# Silhouette Automata

*Bold Innovation in Rapid Lifestyle with Automation*

# Team Vogue Fusion {Puls-230361}

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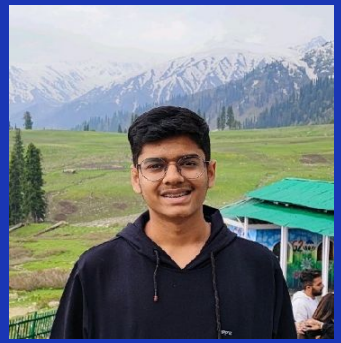


Devish Mittal

# Abstract

Color is a language of its own in the world of fashion. The right color can make a garment pop on the runway or fly off the shelves. It can reflect cultural and societal trends, express individual identity, and even influence our mood.

Design is an essential part of the clothing industry. In the world of Fast-Fashion, Production time of major retail brands take upto 3-5 months, in which sampling and design time itself takes minimum of 2-3 weeks. Also, it faces issues like transparency, efficiency, and real-time feedback during the design-to-production workflow.

To overcome this issue, we are providing a simple automated solution that uses GenAI to solve the issues regarding Design and Color printing part of the process. which generates designs based on simple inputs like fabric choices, styles, and keywords analyzing the market trends. Leveraging models like GANs and StyleGANs to create a high quality and customizable Designs.

This unified interface bridges creativity and practicality, offering tools for instant feedback, seamless image-to-image transformations, and accurate color formulations for manufacturers. The solution enhances efficiency by minimizing delays caused by isolated workflows, enabling faster decision-making and creative exploration.

# Market Challenges

**Trend Volatility:**

- It is very tough to follow the market fashion trends to predict the demand and avoid unsold stock.
- 60% of the fashion are sold at discounted prices due to incorrect demand forecasting

**Fragmented Markets:**

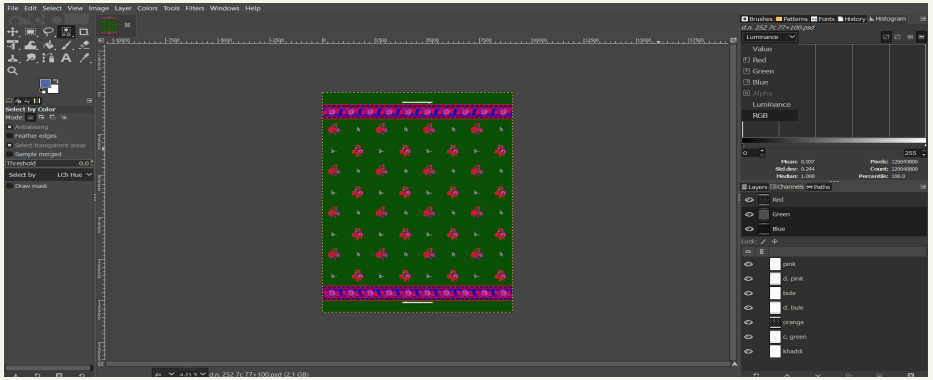
- Highly Fragmented markets which is also very competitive, but manufacturing is done by only couple of manufacturers, making it tough for small scale retailers.

**Lack of Digital Transformation:**

- Many Retailers, be it large or small scales, are yet to implement/integrate latest digital tools, which can help in decreasing their time of production by at least 10%.

**Cost Volatility:**

- Fluctuations in raw material costs, such as cotton and synthetic fibers, make pricing unpredictable.



