GenWardrobe: A Fully Generative System for Travel Fashion Wardrobe Construction

2025 ACM International Conference on Multimedia

01

Concept & Motivation

Motivation

- Given the increasing consumer demand in both the **travel and fashion industries**, providing intelligent solutions for **travel wardrobe construction** carries substantial practical value.

Challenges:

- ⚠️ Lack of comprehensive integration of '**human–complex context constraint–fashion knowledge**'
- ⚠️ Underutilization of **generative AI**

- **Goal**: Create an end-to-end system that understands '**human–complex context constraint–fashion knowledge**' to generate travel fashion wardrobes.

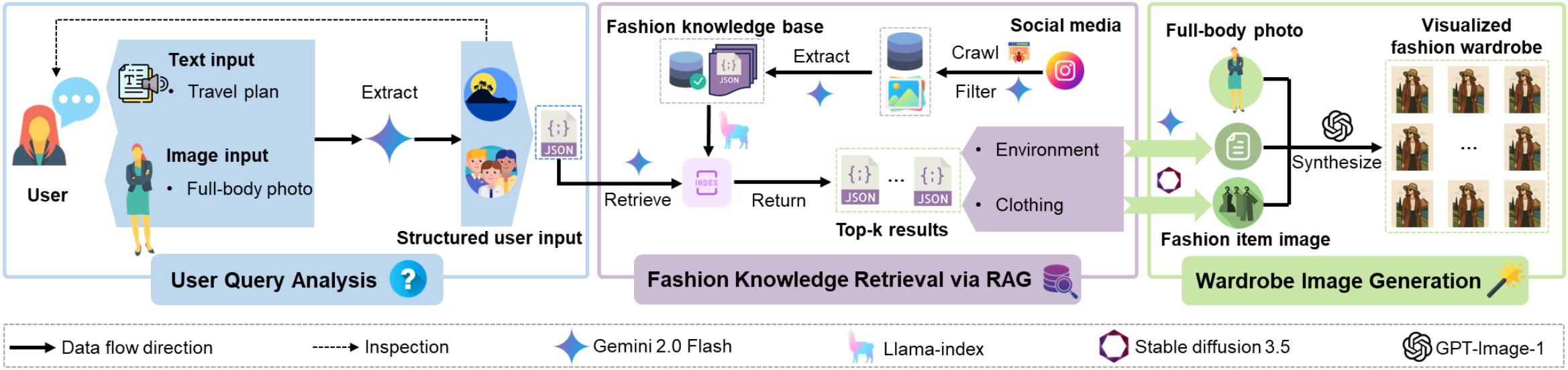
- **Key Concept**: Tripartite Modeling of '**human–complex context constraint–fashion knowledge**'

02

System Design & Workflow

System Design

- User Query Analysis
- Fashion Knowledge Retrieval via RAG
- Wardrobe Image Generation



