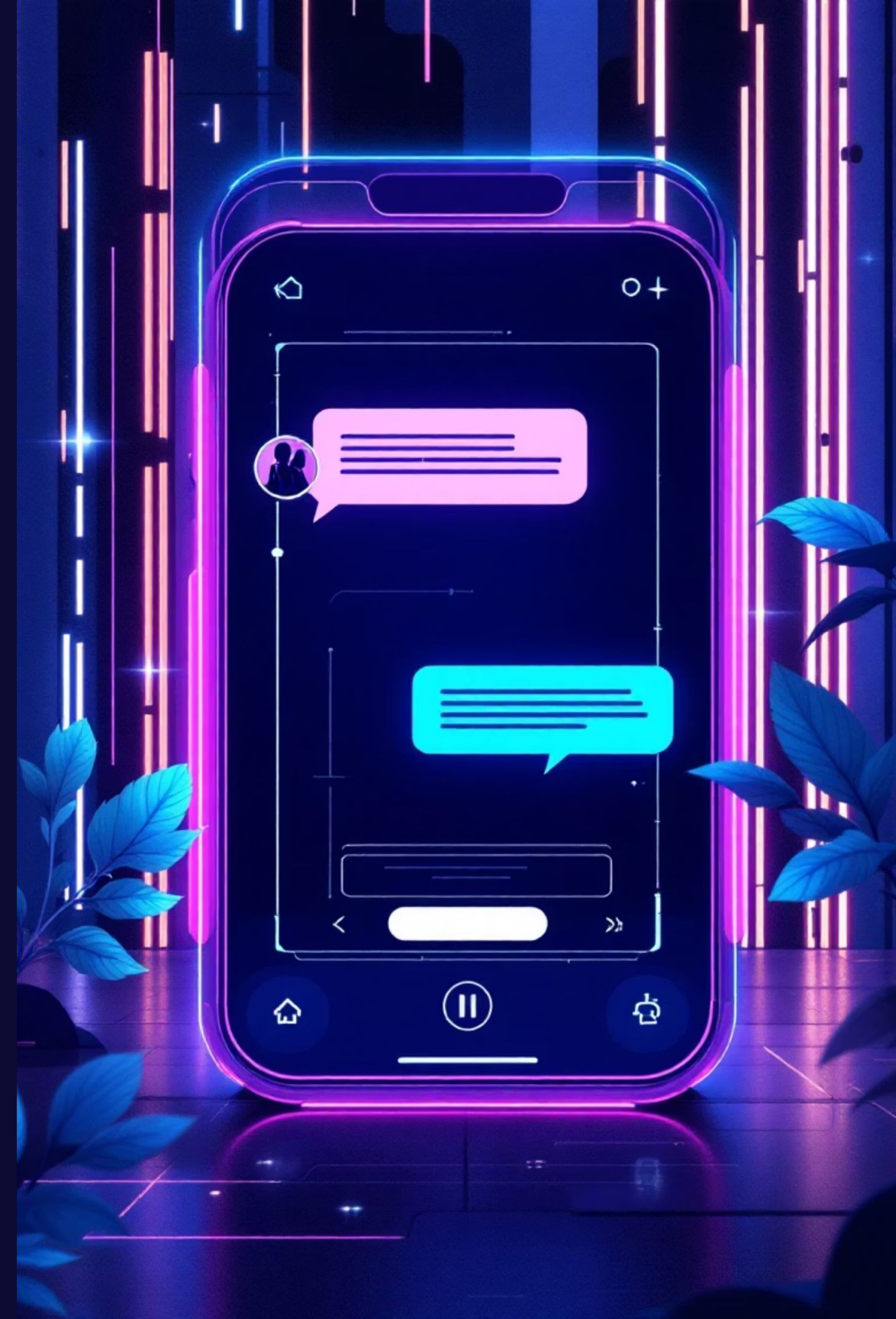


# Mercury: The AI Shopping Agent

A unified, LLM-optional AI assistant for conversational and visual product discovery, tailored for curated commerce catalogs.