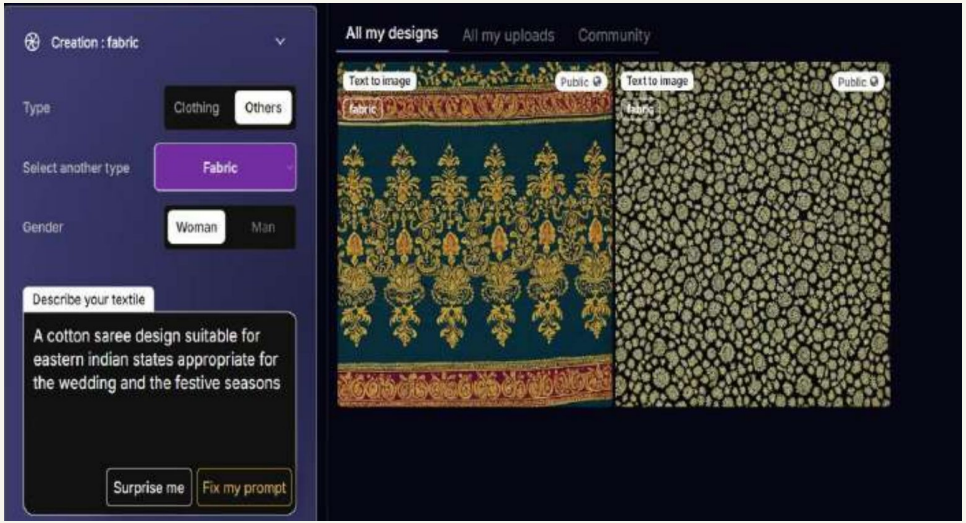
| Color | Thaan | Cut | Metre | Color | Quantity | Rate | Amount | | | | red | rani | gold | meroon | b green | navy | avg cost | WITH GST |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rani | 24 | 145 | 3480 | Red F3B | 14 | 317 | 4438 | | | | | | | | | | | |
| | | | | Violet 5R | 0.1 | 511 | 51.1 | 4489.1 | 187.046 | | 223 | 187 | 148 | 99 | | | 164.25 | 193.815 |
| | | | | | | | | | | | 223 | 187 | 148 | | 198 | | 189 | 223.02 |
| Gold | 24 | 145 | 3480 | GYME2RL | 4 | 314 | 1256 | | | | 223 | 187 | | 99 | | 126 | 158.75 | 187.325 |
| | | | | YME4GL | 6 | 384 | 2304 | 3560 | 148.333 | | 223 | 187 | | | 198 | 126 | 183.5 | 216.53 |
| | | | | | | | | | | | 223 | 187 | 148 | | 198 | | 189 | 223.02 |
| OldRed | 24 | 145 | 3480 | Red5B | 15 | 270 | 4050 | | | | 223 | 187 | | 99 | | 126 | 158.75 | 187.325 |
| | | | | OME2RL | 3 | 470 | 1410 | 5460 | 227.5 | | | | | | | | 1043.25 | 1231.04 |
| | | | | | | | | | | | | | | avg cost/per than | | | 173.875 | 205.173 |
| NewRed | 24 | 145 | 3480 | Red F3B | 8 | 317 | 2536 | | | | | | | | | | 145 | 145 |
| | | | | OME2RL | 3.6 | 470 | 1692 | | | | | | | avg cost / mtr | | | 1.19914 | 1.41498 |
| | | | | GYME2Rl | 3.6 | 314 | 1130.4 | 5358.4 | 223.267 | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| Maroon | 24 | 145 | 3480 | MaroonR | 7 | 285 | 1995 | | | | | | | | | | | |
| | | | | BlackB | 0.6 | 242 | 145.2 | | BlackB 13 | 282 | | | | | | | | |
| | | | | OME2RL | 0.5 | 470 | 235 | 2375.2 | 98.9667 | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| BottleGree | 19 | 145 | 2755 | YME4GL | 3.7 | 384 | 1420.8 | | | | | | | | | | | |
| | | | | BlackB | 4.1 | 242 | 992.2 | | | | | | | | | | | |
| | | | | TBH2GP | 1.6 | 291 | 465.6 | 2878.6 | 151.505 | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| Navy | 24 | 145 | 3480 | BlackB | 8 | 242 | 1936 | | | | | | | | | | | |
| | | | | Red F3B | 2 | 317 | 634 | | | | | | | | | | | |
| | | | | Black GDN/Black ANN | 1.6 | 285 | 456 | 3026 | 126.083 | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| Bottlegree | 20 | 145 | 2900 | YME4GL | 5 | 384 | 1920 | | | | | | | | | | | |
| | | | | BlackB | 6 | 242 | 1452 | | | | | | | | | | | |
| | | | | TBH2GP | 2 | 291 | 582 | 3954 | 197.7 | | | | | | | | | |

# Solution Overview

Our platform enables users to create high-quality textile patterns instantly using generative AI, based on inputs like fabric choices, and styles as well as rough sketches.

