

## **AI-Powered Automated Fashion Design System: Revolutionizing Creativity and Sustainability in Fashion**

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The integration of Artificial Intelligence (AI) into the fashion industry is reshaping traditional design processes, addressing challenges such as high costs, inefficiency, and environmental impact. This research presents an AI-powered automated fashion design system that leverages cutting-edge technologies, including Machine Learning (ML), Generative Adversarial Networks (GANs), Natural Language Processing (NLP), and Computer Vision. The system enables the generation of innovative, personalized designs, virtual prototypes, and accurate three-dimensional (3D) simulations based on user measurements or scanned data. Key functionalities include real-time pattern generation, virtual try-ons, and trend analysis informed by vast datasets of historical designs and consumer preferences. The study emphasizes a user-centric approach, combining advanced AI algorithms with intuitive tools to democratize design processes and reduce material waste. Results demonstrate that the system enhances design productivity by 35%, reduces production time by 40%, and achieves 95% accuracy in 3D body simulations. By contrasting existing solutions with the proposed system, this research highlights its superior integration of design generation, trend prediction, and customization. Unlike standalone tools, the system unifies these features to provide a comprehensive solution for designers and consumers alike. The findings underscore the potential of AI to bridge creativity and technology, fostering collaboration between human designers and AI systems. Additionally, the study addresses critical ethical considerations, such as data privacy and inclusivity, ensuring responsible AI adoption. It explores socio-economic implications, including the democratization of fashion and the promotion of sustainable practices. This research contributes a novel methodology that not only enhances the creative and production workflows of designers but also empowers consumers with personalized, interactive experiences. Future research will focus on refining AI-generated outputs, expanding datasets to minimize bias, and broadening the system's applicability to diverse markets and user groups.

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