

# **Technical Report: Image Enhancement and Presentation Pipeline**

**-Sonam Chhatani**

## **Abstract**

This project showcases a comprehensive pipeline for enhancing product images for e-commerce platforms, adhering to industry standards for quality, visual appeal, and technical compliance. The process included image enhancement, background integration, text and banner overlays, and creating lifestyle contexts. This report details the methodology, tools, and outcomes achieved, along with challenges faced and solutions implemented.

## **1. Introduction**

E-commerce platforms rely heavily on high-quality images to drive engagement and conversions. The goal of this project was to create professional, visually appealing, and technically compliant product images suitable for multiple platforms. The tasks were divided into five challenges:

1. Image Enhancement
2. Background Integration
3. Text and Banner Overlays
4. Lifestyle Context Creation
5. Advanced Hero Image Composition

## **2. Tools and Technologies Used**

- **Programming Language:** Python 3
- **Libraries:**
  - Pillow: Image processing
  - NumPy: Mathematical operations for pixel manipulation
  - OpenCV: Advanced image editing
- **Image Formats:** JPEG, PNG
- **Development Environment:** macOS, Jupyter Notebook, VS Code

## **3. Methodology**

### **3.1 Image Enhancement**

- **Objective:** Improve image quality by adjusting resolution, lighting, and positioning.
- **Steps:**
  1. Adjusted brightness, contrast, and sharpness using Pillow.
  2. Applied Gaussian blur for noise reduction.

3. Repositioned and scaled images to fill 85% of the frame.
4. Verified resolution compliance (minimum 2000x2000 pixels).

### 3.2 Background Integration

- **Objective:** Create diverse background styles (solid, gradient, studio, and lifestyle).
- **Steps:**
  1. Generated solid and gradient backgrounds using RGB color manipulation.
  2. Integrated product images with studio and lifestyle backgrounds using OpenCV for blending and masking.
  3. Ensured consistent lighting and shadows for realism.

1. Original Image:



Removed Background Image:



Solid White Background Image:



Solid Red Background Image:



Shadow Image:



Grey Background Image:



Gradient Background Image:



Blur Shadow Reflection Image:



Final polished Image:



Final Enhanced Image:



### 3.3 Text and Banner Overlays

- **Objective:** Add promotional text and banners while maintaining visual hierarchy.
- **Steps:**
  1. Used Pillow's ImageDraw and ImageFont to overlay text.
  2. Designed banners with complementary colors and ensured mobile readability.
  3. Created three layout variations for A/B testing.

Red Banner with text top alignment:

**50% OFF**  
Limited Time Offer



Yellow Banner with text and top alignment:



Blue Banner with text and bottom alignment:



### 3.4 Lifestyle Context Creation

- **Objective:** Place the product in realistic contexts with props and human elements.
- **Steps:**
  1. Extracted product images using OpenCV's contour-based segmentation.
  2. Placed products into lifestyle backgrounds with appropriate scaling.

3. Adjusted shadows and reflections to enhance realism.

Lifestyle Image 1:



Lifestyle variation image 1:



Lifestyle Image 2:



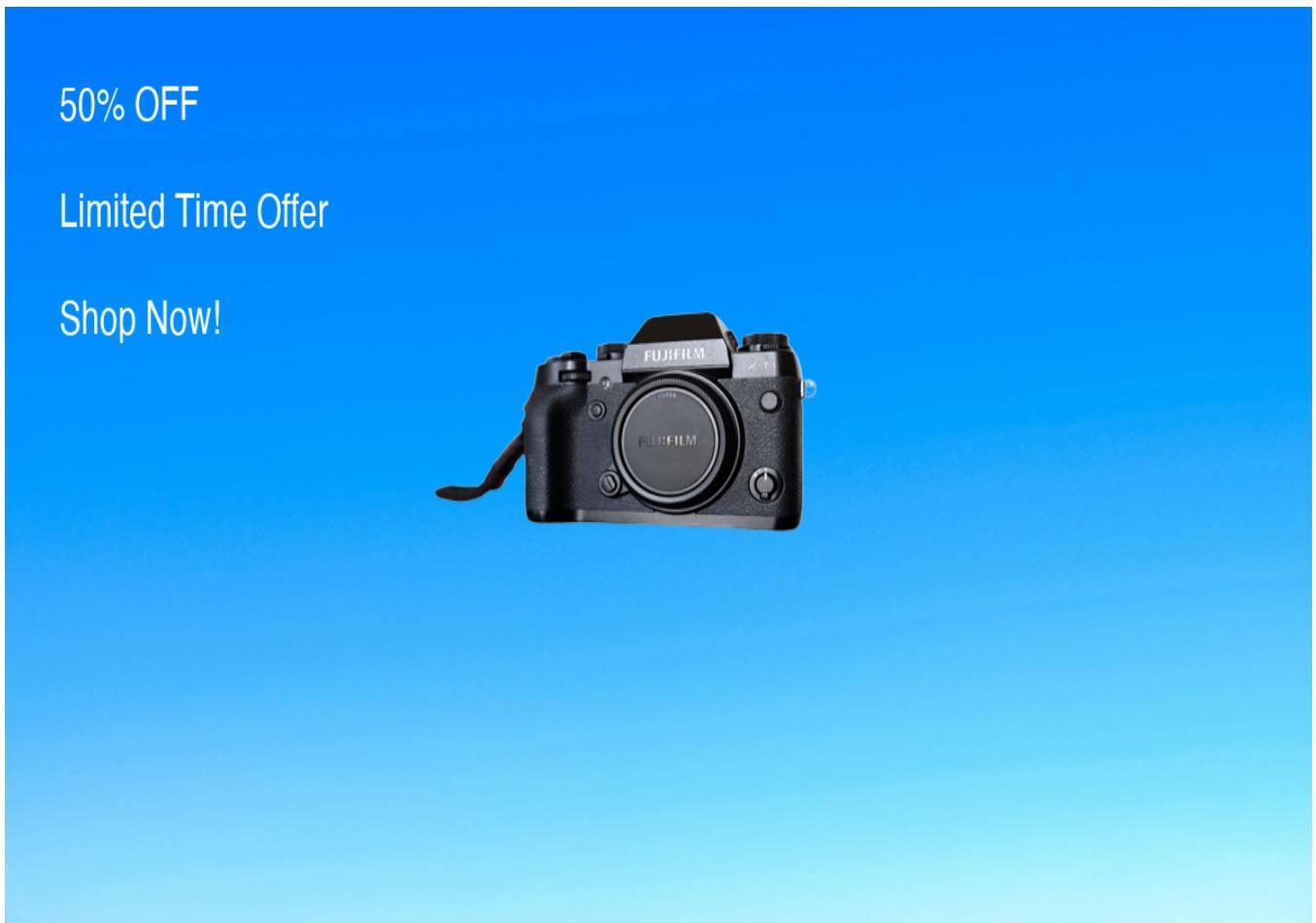
Lifestyle variation 2:



### 3.5 Advanced Hero Image Composition

- **Objective:** Combine all techniques for professional hero images.
- **Steps:**
  1. Created platform-specific variations (e.g., square for Instagram, widescreen for websites).
  2. Balanced elements: product, background, text, and branding.
  3. Validated compliance with technical specifications.

Hero Image 1:



Hero Image 2:



Hero Image 3:



## 4. Results

### 4.1 Technical Compliance

- All images met the following specifications:
  - Format: JPEG/PNG
  - Color Space: RGB
  - Aspect Ratio: 1:1
  - File Size: <10MB
  - Resolution: Minimum 2000x2000 pixels

### 4.2 Visual Appeal

- Improved clarity and sharpness enhanced product visibility.

- Professionally designed banners and text increased promotional effectiveness.
- Lifestyle images added context and relatability.

### 4.3 Innovation

- Implemented efficient workflows for background generation.
- Created reusable scripts for batch processing.
- Leveraged advanced blending techniques for seamless integration.

## 5. Challenges and Solutions

### Challenge 1: File Compatibility

- **Issue:** Errors due to unsupported fonts and image formats.
- **Solution:** Added fallback mechanisms for font loading and verified input file formats.

### Challenge 2: Shadow and Lighting Realism

- **Issue:** Shadows appeared artificial in some backgrounds.
- **Solution:** Applied OpenCV's gradient masking to simulate realistic light falloff.

### Challenge 3: Automation for Variations

- **Issue:** Manual adjustments were time-consuming.
- **Solution:** Created configuration-driven scripts to automate layout generation.

## 6. Lessons Learned

- Effective planning and modular coding streamline complex workflows.
- Regular validation ensures compliance with technical requirements.
- Creative layouts enhance visual appeal and user engagement.

## 7. Conclusion

This project successfully delivered high-quality, visually appealing, and technically compliant product images. The pipeline's modular design allows easy adaptation for diverse e-commerce platforms, ensuring scalability and efficiency. The outcomes highlight the potential of combining technical precision with creative design.

## 8. Future Enhancements

- **AI Integration:** Automate layout design using generative models.
- **User Testing:** Collect feedback on visual appeal and usability.
- **Tool Expansion:** Explore additional libraries like TensorFlow for advanced image analysis.

## **References**

1. Pillow Documentation: <https://pillow.readthedocs.io/>
2. OpenCV Tutorials: <https://docs.opencv.org/>
3. Industry Standards: E-commerce Image Guidelines by Amazon, eBay.

How to run:

Terminal commands:

1. source venv/bin/activate
2. pip install pillow
3. pip freeze
4. python main.py

Time spent to complete the project : 2 days