International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 07 Issue: 05 | May - 2023 Impact Factor: 8.176 ISSN: 2582-3930

INNOVATION ON DEMAND: DESIGNING CUSTOMIZED CLOTHING WITH GAN

Prof. Neha Ghawate, Aniket Kale, Sharanu Belaki, Shailesh Salve, Vibhushan Pol
[1]*Prof. Neha Ghawate I.T PGMCOE*
[2]*Aniket kale I.T PGMCOE*
[3]*Sharanu Belaki I.T PGMCOE*
[4]*Shailesh Salve I.T PGMCOE*
[5]*Vibhushan Pol I.T PGMCOE*

Abstract – Designers in today's world need to possess a unique blend of creative and social intelligence to make it big. Take fashion designers for example - they require a plethora of skills such as innovative problem-solving, negotiation, empathy, persuasion, and many more. The advent of AI has revolutionized the field of design, allowing designers to develop and enhance their skills while opening up new job opportunities for individuals without a design background. The importance of design thinking in the fashion industry cannot be overstated, as the power dynamic shifts from designers to the audiences. Fashion is no longer just about creating designs and bringing them to life - it has evolved to embrace everyone.

AI plays a crucial role in fashion design, helping designers gain insights into their customers' behavior and preferences. By analyzing behavior patterns using collected data, designers can improve their design process, develop effective design principles, and test prototypes accordingly. AI-powered design skills and product development methods are shaping the future of fashion design.

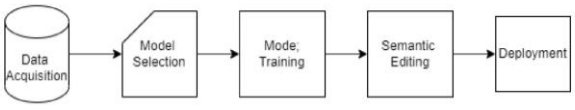
The main objective of any fashion design project is to create unique and innovative designs that cater to a diverse range of fashion styles. What's remarkable about this is that even users without technical and artistic drawing skills can create high-quality designs.

Key Words: designers, Fashion, AI, Clothing, unique, GAN.

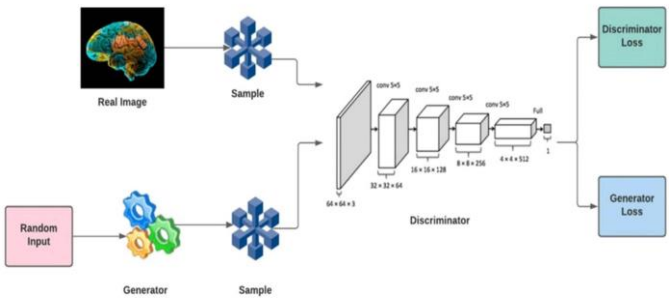
1.INTRODUCTION

One of the symbols of human civilization is clothing. Recently, artificial intelligence (AI) technology has been used in a variety of fields, which is gaining more and more attention in the fashion industry. Designing clothing is an artistic activity that blends functionality with creativity. During the design thinking and ideation process, the inclination of designers to
stick to a particular mental frame and high emotional involvement in their first ideas frequently limit their capacity for innovation. The increasing diversity of consumer wants, the fierce worldwide rivalry, and the shortened time-to-market (also known as "quick fashion") in the fashion business, in particular, make this problem for designers even more difficult. Recent developments in deep generative models have opened up new avenues for automated production and/or editing of design concepts, which can help designers overcome cognitive challenges. Generative adversarial networks are a deep learning technique for generative modeling that involves the use of convolutional neural networks, or GANs. GANs' ability to generate data that closely resembles real data is one of their most beneficial characteristics, making them applicable in various real-world situations. They can generate images, text, audio, and video that are indistinguishable from accurate data. A generative model called the GAN, or Generative Adversarial Network can produce images by studying the probability distribution of a large dataset of images. It makes it possible to produce high-quality artwork or designs even without drawing expertise. In this project, we aim to create and combine photos of apparel. You can decide which structure or fashion the garment should resemble while mixed. You can also change the created clothing's properties, such as its dark color, or add a jacket, dress, or coat. The user interface will make the interaction feasible and attractive. This report is divided into sections, the first section is a literature survey that will take you through what research has been done in this domain, and what are their features and limitations. Then section two contains specifications i.e expected input, output, and platform. Section 4 includes a block diagram and its explanation. Section
contains the conclusion of this project and at last section 6 contains references.