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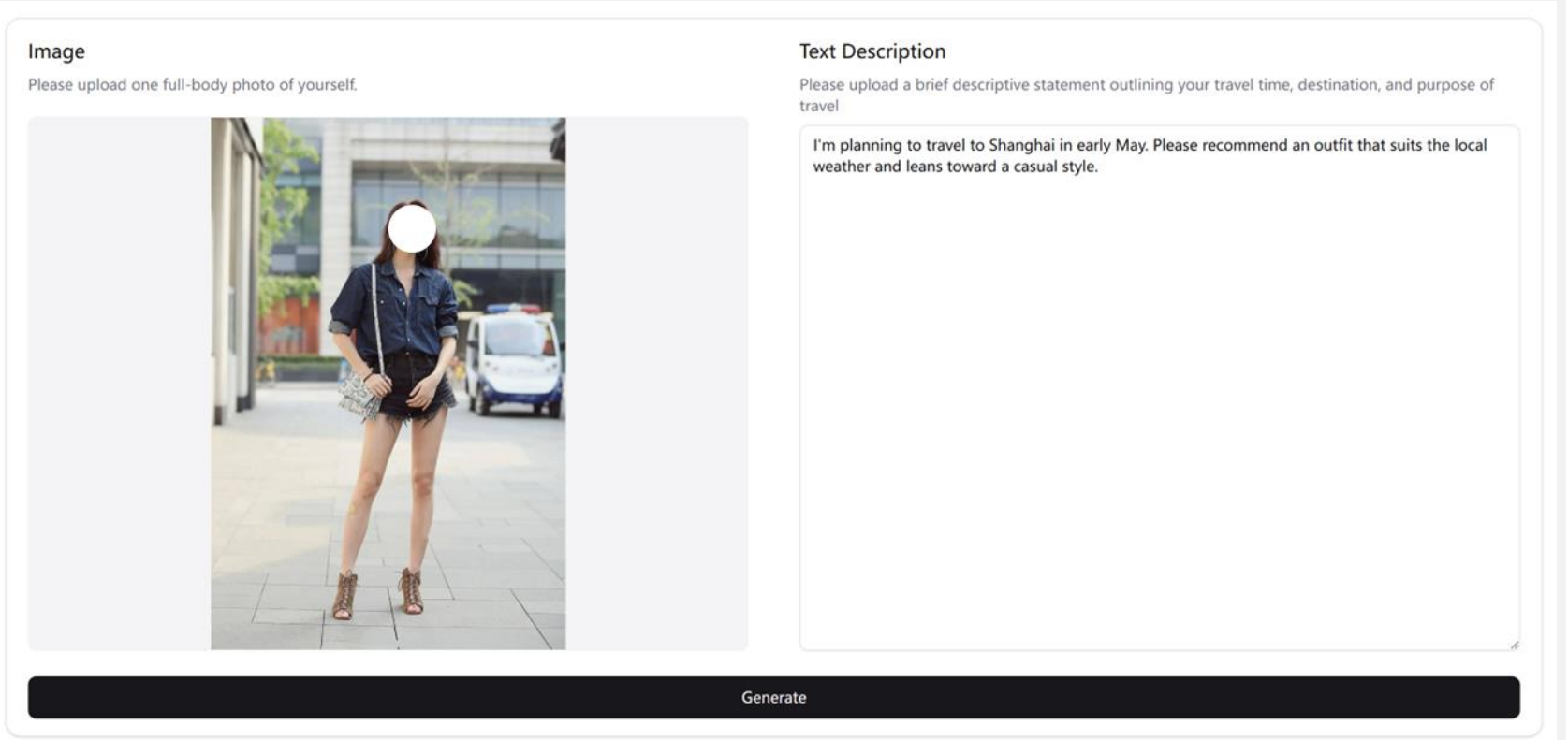
Implementation & Demo

1. User Query Analysis

Raw user input

- Full-body photo
- Travel plan



Structured user input

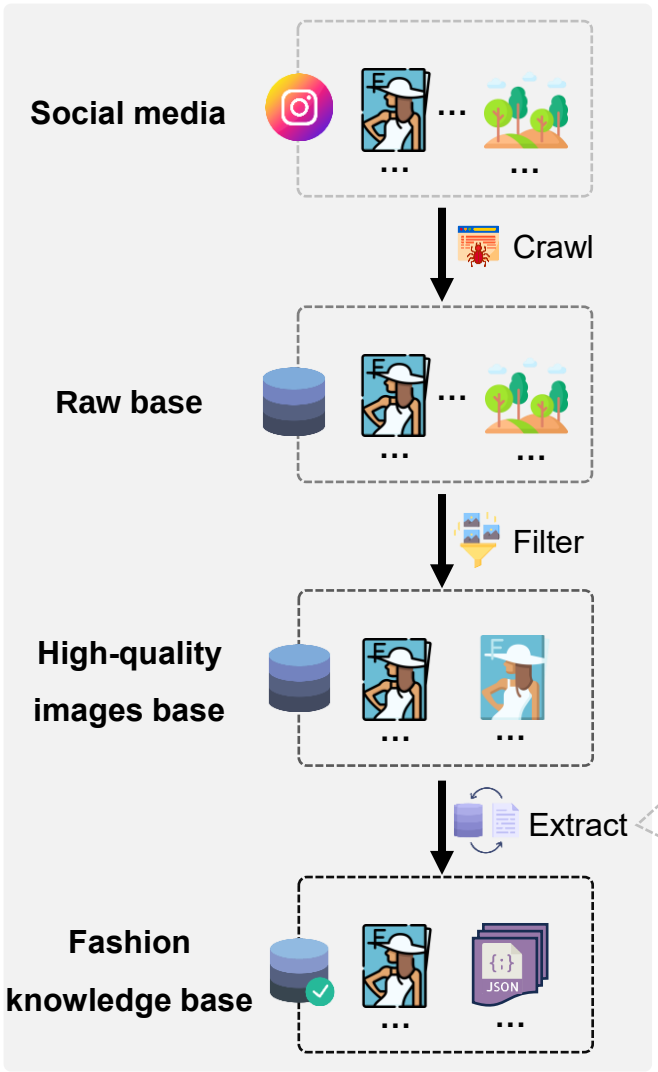
- User personal attributes
- Travel plan

```
[
  "Gender: Female\nAge: Young adult\nSkin Tone: Light\nHairstyle Hair Color: Brown\nHairstyle Hair Type: Straight\nHairstyle Hair Length: Long\nHairstyle Specific Hairstyle: Loose\nPose: Standing\nFace Shape: Oval\nBody Shape: H\nClothing Fashion Style: Casual\nSeason: Spring\nWeather: Sunny\nTime of Day: Morning\nLighting style: Natural light\nLocation: Urban setting\nTemperature: 20-25\nScene Environment: Outdoor\nScene Type: Street\nScene Features: Buildings, streets\nAmbience: Casual"
]
```

