

PACE Strategy

PLAN

Business Question:

- What product and pricing factors influence return likelihood?
- How does customer rating relate to return probability?
- Which seasons or product categories see the highest return rates?
- How effective are markdowns in increasing sales?
- What are the monthly and seasonal sales trends per category or brand?
- What inventory levels should be maintained per category?

ANALYZE

Data Preparation:

- Handle missing values (size, customer_rating)
- Parse dates to extract month, quarter, season
- Convert categorical variables (e.g., brand, color, season) to encoded features
- Create new features:
 - $\text{discount_amount} = \text{original_price} * \text{markdown_percentage}$
 - $\text{is_discounted} = 1$ if $\text{markdown} > 0$ else 0
 - $\text{season_year} = \text{season} + \text{year from purchase_date}$

Exploratory Data Analysis (EDA):

- Return rates by product category, season, and brand
- Top-selling products vs most-returned products
- Customer rating distribution and its link to return reasons
- Monthly sales trends with line graphs
- Heatmaps showing relationship between discount level and return rate

CONSTRUCT

Model 1: Return Prediction Model

- Type: Binary Classification
- Target Variable: is_returned
- Model Options: Random Forest, Decision Tree
- Features Used:

- category, brand, season, size, color, original_price, current_price, markdown_percentage, customer_rating, stock_quantity

Evaluation Metrics: Accuracy, Precision, Recall, F1 Score, ROC-AUC

Business Use: Flag potentially return-prone products before launch

Analytical Module: Markdown & Pricing Optimization

- Plot markdown percentage vs units sold
- Identify pricing bands with best sales-to-return ratio
- Markdown effectiveness by season or brand
- Recommend ideal pricing windows

Analytical Module: Customer Satisfaction Insights

- Correlation between customer_rating and return_reason
- Distribution of ratings by category
- Identify low-rated but high-selling products
- Recommend product improvement areas based on complaints

Analytical Module: Inventory Optimization

- Combine sales and returns to assess net sell-through
- Identify overstocks and understocks per category
- Suggest optimal stock based on seasonal forecasts and return-adjusted sales

EXECUTE

Final Execution Plan:

- Data Cleaning & EDA → Jupyter Notebook
- Return Prediction Model → Python (Scikit-learn)
- sMarkdown Strategy Analysis → Visuals and insights
- Customer & Inventory Analysis → Descriptive summary
- Power BI Dashboard → Visualize return rates, markdown impact, category sales
- Documentation → GitHub project with README + blog post/case study