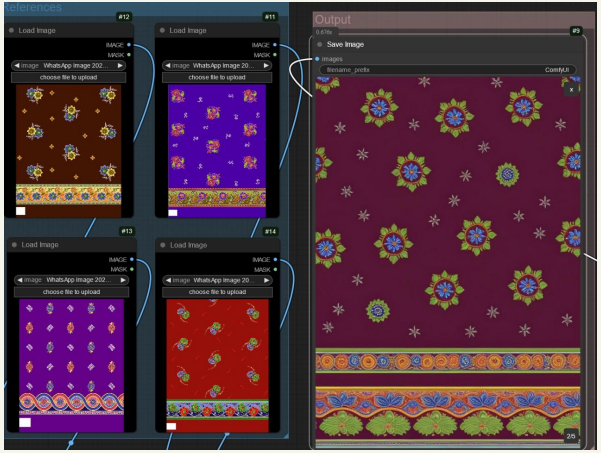
Based on the generated design we provide real-time cost calculations based on selected materials and colors, allowing users to make informed financial decisions.

Also provided are options to make slight modification to the generated designs to improve styling, fitting and cost analysis




This seamless combination of creativity, customization, and cost transparency significantly streamlines the design-to-production workflow.

# Key Features





## 1.AI-Powered Design Generation:

Instantly generates unique textile designs based on user inputs like keywords, styles, and fabric preferences.

## 2.Image-to-Image Prompts:

Allows dynamic design and color changes using AI-driven image-to-image transformations, enabling real-time customization without restarting the design process

## 3.Real-Time Cost Prediction:

Provides dynamic pricing updates as users adjust design elements such as color, fabric, and pattern, ensuring accurate cost estimation.

## 4.Colour Formulas:

Offers precise color formulas for users, enabling manufacturers to reliably replicate the exact colors in production.

## 5.Increased Efficiency:

Reduces delays caused by separate workflows, improving time-to-market for new designs, to keep up with ever changing fashion trends.

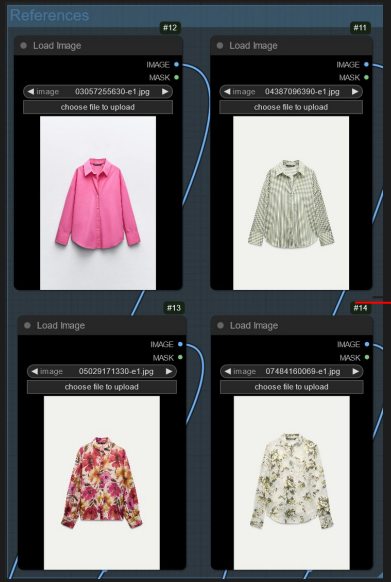
# Workflow

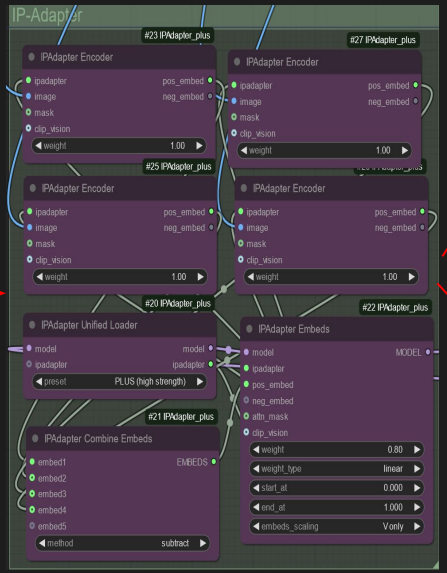
**References**
Design inspirations

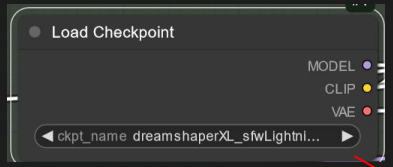
**IP Adapter Plus**
For image to image generation