03

Implementation & Demo

2. Fashion Knowledge Retrieval via RAG: Fashion Knowledge Base Construction



Information Extraction Principles

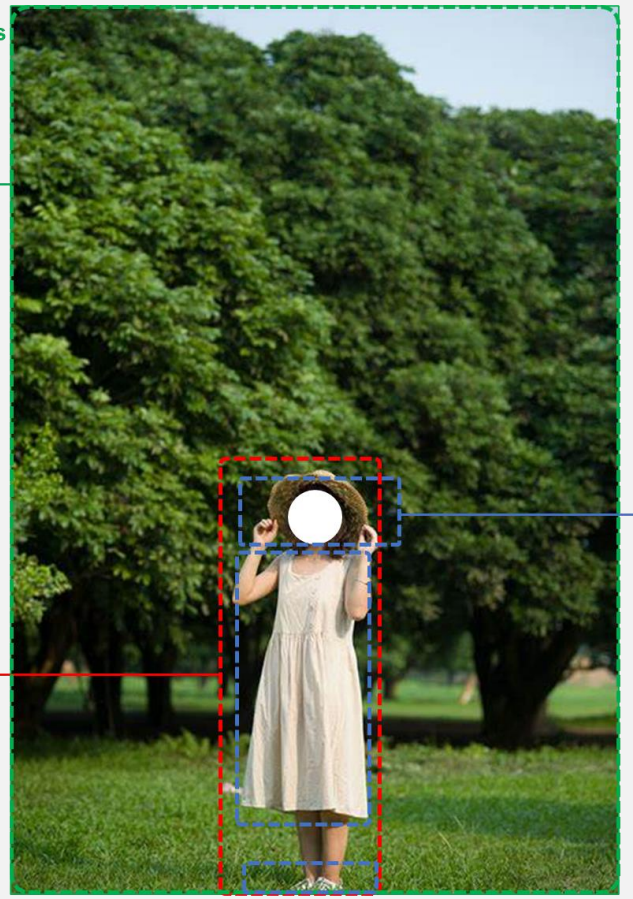
- We obtain a large fashion knowledge base with approximately one million pieces of fashion knowledge.

3. Environment-Related Features

- Background Dominant Color
- Season
- Weather
- Time of Day
- Lighting style
- Location
- Temperature
- Scene Type
- Scene Features
- Ambience

1. Person-Related Features

- Skin tone
- Gender
- Hairstyle
- Age
- Pose
- Face Shape
- Body Shape



2. Clothing and Accessories Features

- **Clothing Items**
  - Upper Body
    - Outerwear
    - Innerwear
  - Lower Body
  - Full-Body Clothing
  - Special Clothing

  → Type, Color, Material, Silhouette, Design

- **Clothing Fashion Style**
- **Accessories**
  - Head Accessories
  - Upper Body Accessories
  - Hand Accessories
  - Lower Body Accessories
  - Feet Accessories
  - Bag Accessories

