International Journal of
DATA SCIENCE AND IOT MANAGEMENT SYSTEM
ISSN: 3068-272X
www.ijdim.com
Original Research Paper

FashGAN: Conditional GAN-Based Virtual Clothing Design and Try-On System for Enhanced User Experience and Fashion Technology Innovation

[1]Dr. P.V.S. Sarma,[2]Shaik Afrozah,[3]Talasila Jyothi,[4]Yetukuri Sradha

[1]Associate Professor, Dept of Computer Science and Engineering, St. Ann's College of Engineering and Technology, Chirala-523187, India.

[2,3,4]B. Tech Student, Dept of Computer Science and Engineering, St. Ann's College of Engineering and Technology, Chirala-523187, India.

ABSTRACT

This project presents a Generative Artificial Intelligence–based fashion detection and recommendation system for automated outfit visualization. The system analyzes user-uploaded clothing images to identify apparel categories. Based on the identified category, a Conditional Generative Adversarial Network is employed to generate corresponding outfit images. The generated outputs provide an approximate visual representation rather than fully realistic results, highlighting the experimental nature of the system. A web-based application is developed to enable real-time image upload and result visualization. The system also offers basic fashion recommendations to assist users in styling decisions. Secure user authentication ensures controlled and personalized access.

KEY WORDS: ***Generative Artificial Intelligence, Conditional Generative Adversarial Networks, Image-Based Apparel Classification, Fashion Image Synthesis, Virtual Outfit Generation, Fashion Recommendation System.***

INTRODUCTION

Existing fashion platforms primarily rely on static images and manual browsing, which limits user engagement and creativity. They often cannot provide personalized styling suggestions or generate new outfit visuals dynamically. To address these limitations, this project implements a Generative AI based fashion detection and recommendation system. Users can upload images of clothing, and the system identifies the apparel category using an automated classification approach. Based on the identified category, a Conditional Generative Adversarial Network (cGAN) generates corresponding outfit images. The web application displays both the uploaded image and the generated outfit, along with style suggestions for better fashion guidance. Secure signup and login modules provide personalized access to users. This system demonstrates the potential of

generative modeling to enhance user experience and interactivity in digital fashion platforms.

LITERATURE REVIEW

Recent research has explored generative models for fashion synthesis and recommendation. Gu, Chu, and Dong proposed a conditional GAN for clothing image generation, but lacked user interaction. Linlin Liu, Haijun Zhang, and Dongliang Zhou used multi-modal embedding for outfit compatibility, without real-time visualization. Xinyi Meng reviewed GAN-based fashion recommendation, noting limited realism and personalization. Jaewon Jung, Hyeji Kim, and Jongyoul Park developed a generative framework for fashion items but no web-based recommendations. Other studies highlight the need for better integration between recognition and generation. The proposed system addresses these gaps by combining category detection, generative outfit creation, and an interactive web interface.

RELATED WORK

This project uses a Generative AI–based system for fashion detection and outfit generation. A conditional GAN is employed to generate corresponding outfit images based on the detected clothing category. The Flask framework is used for building the web application due to its simplicity and modularity. Uploaded images are processed and stored in a structured directory, and Python libraries like Pillow and OpenCV are used for image handling and preprocessing. HTML and CSS are used for the frontend to provide an interactive and visually appealing interface. By combining generative modeling with web frameworks, the system demonstrates end-to-end functionality such as image upload, category prediction, outfit generation, and personalized style suggestions.

EXISTING METHOD

Existing fashion recommendation and generation systems primarily focus on either clothing image generation or outfit recommendation, but rarely combine both in a unified platform. Some systems use conditional GANs to generate clothing images, yet they lack user interaction and web-based interfaces for real-time visualization. Other approaches focus on outfit compatibility using multi-modal embeddings, but they do not provide automated category detection or personalized style suggestions. GAN-based fashion recommendation methods improve image generation quality but still face limitations in realism and user engagement. Overall, these systems are either limited to static datasets, manual selection, or separate modules for generation and

International Journal of
DATA SCIENCE AND IOT MANAGEMENT SYSTEM
ISSN: 3068-272X
www.ijdim.com
Original Research Paper

recommendation, restricting their practical usability and interactive experience.