# Vision & Core Outcome

Delivered a single, powerful AI agent that enhances the shopping experience by understanding intent, providing relevant recommendations, and enabling product search via images.

## Conversational Discovery

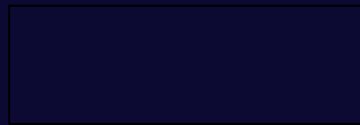
LLM-based General chat and complex text recommendations based on natural language intent.

## Hybrid Retrieval

Combining keyword (BM25) and semantic (Embeddings) search for maximum relevance for Recommendations

## Visual Matching

Image-based search using CLIP, using the product catalog.



# Development Stack Overview

## Key Technology Stack

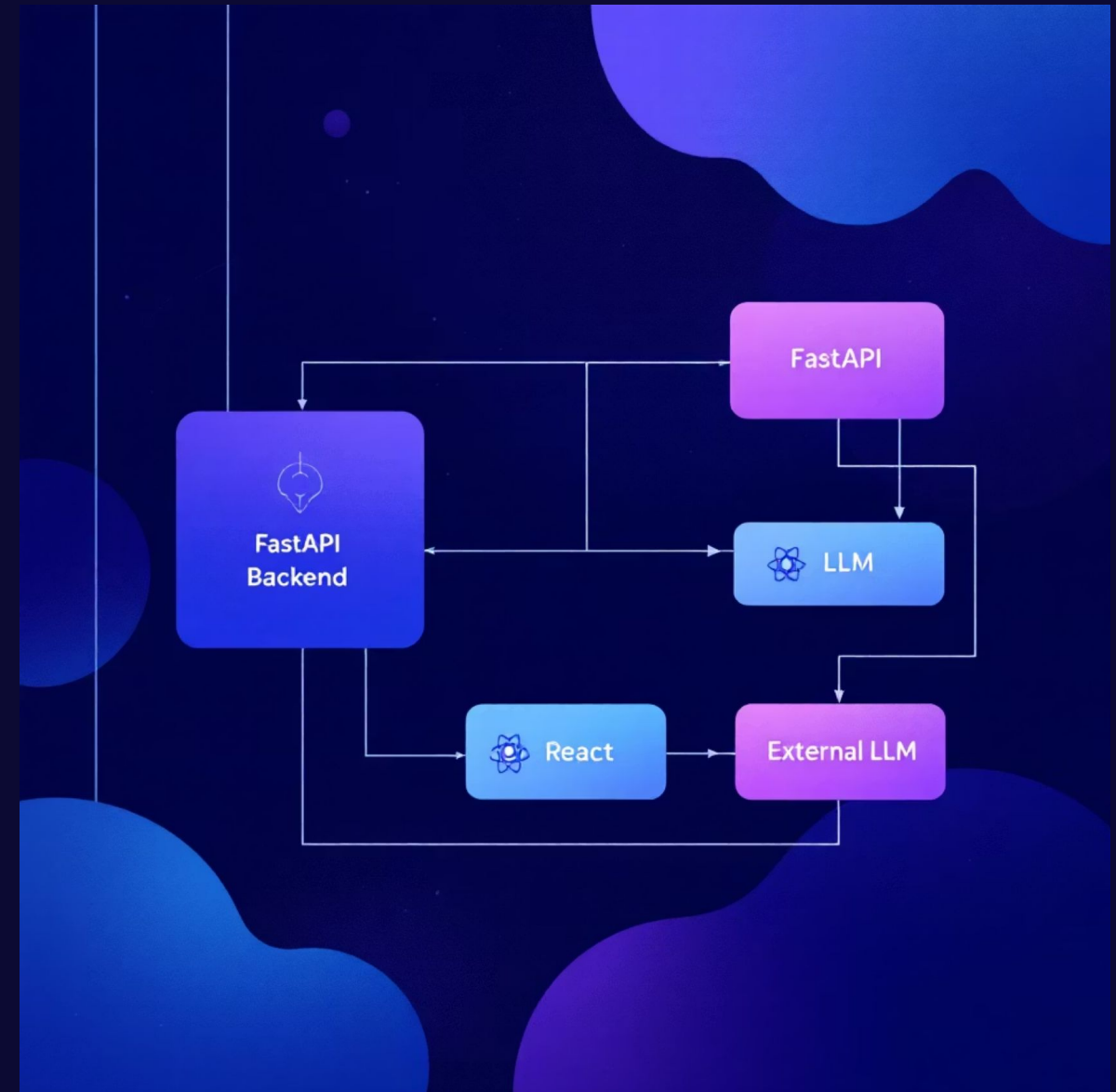
**Backend:** FastAPI (Python)