2. METHODOLOGY



Generative Adversarial Network :



GAN is an artificial neural network commonly used in deep learning to generate new samples that resemble the original data. It consists of two neural networks, namely the generator and the discriminator, which are trained in an adversarial manner.

One of the key advantages of GAN is its ability to generate diverse and realistic data, offering a wide range of variations in the generated samples. The adversarial training process employed by GAN networks leads to dynamic and self-improving training, resulting in enhanced performance. In the field of design and arts, GAN can be leveraged to generate creative designs that push the boundaries of human creativity.

Training:

For our project, we opted for the StyleGAN2 ADA Architecture of GAN. This architecture incorporates adaptive discriminator augmentation, which helps prevent overfitting and promotes diversity in the generated image samples. It also includes a path length regularization term that addresses mode collapse and improves training stability.

Semantic Editing:

Regarding the training process for our AI Clothing Designer, we utilized the lookbook dataset created by Donggeun Yoo. This dataset comprises 8732 images of upper clothing and 68814 fashion model images, all with a resolution of 512x512 pixels. The training involves iteratively optimizing the generator and discriminator networks. In each iteration, the generator generates a batch of realistic images, while the discriminator aims to correctly classify real and synthetic images. Feedback from the discriminator is used to adjust the weights of the generator, and this process is repeated over multiple iterations. Detailed information about the dataset used can be found in the dataset section of this report. Semantic editing is another important aspect of our project. It allows us to modify semantic attributes, such as style or structure, by manipulating the corresponding latent vector in the latent space. To achieve semantic editing, we employed GANSpace, a framework that enables the visualization and exploration of latent space. GANSpace helps us discover meaningful directions in the latent space that correspond to attributes like color and sleeve length. Directions found in early layers often represent high-level features such as cloth structures, while directions found in the later layers typically represent low-level features like lighting or colors.

Deployment:

The deployment of a completed machine learning model in a live setting, where it can be utilized for its intended function, is a critical step in the machine learning workflow. In this project, we have chosen to leverage the Hugging Face Deployment Services, which provides a platform called Spaces. Spaces offers a straightforward solution for hosting and deploying ML applications without incurring any additional costs. By utilizing Spaces, we can easily upload our AI Clothing Designer application and have it hosted and accessible to users.

One of the key advantages of using Hugging Face Deployment Services is its seamless integration with user interfaces (UIs). This integration allows us to create an intuitive and user-friendly interface for our AI Clothing Designer, enabling users to interact with the application efficiently. Additionally, the platform efficiently streams the generated designs, ensuring smooth and responsive user experience.

DATASETS: LOOK BOOK

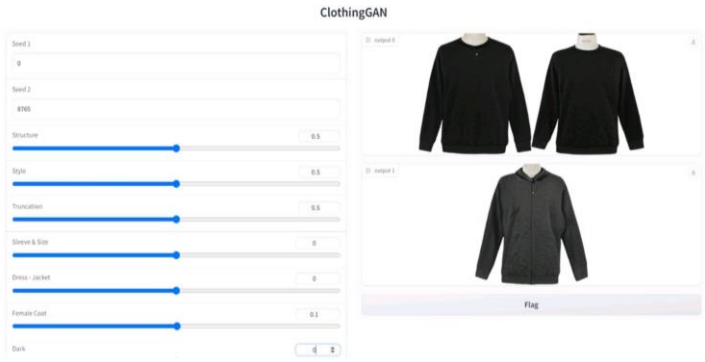
To train the model, we have selected the clothing dataset created by Donggeun Yoo for the PixelDTGAN paper. This dataset consists of 77,546 images, with approximately 8,000 images specifically focused on upper clothing with clean backgrounds. These clothing images are associated with the rest of the fashion model images in the dataset.

