Orders
    - Return Rate (%)
    - Avg Price
    - High-Risk Product Count
  - Visualizations included:
    - Bar chart: Return % by product category
    - Table: High-risk product list
    - Map: Return trends by customer state
    - Slicers: Product category, seller, customer region
  - Implemented **drill-through filters** to allow deep dives by category.
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## Conclusion

This end-to-end project combines **machine learning** and **business intelligence** to tackle one of e-commerce's key challenges—**product returns**. With return prediction modelling and interactive dashboards, businesses can now **reduce return rates**, **monitor seller performance**, and **optimize product listings** for improved customer experience and profit sustainability.

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