**Checkpoint**
Model selection

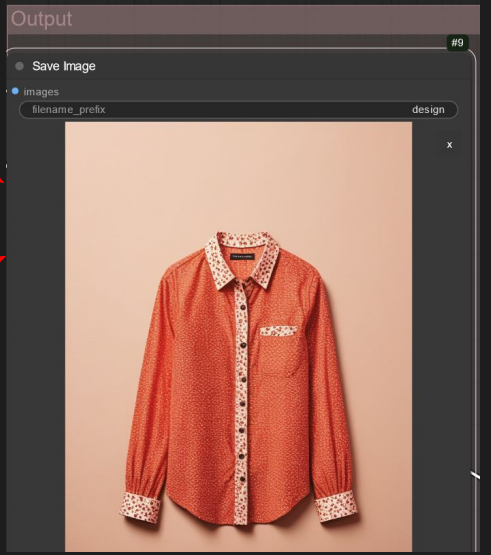
**Output**
New design inspired by references



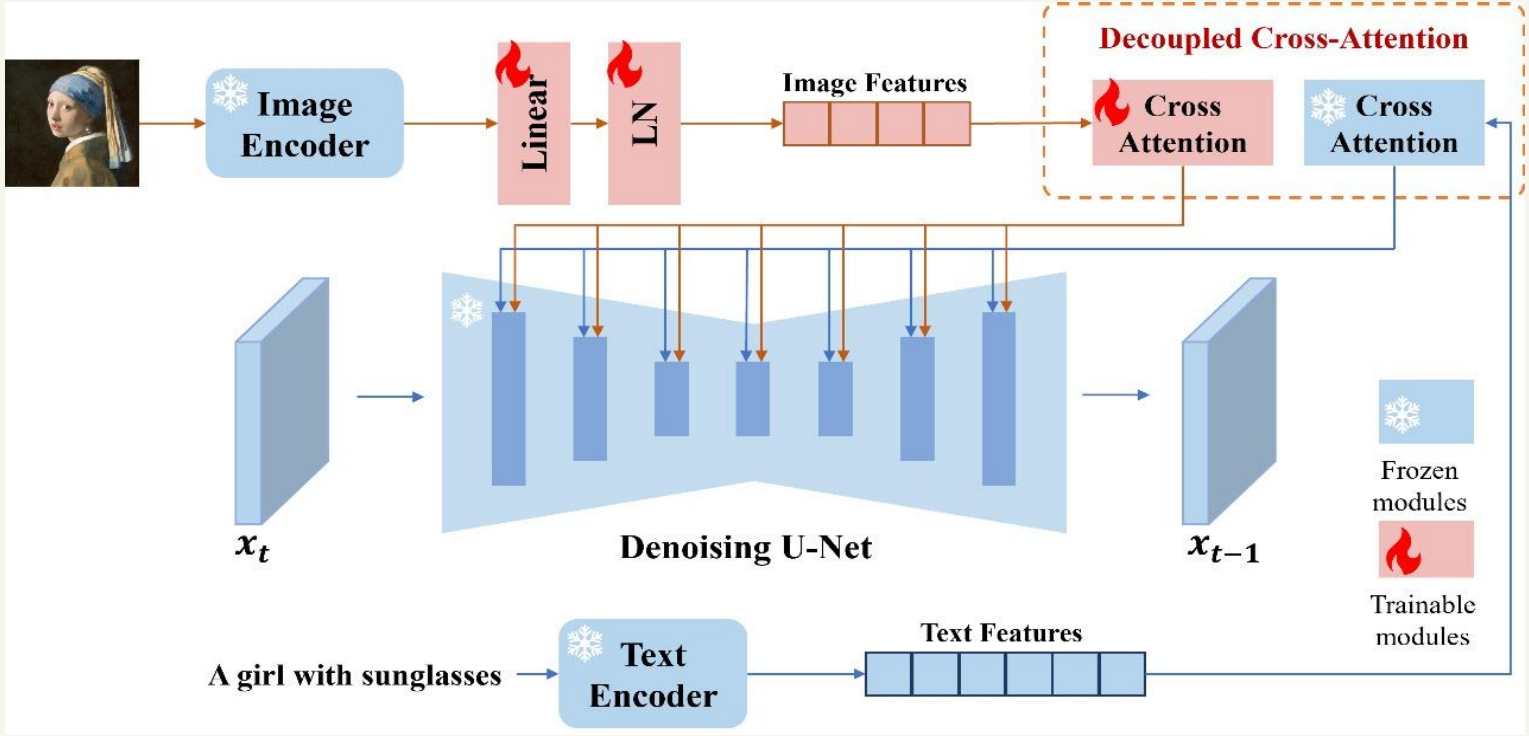



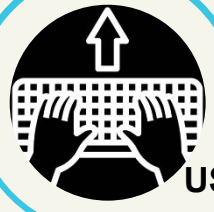

**CLIP Text Encode**
For Positive and negative prompts

# Model Architecture



# IMPLEMENTATION



## USER INPUT

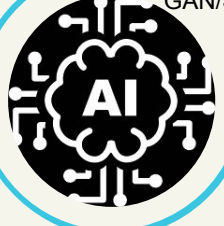
Fabric, Style, Keywords, Design Inspirations

## User Selection

Select the best design

## Cost Calculation

Fabric, Color, and Texture costs from databases




## COMFY UI GEN

Designs created using GAN/StyleGAN models

## Real-time Design Adjustments

Adjust the finer details in design

## Final Confirmation

# Tech Stack

**1. Core Design Generation**
GANs/StyleGANs: Neural networks for generating high-quality and customizable textile designs.
Python: Programming language for integrating and orchestrating AI models.

