Project Title:

Smart Packaging Optimizer for Cosmetics & Perfumery Retailers

1. Specific Problem Definition

In the cosmetics and perfumery industry, brands and retailers struggle to identify which products are most frequently purchased together. Without clear data on these purchasing patterns, marketing teams rely on intuition when designing gift sets, promotional bundles, or cross-selling strategies.
This often results in **inefficient bundling**, where some sets underperform while others miss opportunities to boost sales through complementary pairing.

Specific, measurable problem:

> Cosmetics and perfumery retailers lack data-driven insights into which products are most often purchased together, leading to suboptimal bundling strategies and lost cross-selling revenue.

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2. Proposed Solution with Methodology

A. Solution Overview

Develop a **Smart Packaging Optimizer** -a marketing analytics system that identifies complementary product relationships (e.g., lipstick + perfume, moisturizer + serum) using sales transaction data.
The tool will suggest the **best product bundles** to increase basket value, improve promotional efficiency, and design data-driven gift sets.

Please see our UI design prototype by the link below:
https://layer-bonus-12629325.figma.site/

Use the following credentials to get access:

- login- test@test.com
- pass- test

The interactive dashboard interface ensures accessibility for non-technical marketing teams, enabling quick decision-making without coding knowledge.

B. Data Collection

Data Needed:

1. **Transaction Data:**
    - Transaction_ID
    - Product_Name / SKU
    - Category (e.g., fragrance, skincare, makeup)
    - Brand
    - Price
    - Date of purchase
    - Quantity purchased
    - Customer_ID (if available, for repeat patterns)
2. **Optional Supplementary Data:**
    - Customer demographics (age, gender)
    - Campaign or discount tags (to measure promotion influence)
    - Store location or channel (online/offline)

Data Source:

- Historical point-of-sale data from cosmetics or perfumery stores.
- If real data is unavailable, we may artificially generate the data.

C. Analytical Techniques

To identify optimal bundling strategies, three complementary algorithms will be tested and compared on accuracy, interpretability, and business utility:

Algorithm	Purpose	Strengths	Use Case
1. Association Rule Mining (Apriori)	Discover frequent co-purchased products	Simple and interpretable (support, confidence, lift)	Establish baseline co-purchase insights
2. Item2Vec (Product Embedding Model)	Capture semantic similarity between products using purchase sequences	Reveals “goes-with” items even when frequency is low; supports visual mapping	Uncover hidden complementary relationships
3. Item-Based Collaborative Filtering (Implicit Feedback)	Personalize bundle recommendations using historical customer behavior	Adapts to individual or segment patterns; scalable for large catalogs	Generate tailored, segment-specific bundles

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D. Implementation Plan

1. **Integration:**
    - Deploy the Optimizer as a dashboard (Tableau, Power BI, or Streamlit) connected to sales data.
    - Marketing teams can view “Top Product Pairs” or “Bundle Suggestions.”
2. **Action Steps:**
    - Create **data-backed gift sets** (e.g., perfume + body lotion bundle).
    - Promote **cross-selling** in-store and online (“Complete your routine” recommendations).
    - Adjust **seasonal packaging** (holiday kits, Valentine’s combos) based on detected trends.

3. **Feedback Loop:**
    - Track performance of recommended bundles and update the model monthly with new data.

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3. Expected Outcomes

- **Revenue Growth:** Higher average transaction value through bundled offers.
- **Optimized Inventory:** Better prediction of which products to stock together.
- **Personalized Marketing:** Targeted bundle recommendations for customer segments.
- **Reduced Waste:** Fewer unprofitable or unsold bundles.
- **Enhanced Customer Experience:** More relevant and attractive product pairings.

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4. Evaluation Metrics

Objective	KPI / Metric	Measurement Method
Increase cross-selling	% increase in multi-product transactions	Compare before vs. after implementation
Boost sales	Average basket value (ABV)	Transaction analysis
Improve bundling efficiency	Bundle ROI (revenue ÷ cost of goods)	Monthly sales tracking
Marketing effectiveness	Conversion rate of promoted bundles	Campaign analytics
Customer satisfaction	Positive feedback or NPS for bundles	Post-purchase surveys

For Model accuracy: Precision and recall of high-performing bundles (to evaluate reliability of recommendations).

Profitability Segmentation: Margin and cost data will be overlaid on the discovered associations to highlight bundles that are not only popular but also **profitable**. This ensures marketing teams focus on high-margin, high-frequency combinations, optimizing both sales volume and return on investment.

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6. Summary

The **Smart Packaging Optimizer** empowers cosmetics and perfumery businesses to **replace guesswork with insight.**
By analyzing real purchase behavior through association rule mining, it allows retailers to design smarter, data-driven product bundles that match customer preferences -resulting in higher revenue, better product planning, and stronger customer loyalty.