**Frontend:** Vite + React (TS) + Tailwind CSS

**Vision:** CLIP (Contrastive Language–Image Pre-training)

**Text Search:** BM25 + Vector Embeddings

**LLM:** Options to plug-in (Gemini/OpenAI/Ollama)



# The Unified Agent: Three Operational Modes

## Intent Routing

The core agent loop identifies user intent: Small-talk, Text Recommendations, or Image Search. This single layer decides which tool to execute.

## Small-Talk (LLM Optional)

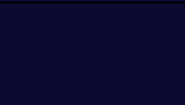
Triggers on general inquiries ("Who are you?"). Provides contextual, creative responses that reference the catalog when an LLM is active.

## Text Recommendations

Parses constraints (category, color, budget) and utilizes a hybrid retrieval system for product ranking. Enforces strict price and category filters.

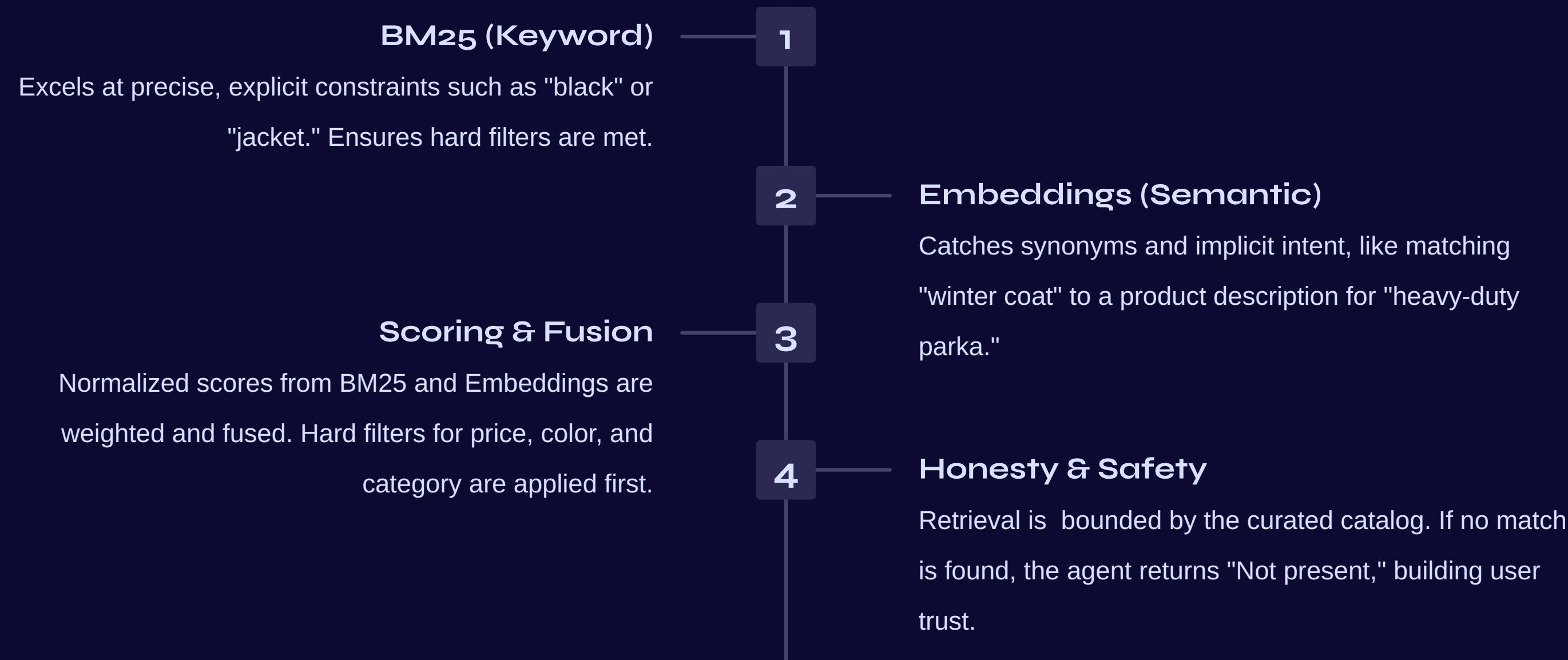
## Image Search (Vision)