**2. Frontend and Backend**
React.js: Interactive and responsive user interface for design inputs and adjustments.
Node.js with Express.js: Handles API requests and connects the frontend to backend services.
Flask/FastAPI: Lightweight APIs for AI model endpoints and computations.

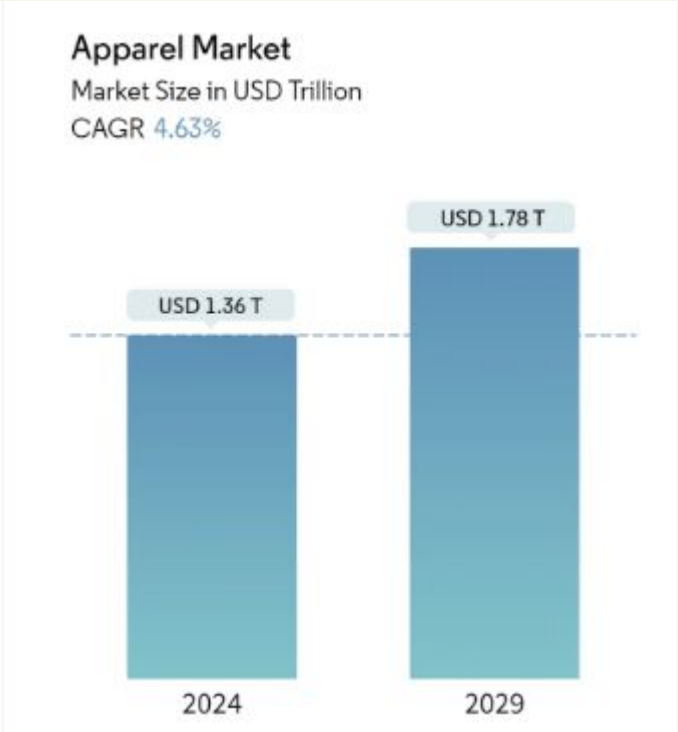
**3. AI and Image Processing**
OpenCV: For pixel-level operations, such as color histograms and fabric analysis.
NumPy & Pandas: For real-time calculations of costs based on pixel distribution, color formulas, and material databases.

**4. Database and Storage**
PostgreSQL: For storing user data, design templates, and cost calculation parameters.
PrismaORM: Flexible database for managing unstructured data like design metadata or logs.

**5. Deployment**
Docker: Containerized deployment of the frontend, backend, and AI models.
AWS/GCP: Cloud infrastructure to host the application, databases, and models.