PROPOSED METHOD

To overcome the limitations of existing fashion recommendation systems, the proposed system integrates clothing category detection, outfit generation, and personalized style suggestions in a single platform. Unlike prior methods that generate clothing images or recommend outfits separately, this system allows users to upload an image, automatically identifies the clothing category, and uses a Conditional GAN to generate a corresponding outfit. A web-based interface built with Flask, HTML, and CSS enables real-time visualization of both the uploaded and generated images, along with fashion tips. Secure user authentication ensures controlled access and personalized experience. By combining generative modeling, automated classification, and interactive interface, the system provides an end-to-end solution for digital fashion exploration and virtual try-on.

SYSTEM ARCHITECTURE

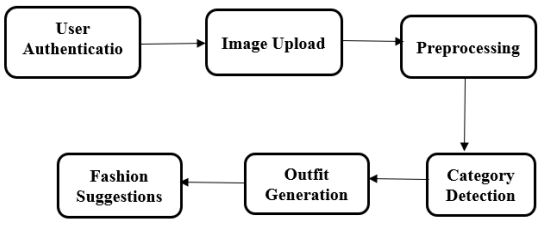

Fig 1: Block diagram

METHADOLOGY DESCRIPTION

User Authentication: This module allows users to securely sign up and log in to the system. It ensures that only authorized users can access image upload and fashion recommendation functionalities.

Image Upload: Users can upload clothing images through the web interface. The uploaded images serve as input for category detection and outfit generation.

Preprocessing: Uploaded images are resized, normalized, and converted into a suitable format for the classification and generative models. This step ensures consistent input quality for accurate predictions and image generation.

Category Detection: The system automatically identifies the clothing category (e.g., shirt, dress, pants) from the preprocessed image. The predicted category guides the Conditional GAN for generating a corresponding outfit.

Outfit Generation: A Conditional GAN generates new outfit images based on the detected clothing category. This module allows users to visualize AI-generated outfit variations for the uploaded clothing.

Fashion Suggestions: The system provides personalized styling tips according to the detected clothing type. These suggestions

International Journal of
DATA SCIENCE AND IOT MANAGEMENT SYSTEM
ISSN: 3068-272X
www.ijdim.com
Original Research Paper

enhance user experience and assist in making informed fashion choices.

RESULTS AND DISCUSSION

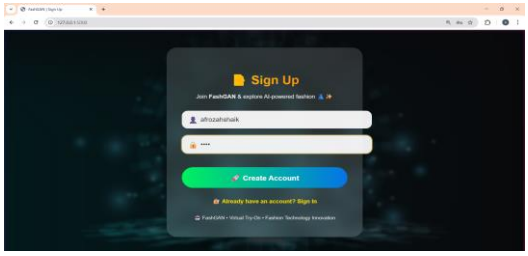

Fig 2: Sign up Page

The Sign-Up page provides a secure and user-friendly interface for new users to create an account. Users can enter a username and password to register.

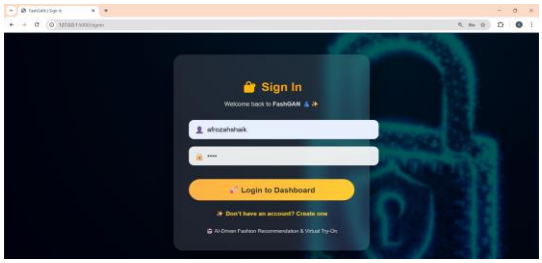

Fig 3: Sign In Page

This is the Login Page. The Login Page allows registered users to securely access the system by entering their username and password, ensuring authenticated entry into the platform's features and services.