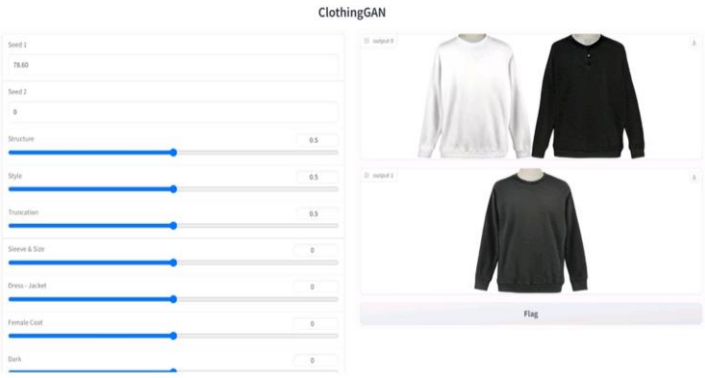
For our training purposes, we have chosen to exclusively utilize the clothing images with clean backgrounds. This ensures that the model focuses solely on the clothing items without any distractions from the surrounding environment. The resolution of the images in the dataset is set at 512x512 pixels, providing sufficient detail for training the AI Clothing Designer model. Please note that the dataset was initially private and shared only for research purposes. However, we obtained access to the dataset after making a request. The dataset falls under the MIT License, which governs its usage and distribution. For further information and access to the dataset, you can visit the author's website, where it is made available. By utilizing this curated clothing dataset, we aim to train our model to generate realistic and diverse clothing designs with a focus on clean backgrounds, enhancing the overall quality and accuracy of the AI Clothing Designer's outputs.

Images in Dataset:

RESULTS:

The evaluation of the AI Clothing Designer system encompasses aspects such as accuracy, variety, time consumption, user-friendliness, and clothing type. The attributes chosen to vary, like sleeves and cleavage preferences, must accurately reflect changes in the generated images. The system aims to produce unique and creative designs, while also being efficient in terms of time. User-friendly interaction and flexibility with different clothing types are crucial. Evaluation includes human expertise, content-based image retrieval, and performance metrics like FID, KID, and IS scores to assess quality and diversity. However, the current system may have limitations in generating diverse and colorful images, which can be improved upon for enhanced output variety and visual appeal.





3. CONCLUSIONS

Based on generative adversarial networks (GANs) from the deep learning paradigm, this model will take the clothes bought by users as input and generate unique designs of clothes. The project aims to merge two input clothing images of two different kinds and generate their results by varying some parameters of them, the color contrast, sleeve varieties, style fusions, and seasonal-traditional-occasional fashion from bottom to top can be achieved. The research contributes to AI fashion design by demonstrating a new method for generating designs and enhancing creativity. Future work could involve generating more diverse and colorful images also, exploring other algorithms and techniques for generating designs, and incorporating user feedback to improve the relevance and quality of the generated designs.

ACKNOWLEDGEMENT

We would like to express our sincere gratitude towards our B.Tech project guide Prof. Neha Ghawate for her constant encouragement, valuable suggestions, and her precious time in every possible way in spite of her busy schedule throughout our project activity. We would also like to thank Abid Shaikh (H.O.D, I.T) for the motivation and the opportunity you have given us. We take this opportunity to express our sincere thanks to all the staff members of the I.T Department for their constant help whenever required. Finally, we express our sincere thanks to all those who helped us directly or indirectly in many ways in the completion of this B.E Project.

REFERENCES

1. Q. Wu, B. Zhu, B. Yong, Y. Wei, X. Jiang, R. Zhou, and Q. Zhou (2021), "ClothGAN: Generation of fashionable Dunhuang clothes using generative adversarial networks," Connection Science, 33(2), 341-358. DOI: 10.1080/09540091.2020.1822780

2. M. Singh, U. Bajpai, S. Prasath, "Generation of fashionable clothes using generative adversarial networks: A preliminary feasibility study," April 2020, International Journal of Clothing Science and Technology.

3. Y. Lang, Y. He, J. Dong, FYang, H. Xue (2020), "DESIGN-GAN: CROSS-CATEGORY FASHION TRANSLATION DRIVEN BY LANDMARK ATTENTION," ICASSP 2020 - 2020 IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP). DOI: 10.1109/icassp40776.2020.9053

4. Q. Ping, B. Wu, W. Ding, J. Yuan, "Fashion-AttGAN: Attribute-Aware Fashion Editing with Multi-Objective GAN," IEEE/CVF Conference on Computer Vision and Pattern Recognition Workshops.

5. K. Sohn, C. E. Sung, G. Koo & O. Kwon (2021), "Artificial intelligence in the fashion industry," ResearchFeatures magazine.

6. M. Moosae, Y. Lin, A. Akhazhanov, H. Chen, F. Wang, H. Yang, "OutfitGAN: Learning Compatible Items for Generative Fashion Outfits," Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR) Workshops, 2022, pp. 2273-2277.