

AI Engineering Challenge: Simulate and Improve User Perception of Cosmetic Packaging

Objective

Design and implement a Python-based system that simulates how a specific demographic perceives the packaging of a cosmetic product — and recommends actionable design changes to improve user perception.

Target Demographic

Urban Gen Z Trendsetters

- **Age:** 18–25
 - **Gender:** Female
 - **Region:** Asia-Pacific (e.g., Seoul, Tokyo, Bangkok)
 - **Traits:** Fashion-forward, highly active on social media, trend-driven
 - **Values:** Visually pleasing aesthetics, novelty, minimalism, "Instagrammable" packaging
 - **Digital Behavior:** Strong influence from TikTok, Instagram, beauty influencers
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Input

- An image of cosmetic product packaging (e.g., facial serum, cream, etc.)
 - Optional metadata (e.g., product category, price range, brand tone)
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Output

For the input packaging and target demographic, the system should generate:

1. Perception Scores *(Scale: 0–10)*

- **Aesthetic Appeal**
- **Brand Trustworthiness**
- **Purchase Likelihood**
- **Perceived Luxury Level**

2. AI-Based Design Recommendation

- Return a **textual recommendation** for improving the design to boost one or more low-rated attributes
- Recommendation must reference specific design aspects (e.g., “Use softer colors,” “Switch to serif typography for premium appeal”)

3. Extra points: Visual Explanation

Overlay **heatmap or attention map** to highlight packaging elements that most influenced the ratings (e.g., font style, cap design, color palette)

Implementation Requirements

- Must be implemented in **Python**, using either a script or Jupyter notebook.
- System components should be modular: input preprocessing, perception scoring, explanation, and recommendation.
- Use of vision-language models (e.g., CLIP, BLIP) is allowed **only after a manual scoring system is developed** (see below).

Additional Requirements

Design Reasoning Document (Required)

Submit a brief explanation (markdown or PDF) describing:

- How you defined perception criteria for the demographic
 - How you identified visual features to score (e.g., color, layout, typography)
 - How you derived recommendations
 - Why you structured your system the way you did
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4. Manual Scoring System Before ML

Before using any machine learning models or pretrained vision systems:

- Implement a basic perception scoring function using **manual rules or heuristics**.
 - Example:
 - Soft pastel colors → +2 Aesthetic
 - Glass bottle → +3 Luxury
 - Dense text → -2 Trust
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Evaluation Criteria

- Quality and reasoning of perception modeling
- Relevance and clarity of recommendations
- Quality of visual explanations (e.g., heatmaps)
- Completeness of documentation and adherence to heuristic-first rule
- Code quality, clarity, and modularity
- Bonus: ability to generate alternate packaging variants (if implemented)