# Case study

The global apparel market, valued at **USD 1.36 trillion in 2024**, is projected to reach **USD 1.78 trillion by 2029** at a CAGR of **4.63%**, driven by e-commerce growth, influencer marketing, and shifting fashion trends. Fast fashion brands must adapt quickly to remain competitive in this rapidly evolving industry. Currently, production timelines for major retailers span **3-5 months**, with the **design phase alone taking 2-3 weeks**. Silhouette Automata can transform Pantaloons' production model by reducing the design phase to **1-2 days** through automated AI-driven processes, including trend-based designs and cost analysis. This enables seamless integration into the manufacturing and distribution phases, reducing inefficiencies and optimizing operations. By leveraging AI, Pantaloons can cut the entire production cycle to just **to weeks** , allowing faster market entry and improved responsiveness to seasonal demands. This transformation enhances cost efficiency, minimizes waste, and positions Pantaloons as a leader in fast fashion, tapping into the **$1.36 trillion market potential**.



# Cost Analysis

- **Reduced Sampling Costs**: Digital samples minimize the need for physical prototypes, lowering expenses by up to 30-50% per sample.
- **Labor Cost Savings**: Automation speeds up the design process, allowing teams to focus on higher-value tasks.
- **Streamlined Production Workflow**: Real-time feedback cuts design-to-production time by **90%,** reducing overheads associated with miscommunication and rework.
- **Material Efficiency**: AI optimizes fabric usage, reducing waste by 25 - 30% and save initial costs.

# Return On Investment

- **Increased Speed to Market**: Faster design processes enable brands to respond quickly to trends, capturing more sales opportunities. Since 50% of sales are achieved within the first three months of a fashion launch.
- **Enhanced Creativity and Customization**: Unique, tailored designs boost customer satisfaction and loyalty, driving higher sales volumes.
- **Improved Decision-Making**: Real-time cost calculations facilitate informed decisions, reducing costly mistakes. Informed decisions lead to 20% higher operational efficiency.
- **Long-Term Cost Reductions**: Initial technology investments lead to significant long-term savings through reduced waste and efficient processes, and fewer errors lead to **ROI increases of 3-5x** within 2-3 years

# Call to Action

Our GenAI-powered solution is transforming the design-to-production workflow in the fashion industry.

**Speed Up Production**: Generate high-quality, customizable designs in minutes by inputting fabric choices, styles, and keywords.

**Stay on Trend**: Harness advanced models like GANs and StyleGANs to analyze market trends and create designs that resonate with your audience.

**Production Cost Calculation**: The solution utilizes color histograms, fabric costs, and color-specific pricing to provide real-time, accurate production cost insights. This ensures informed financial decisions and minimizes budget overruns.

**Enhance Efficiency**: Eliminate delays with our unified platform offering real-time feedback, image-to-image transformations, and precise color formulations.

**Bridge Creativity and Practicality**: Empower designers and manufacturers with tools for seamless collaboration, reducing sampling time from weeks to days.

# Training and Support

To unlock the full potential of the **Fashion Automata** platform and reduce production timelines, we offer a comprehensive training program for design teams:

- Equip designers with skills to spot emerging trends and quickly source reference images for inspiration.
- Train teams to utilize the platform’s AI tools effectively, enabling them to create designs in minutes rather than days.
- Provide round-the-clock access to experts for seamless adoption and troubleshooting of the platform.
- Guide teams to incorporate the platform into existing workflows, reducing friction and enhancing efficiency throughout the design-to-production process.

# What Makes Us Unique

- Seamless Design Generation with Real-Time Customization → By leveraging ComfyUI integrated with GANs/StyleGANs, our platform generates high-quality textile designs instantly based on user inputs. Users can fine-tune their designs dynamically with real-time image-to-image transformations, ensuring creativity and precision without restarting the process.

- End-to-End Design-to-Production Workflow → We bridge the gap between design and production by providing tools that calculate cost parameters (color histograms, fabric, and materials) alongside customizable design features. This holistic approach integrates AI-driven automation and real-time decision-making to streamline every stage of the workflow.