Encodes the query image via CLIP and finds the nearest product vectors in the catalog via cosine similarity.



# Retrieval & Ranking: Why Hybrid RAG Works Best

Approach fuses keyword precision with semantic understanding to deliver highly relevant results without hallucination.





# Visual Search Powered by CLIP

Image search enables shoppers to find products based on real-world inspiration, leveraging pre-trained vision models.

## CLIP Integration

The Contrastive Language-Image Pre-training model allows Mercury to efficiently compare visual features.

- All catalog images are pre-encoded into a vector store.
- The query image (upload or URL) is encoded in real-time.
- Cosine similarity is calculated to find the closest visual matches in the catalog (top-K results).
- The process is CPU-friendly, making it fast and scalable for our prototype.



# Robust API Endpoints (FastAPI)

The backend provides a clear, documented set of endpoints for all agent functionalities and system health monitoring.

Endpoint	Function
POST /api/chat	The primary endpoint: Orchestrates intent, routes to tools, and returns the final agent reply and results.
POST /api/search_text	Direct access to the Hybrid Text Retrieval (BM25 + Embeddings).
POST /api/search_image	Handles image file upload for CLIP search. (POST /api/search_by_url for image URL input)
GET /api/catalog	Returns the full product catalog array (JSON).
GET /health	System check: Reports status, item count, and uptime.

Full interactive documentation is available via Swagger.



# Demo



## Mercury AI Commerce Agent

API Docs ↗

Chat, text recommendations, and image-based search — unified. Mercury routes your request to the right tool, combines results, and explains them in plain language.

Ask anything

Brown cap under 30

Ask Mercury

Clear

Upload an image

Choose file

No file chosen

...or paste image URL


https://example.com/photo.jpg

Agent


Here are caps at or under \$30:

- Brown Thermal Knit Beanie — \$26.25 (brown, caps)
- Brown Thermal Knit Beanie — \$20.57 (brown, caps)
- Black Running Cap — \$29.02 (black, caps)
- White Trucker Hat — \$26.46 (white, caps)
- Blue Running Cap — \$26.57 (blue, caps)
- ...and 3 more.


Recommendations




**Brown Thermal Knit Beanie**  
caps • brown  
**\$26.25**  
Brown Thermal Knit Beanie crafted with soft-touch materials for winter, thermal. Offers everyday practicality. A reliable cap you can use daily.  
score: 0.591



**Brown Thermal Knit Beanie**  
caps • brown  
**\$20.57**  
Brown Thermal Knit Beanie crafted with lightweight materials for winter, thermal. Offers everyday practicality. A reliable cap you can use daily.  
score: 0.586



**Black Running Cap**  
caps • black  
**\$29.02**  
Black Running Cap crafted with quick-dry materials for running, lightweight. Offers all-day comfort. A reliable cap you can use daily.  
score: 0.569



**White Trucker Hat**  
caps • white  
**\$26.46**  
White Trucker Hat crafted with all-season materials for mesh, casual. Offers everyday practicality. A reliable cap you can use daily.  
score: 0.540



## Mercury AI Commerce Agent

API Docs ↗

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Ask anything

Green running shoes

Ask Mercury

Clear

Upload an image

Choose file

No file chosen

...or paste image URL


https://example.com/photo.jpg

Agent


Here are some shoes matches:

- Green Running Shoes — \$75.64 (green, shoes)
- Green Training Sneakers — \$80.99 (green, shoes)
- Orange Running Shoes — \$80.62 (orange, shoes)
- Black Trail Runners — \$82.41 (black, shoes)
- Green Casual Sneakers — \$79.52 (green, shoes)
- ...and 6 more.


