



# E-commerce Return Rate Reduction Analysis



## Project Overview

This project analyses e-commerce order return patterns and predicts **return risk levels** using data analysis, machine learning, SQL, and Power BI.

The goal is to help businesses **identify high-risk return orders** and take preventive actions to reduce return rates.

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## Objectives

- Analyse return trends across **categories, suppliers, locations, and marketing channels**
  - Build a **Logistic Regression model** to predict return probability
  - Classify orders into **Low / Medium / High return risk**
  - Visualize insights using **Power BI dashboards**
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## Tools & Technologies Used

- **Python** (Pandas, NumPy, Matplotlib, Scikit-learn)
  - **SQL** (SQLite / SQL Server)
  - **Power BI**
  - **Jupyter Notebook**
  - **CSV Dataset**
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## Steps Involved

1. **Data Cleaning & Exploration**
  - Checked missing values and data types
  - Analysed return rate by category, supplier, location, and channel
2. **Feature Engineering**
  - Encoded categorical variables
  - Selected key features: price, quantity, category, supplier, marketing channel
3. **Machine Learning Model**
  - Built **Logistic Regression** model
  - Evaluated using Precision, Recall, F1-score, ROC-AUC
  - Generated **return probability**
4. **Risk Classification**

- Converted probabilities into risk levels:
    - Low (0–30%)
    - Medium (30–60%)
    - High (60–100%)
5. **Power BI Dashboard**
- KPI cards: Total Orders, Returned Orders, High-Risk Orders
  - Bar & column charts by category, supplier, channel
  - Table view with return probability and risk level
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## Key Insights

- **Fashion category** has the highest return rate
  - **Supplier C & D** contribute more to returns
  - **Paid Ads** channel shows higher return risk
  - Logistic Regression effectively predicts return probability (ROC-AUC  $\approx 0.84$ )
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## Final Outcome

- Successfully built an **end-to-end data analytics project**
  - Combined **Python + SQL + Power BI**
  - Delivered actionable insights to reduce return rates
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## Dataset

The dataset contains 1,000 e-commerce orders with:

- Product, price, quantity
  - Customer location
  - Marketing channel
  - Return flag, return probability, return risk level
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## Author

**Indramma M**  
*Data Analyst*