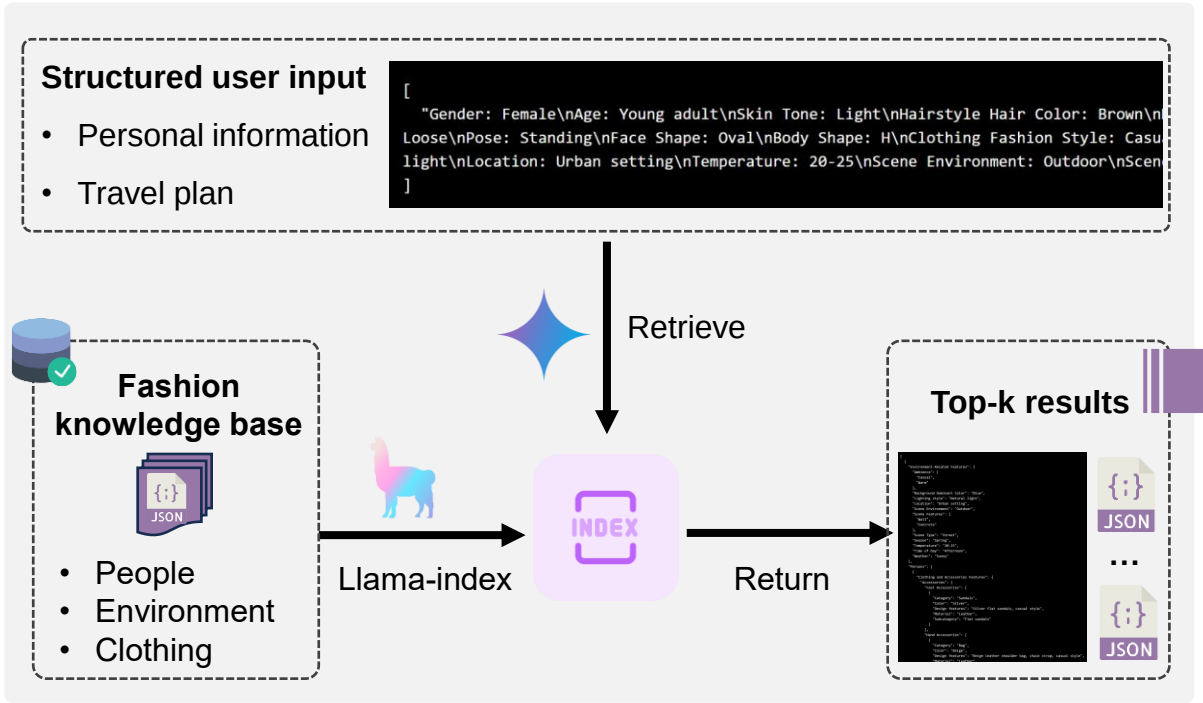
  → Type, Color, Material, Design

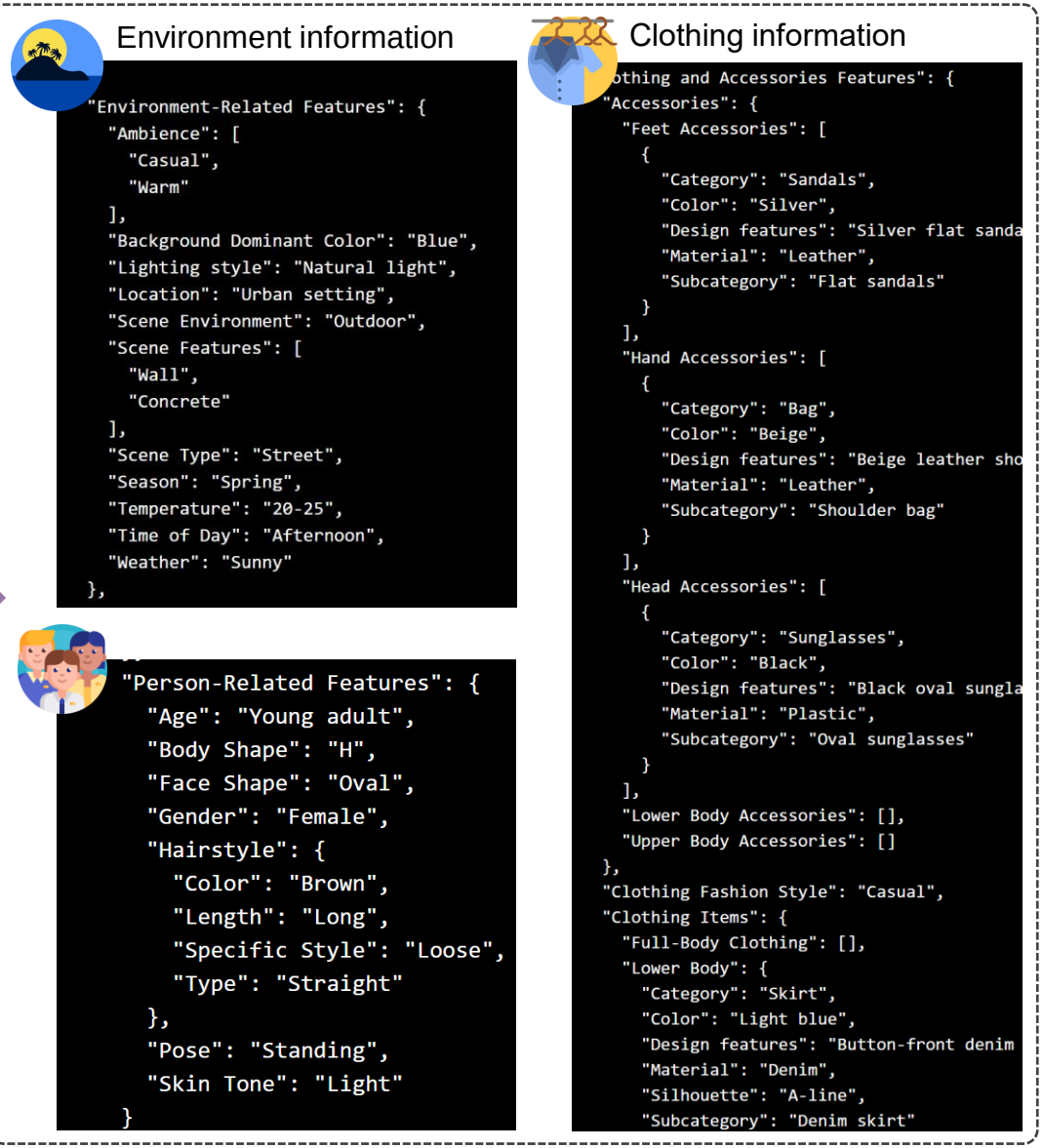
03

Implementation & Demo

2. Fashion Knowledge Retrieval via RAG:

Fashion Knowledge Retrieval





Top-k fashion knowledge

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Implementation & Demo

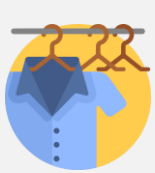
3. Wardrobe Image Generation

Top-k results

JSON

Environment information

JSON



Clothing information

(1) Full-body photo

(2) Background description

```
{
  "text1": "spring sunny afternoon natural light urban street wall concrete outdoor 20-25 degrees casual warm"
},
{
  "text2": "sunny spring afternoon natural light outdoor urban street columns sidewalk 20-25 degrees casual warm"
},
{
  "text3": "spring sunny afternoon natural light urban street buildings sidewalk street furniture casual stylish"
}
```

