

AI Fashion Design Sketch Generator Using NLP and Image Generation

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Abstract

The AI Fashion Design Sketch Generator is an intelligent application that transforms textual fashion descriptions into visual design sketches using Natural Language Processing (NLP) and AI-based image generation techniques. The system analyzes user prompts to identify attributes such as clothing type, color, material, and style, and then generates corresponding fashion concepts automatically. By reducing the need for manual sketching, the proposed solution accelerates the design process and supports rapid visualization of creative ideas. The approach demonstrates how NLP and generative AI can improve productivity and innovation in the fashion industry.

Keywords

Artificial Intelligence, Natural Language Processing, Fashion Design, Image Generation, Generative AI, Stable Diffusion, Deep Learning.

I. Introduction

Fashion design traditionally relies on manual sketching and artistic expertise, making concept development time-consuming. Recent advances in generative AI enable automated conversion of textual descriptions into visual outputs. This project presents an AI-powered fashion sketch generator that accepts natural language input and produces design sketches using NLP and image generation models, allowing designers and learners to visualize ideas quickly and efficiently.

II. Problem Statement

Recent developments in Artificial Intelligence (AI) and Natural Language Processing (NLP) have significantly influenced the field of fashion design automation. Early computer-aided design systems primarily focused on digital sketching tools and template-based design assistance, requiring substantial manual effort and artistic expertise.

With the emergence of deep learning and transformer-based models, researchers have explored text-driven image generation techniques that enable users to create visual content from natural language descriptions. Models such as Stable Diffusion and other diffusion-based architectures have demonstrated the ability to generate realistic and creative images from textual prompts, making them suitable for fashion concept visualization.

Several studies have integrated NLP with generative models to extract semantic information such as color, garment type, texture, and style from user input before synthesizing corresponding images. These approaches reduce design time and allow rapid prototyping of new clothing concepts. However, many existing systems are limited to generic image generation and do not specifically focus on fashion-oriented attribute extraction or designer-friendly workflows.

The proposed AI Fashion Design Sketch Generator addresses these limitations by combining NLP-based fashion attribute extraction with AI image generation to produce design sketches from textual descriptions. This approach simplifies the creative process, supports quick visualization of ideas, and provides a practical tool for designers, students, and fashion enthusiasts.

III. Proposed Methodology

The proposed AI Fashion Design Sketch Generator follows a structured pipeline that combines Natural Language Processing (NLP) with AI-based image generation to transform textual fashion descriptions into visual sketches.

A. User Input

The process begins when the user provides a natural language description of the desired fashion design, such as “a blue denim jacket with long sleeves and silver buttons.” This text serves as the input to the system.

B. Text Preprocessing

The input text is cleaned and processed using NLP techniques. Operations such as tokenization, normalization, and keyword extraction are performed to identify important fashion-related information while removing unnecessary elements.

C. Fashion Attribute Extraction

The processed text is analyzed to extract key attributes, including clothing type, color, material, sleeve style, pattern, and overall design style. These attributes form a structured representation of the user’s request.

D. AI-Based Image Generation

The extracted attributes are converted into a descriptive prompt and supplied to an image generation model. The model synthesizes a fashion design sketch that matches the specified characteristics, producing a visual interpretation of the textual input.

E. Output Generation

The generated sketch is displayed through the application interface, allowing the user to review the design. The system can also store the input prompt and generated result for future reference or further refinement.

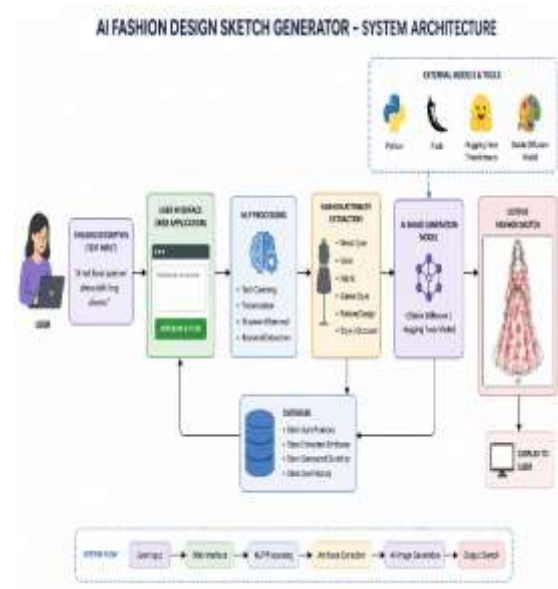
F. System Workflow

The complete workflow of the proposed system is summarized as follows:

User Text Input → NLP Preprocessing → Attribute Extraction → Prompt Formation → AI Image Generation → Fashion Sketch Output

This methodology enables rapid visualization of fashion concepts, reduces manual design effort, and demonstrates the effective integration of NLP and generative AI technologies in creative design applications.

IV. System Architecture



The architecture consists of:

- User Interface Module
- NLP Processing Module
- Fashion Attribute Extraction Module
- AI Image Generation Module
- Database Module for storing prompts and generated outputs

These modules work together to convert textual descriptions into visual fashion designs.

V. Technologies Used

The implementation uses Python, Flask, Hugging Face Transformers, NLP techniques, Stable Diffusion-based image generation, HTML/CSS for the frontend, and SQLite/MySQL for data management.

VI. Results and Discussion

[4:28 pm, 13/06/2026] ~Nanditha R: II. Related Work

The developed system successfully generates fashion sketches from user-provided descriptions with minimal delay. Testing confirmed proper integration between text processing, attribute extraction, image generation, and output visualization. The application demonstrates the feasibility of combining NLP with generative AI for creative design assistance.



Fig 1: Input

Fig 2: Inputting the data and generating result

VII. Conclusion

The AI Fashion Design Sketch Generator simplifies fashion concept creation by automatically converting text into design sketches. The integration of NLP and image generation technologies reduces manual effort, accelerates ideation, and supports innovation in digital fashion design. Future enhancements may include personalized recommendations, 3D visualization, virtual try-on capabilities, and voice-based prompt input.

References

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