

## Technical Assessment Submission

### Visual Product Matcher

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#### 1. Working Application URL

**Live Application:** <https://unthinkable-task.streamlit.app/>

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#### 2. GitHub Repository

**Source Code:** [https://github.com/Matrix9339/Unthinkable\\_PM](https://github.com/Matrix9339/Unthinkable_PM)

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#### 3. Approach

The Visual Product Matcher uses a **pre-trained MobileNetV3 small model** fine-tuned for product similarity. The system follows a streamlined approach:

##### 1. Feature Extraction:

- MobileNetV3 processes product images into **1024-dimensional embedding vectors**, capturing visual patterns like shape, color, and texture.

##### 2. Precomputation Strategy:

- All product images are pre-processed into vectors stored in `product_vectors.json`, enabling **real-time search** without model inference during queries.

##### 3. Similarity Matching:

- **Cosine similarity** compares query image embeddings against precomputed vectors, ranking products by visual resemblance.

##### 4. Efficient Deployment:

- The **Streamlit interface** provides intuitive upload options (file/URL) with filtering by category and similarity thresholds.
- The system runs entirely on **CPU**, making it cost-effective for deployment.

This solution balances **accuracy with performance**, using a lightweight model suitable for web deployment while maintaining robust visual recognition. The precomputation strategy ensures **fast response times**, crucial for user experience in e-commerce applications.

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#### 4. Key Features Implemented

1. Image upload (file + URL input)
  2. Product gallery with similarity scores
  3. Category and similarity threshold filters
  4. Mobile-responsive design
  5. Loading states and error handling
  6. 200+ products with metadata
  7. Live deployment on Streamlit Cloud
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#### 5. Technology Stack

- **Frontend:** Streamlit
  - **Computer Vision:** PyTorch, MobileNetV3
  - **Similarity Search:** Cosine similarity
  - **Hosting:** Streamlit Cloud
  - **Data Storage:** JSON files
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*Submitted by: Himanshu Singh*

*Email: [himanshu.singh2024@vitstudent.ac.in](mailto:himanshu.singh2024@vitstudent.ac.in)*

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