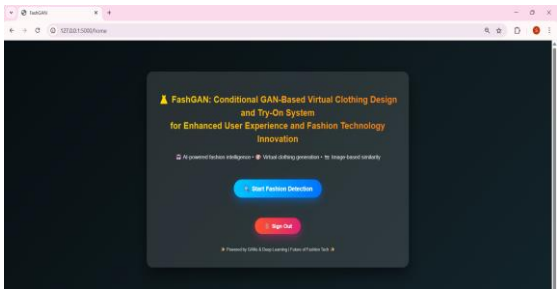

Fig 4: Home Page

This is the Home Page, which functions as the main dashboard for authenticated users. Here, the authenticated users only have the access to the dashboard in order to access it. From this page, users can initiate the fashion detection process and manage their session through the sign-out option.

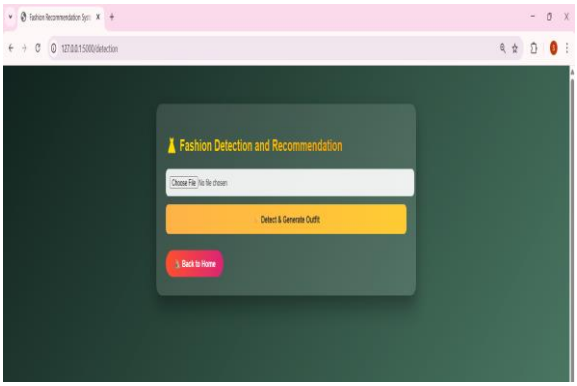

Fig 5: Fashion Detection and Outfit Generation Interface

This figure illustrates the Fashion Detection and Recommendation interface, where users can upload an image file of their choice to initiate clothing recognition and outfit generation.

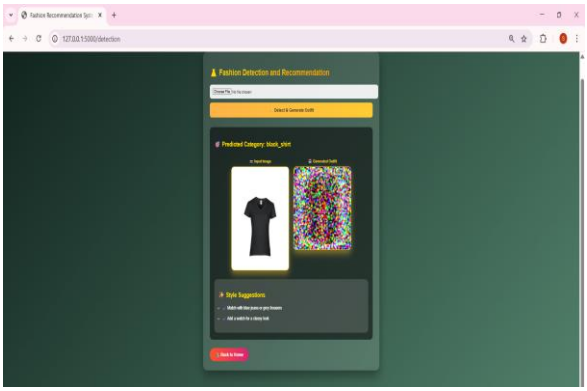

Fig 6: Detected Clothing Category and Generated Virtual Outfit

International Journal of
DATA SCIENCE AND IOT MANAGEMENT SYSTEM
ISSN: 3068-272X
www.ijdim.com
Original Research Paper

This figure illustrates the FashGAN system output, showing the uploaded clothing image, the predicted category, a generated virtual outfit using Conditional GAN, and fashion suggestions for personalized styling.

CONCLUSION

The FashGAN project demonstrates the effective application of Generative AI in fashion technology by integrating clothing category detection, conditional outfit generation, and personalized style recommendations into a unified platform. The system enables users to upload clothing images, visualize AI-generated outfits, and receive styling suggestions, enhancing engagement and creative exploration. By combining a user-friendly web interface with advanced generative modeling, the project addresses the limitations of traditional fashion recommendation systems.

FUTURE ENHANCEMENT

The FashGAN system can be further enhanced to generate more realistic and high-resolution outfit images, improving the visual appeal for users. The platform can be expanded to include a wider range of clothing categories, accessories, and styles, increasing its versatility. Personalized recommendations can be improved by incorporating user preferences, fashion trends, and body type analysis. Integration with 3D virtual try-on technology could allow users to visualize how outfits would look on themselves. Developing a mobile application would make the system more accessible and interactive. A feedback-driven learning mechanism can enable the AI to refine its suggestions over time. Additionally, improvements in real-time processing and user interface design can enhance usability. Overall, these enhancements would make FashGAN a more comprehensive, engaging, and intelligent fashion recommendation platform.

REFERENCES

[1] Harini, P. (2019). GESTURE CONTROLLED GLOVES FOR GAMING AND POWER POINT PRESENTATION CONTROL. *GESTURE*, *6*(12).