Recommendations




**Green Running Shoes**  
shoes • green  
**\$75.64**  
Green Running Shoes crafted with quick-dry materials for running, road. Offers easy care. A reliable shoe you can use daily.  
score: 0.956



**Green Training Sneakers**  
shoes • green  
**\$80.99**  
Green Training Sneakers crafted with lightweight materials for training, gym. Offers all-day comfort. A reliable shoe you can use daily.  
score: 0.750



**Orange Running Shoes**  
shoes • orange  
**\$80.62**  
Orange Running Shoes crafted with water-resistant materials for running, road. Offers everyday practicality. A reliable shoe you can use daily.  
score: 0.721



**Black Trail Runners**  
shoes • black  
**\$82.41**  
Black Trail Runners crafted with premium knit materials for trail, outdoor. Offers all-day comfort. A reliable shoe you can use daily.  
score: 0.635



# Demo



## Mercury AI Commerce Agent

Chat, text recommendations, and image-based search — unified. Mercury routes your request to the right tool, combines results, and explains them in plain language.

[API Docs ↗](#)

Ask anything

Search similar products as the image i uploaded

Ask MercuryClear

Upload an image

Choose file

brownbag.webp

Selected: brownbag.webp

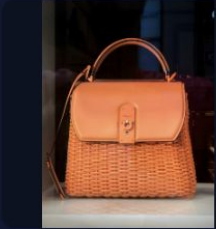
...or paste image URL

https://example.com/photo.jpg

Agent

Here are visually similar items:

Recommendations




Orange Daypack Backpack

bags • orange

\$53.30

Orange Daypack Backpack crafted with water-resistant materials for backpack, daypack. Offers versatile style. A reliable bag you can use daily.

score: 0.600




Gray Travel Duffel

bags • gray

\$51.48

Gray Travel Duffel crafted with premium knit materials for travel, duffel. Offers modern silhouette. A reliable bag you can use daily.

score: 0.533



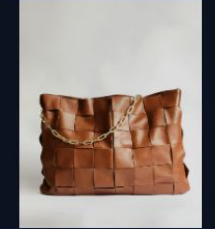
Orange Daypack Backpack

bags • orange

\$63.78

Orange Daypack Backpack crafted with breathable materials for backpack, daypack. Offers secure fit. A reliable bag you can use daily.

score: 0.525



Orange Travel Duffel

bags • orange

\$49.33

Orange Travel Duffel crafted with breathable materials for travel, duffel. Offers travel-ready design. A reliable bag you can use daily.

score: 0.471



## Mercury AI Commerce Agent

Chat, text recommendations, and image-based search — unified. Mercury routes your request to the right tool, combines results, and explains them in plain language.

[API Docs ↗](#)

Ask anything

What items do you have ?

Ask MercuryClear

Upload an image

Choose file

brownbag.webp

...or paste image URL

https://example.com/photo.jpg

Agent

[LLM] We've got a compact catalog of bags, shoes, jackets and caps in multiple colors and prices. Ask me for something specific!



## Mercury AI Commerce Agent

Chat, text recommendations, and image-based search — unified. Mercury routes your request to the right tool, combines results, and explains them in plain language.

[API Docs ↗](#)

Ask anything

What can you do ?

Ask MercuryClear

Upload an image

Choose file

No file chosen

...or paste image URL

https://example.com/photo.jpg

Agent

[LLM] I can chat about your needs, extract filters like color and budget, and find matching products. I also support image-based search.

Thank You