(3) Fashion item image

Synthesize

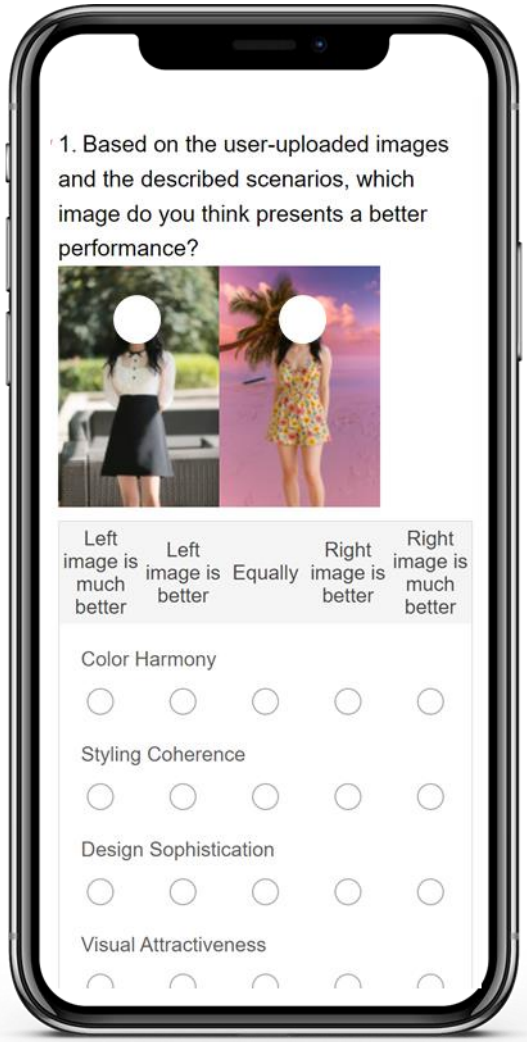
Visualized fashion wardrobe

04

Evaluation

- **Evaluation Method: Based on the Academicism Aesthetic Test (AAT)**

Primary Indicators	Secondary Indicators	Scoring Criteria
• **Aesthetic Appeal**	• 1 Color Harmony	**1. Fritz 5-Level Rating (1–5 Likert scale)** • Used to score individual items on a 1 to 5 scale, where 1 is the least and 5 the most favorable. **2. Pairwise Comparison Method** --5-Level Preference Intensity: • Strong Preference A (Score: 5) • Slight Preference A (Score: 4) • Neutral (Score: 3) • Slight Preference B (Score: 2) • Strong Preference B (Score: 1)
	• 2 Styling Coherence	
	• 3 Design Sophistication	
	• 4 Visual Attractiveness	
	• 5 Trendiness	
	• 6 Proportional Harmony	
• **Contextual Appropriateness**	• 7 Scene Fit	
	• 8 Weather/Time Fit	
• **Personalization**	• 9 Appearance Matching	
	• 10 Style Matching	
• **Visual Realism**	• 11 Clothing Fit Realism	
	• 12 Facial Preservation	
	• 13 Lighting & Blending	



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Evaluation

Five different people and scenarios

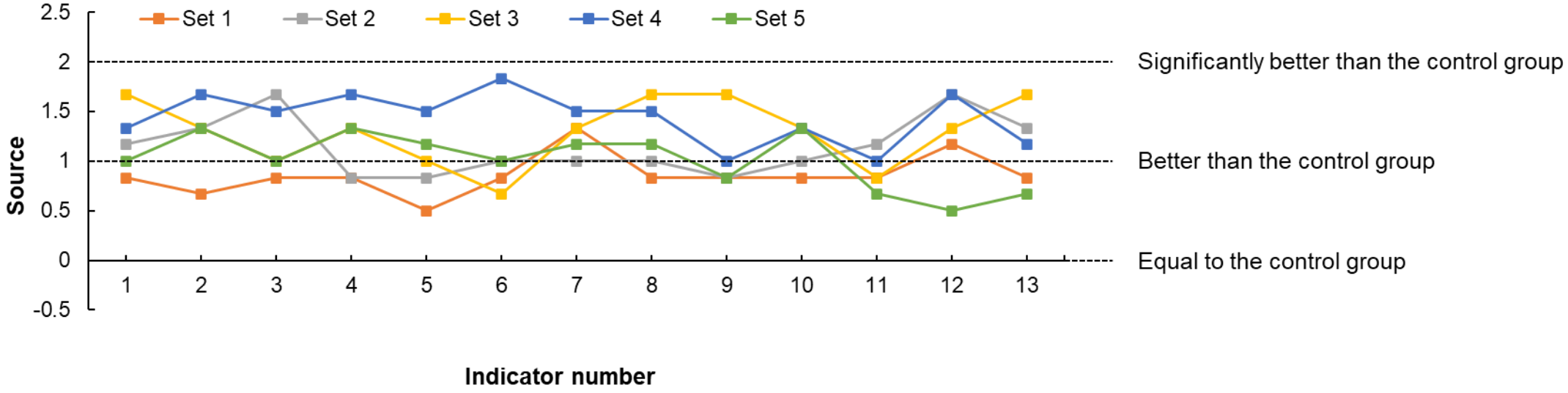
- Set 1: General Travel Scenario
- Set 2: Formal Event Scenario
- Set 3: Leisure and Outdoor Activity Scenario
- Set 4: Daily/Commuting Scenario
- Set 5: Multi-task Scenario

5-point scale

- +2 (“much better”)
- +1 (“better”)
- 0 (“equal”)
- -1 (“worse”)
- -2 (“much worse”)

Six experts in the field of fashion

- 3 males
- 3 females



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Conclusion & Future Work

Impact for MM Community

- ✅ Comprehensive Consideration of ‘human–complex context constraint–fashion knowledge’
- ✅ Multimodal Input: Image + text query
- ✅ Construction of a Large-scale Fashion Knowledge Base
- ✅ RAG for Fashion Knowledge Retrieval
- ✅ Synthesizing Body, Fashion Items, and Realistic Backgrounds
- ✅ Interactive User Interface via a Web Application

Future Work

- 🔮 Integrate AR/VR Try-on
- 🔮 Expand to Multi-day Outfit Planning, Event-based Dressing
- 🔮 Unlock New Value for E-commerce, Digital Wardrobe, and Virtual Stylists