[2] M. Mirza and S. Osindero, *"Conditional Generative Adversarial Nets,"* arXiv preprint arXiv:1411.1784, 2014.

[3] Z. Yi, H. Zhang, P. Tan, and M. Gong, *"DualGAN: Unsupervised Dual Learning for Image-to-Image Translation,"* in *Proc. ICCV*, 2017, pp. 2868–2876.

[4] J.-Y. Zhu, T. Park, P. Isola, and A. A. Efros, *"Unpaired Image-to-Image Translation using Cycle-Consistent Adversarial Networks,"* in *Proc. ICCV*, 2017, pp. 2242–2251.

[5] X. Wang and A. Gupta, *"Generative Image Modeling using Style and Structure Adversarial Networks,"* in *Proc. ECCV*, 2016.

[6] L. Liu, H. Zhang, and D. Zhou, *"Clothing Generation by Multi-Modal Embedding: A Compatibility Matrix-Regularized GAN Model,"* *Image and Vision Computing*, vol. 110, pp. 104–118, 2021.

[7] X. Meng, *"A Survey on GAN-Based Fashion Recommendation and Generation,"* *Engineering Reports*, vol. 3, no. 2, pp. e12456, 2021.

[8] Z. Gu, C. Chu and Y. Dong, *"Fashion-tile: A Tiled Clothing Image Generation Model Based on Improved Conditional Generative Adversarial Network,"* *Intl. Journal of Clothing Science and Technology*, vol. 36, no. 1, pp. 123–140, 2024.

[9] J. Jung, H. Kim, and J. Park, *"Deep Fashion Designer: Generative Adversarial Networks for Fashion Item Generation Based on Many-to-One Image Translation,"* *Electronics*, vol. 14, no. 2, pp. 220, 2025.

[10] H. Dong, S. Gong, and N. Zhu, *"Fashion Image Synthesis with Attribute-Conditional GANs,"* in *Proc. CVPR Workshops*, 2018, pp. 823–831.

[11] T. Xiao, H. Xu, K. Yang, et al., *"The Application of GANs in Fashion Generation and Styling,"* *ACM Computing Surveys*, vol. 52, no. 5, pp. 88, 2020.

[12] S. Zheng, Z. Yang, K. Zhang, and T. Huang, *"Predicting Fashionability: Fine-grained Localization and Attribute Classification,"* in *Proc. ECCV*, 2016.

[13] Y. Han, X. Yu, and A. K. Jain, *"StyleGAN2 for Fashion Image Generation: Challenges and Opportunities,"* *Pattern Recognition Letters*, vol. 150, pp. 204–212, 2021.

[14] A. Sharma and V. Gupta, *"Fashion Recommendation Techniques: A Survey,"* *Intl. Journal of Advanced Computer Science and Applications*, vol. 8, no. 10, pp. 332–338, 2017.

[15] D. Wang, X. He, Z. Zhang, and M. Zhao, *"Deep Learning for Fashion Recommendation: A Review,"* *IEEE Access*, vol. 7, pp. 77149–77167, 2019.

[16] S. Gong, Y. Wang, and L. Cheng, *"Clothing Style Generation with CycleGAN and Embeddings,"* *Journal of Visual Communication and Image Representation*, vol. 67, pp. 102–115, 2020.

[17] H. Zhao, *"Learning Attribute-Conditioned Features for Fashion Understanding,"* *Computer Vision*

and Image Understanding, vol. 185, pp. 35–46, 2019.

[18] P. Isola, J.-Y. Zhu, T. Zhou, and A. A. Efros, *"Image-to-Image Translation with Conditional Adversarial Networks," IEEE Transactions on Pattern Analysis and Machine Intelligence*, vol. 40, no. 12, pp. 386–398, 2018.

[19] S. K. Yadav and F. J. Ahmed, *"Fashion Outfit Recommendation System using Machine Learning Techniques,"* in *Proc. Intl. Conf. on Computing, Communication and Automation (ICCCA)*, 2020, pp. 954–960.