**A Comparative Study of Generative Adversarial Networks**

**for Clothing Image Synthesis**

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**ABSTRACT**

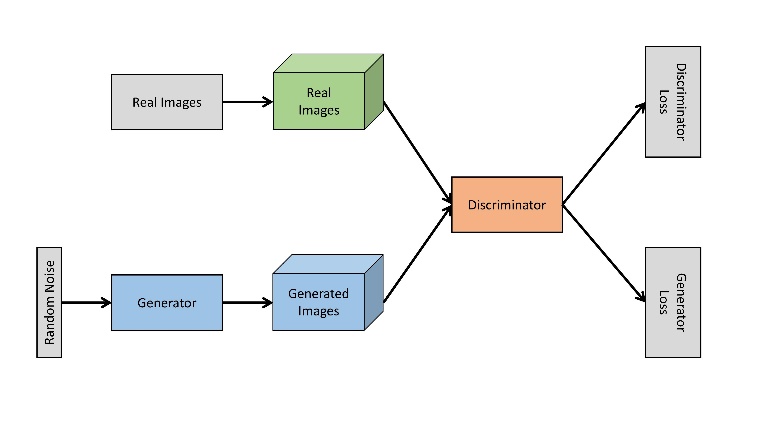
Generative Adversarial Networks (GANs) are powerful models for realistic image synthesis. However, applying GANs to clothing image synthesis poses several challenges, such as diversity, quality, and alignment of the generated images. In this paper, we present a comparative study of different types of GANs for clothing image synthesis, such as traditional GAN, conditional GAN (cGAN), Wasserstein GAN (wGAN), and others. We mainly use FashionMNIST dataset for training, and we also tried a colored-image dataset of clothes, which is “Full Clothing Dataset”. The evaluation of the performance is figured out mainly by visual quality of the generated image. Overall, our model can generate fashion images with controllable labels and relative high quality images in terms of visual effects.

Keywords – Deep Learning, Computer Vision, Generative AI, Adversarial Networks, Image Generation

**I. INTRODUCTION**

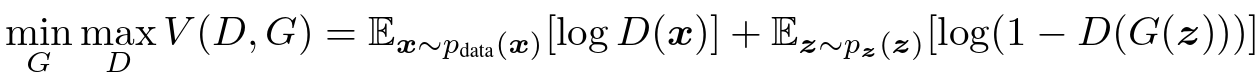
With so many different and complicated types of clothes, fashion matching is an essential part of everyday life for modern people. Every day, people have to face the question: “What should I wear today?” Sheila, a professional fashion designer, is also having trouble coming up with new matching ideas. The goal of this report is to use generative AI models to help people like Sheila make better clothing choices by exploring the Generative Adversarial Networks (GAN).

Generative Adversarial Networks (GANs) are a class of neural network models that can learn to generate realistic and diverse images from random noise. GANs consist of two components: a generator and a discriminator (Fig.1). The generator tries to fool the discriminator by producing fake images that resemble the real ones, while the discriminator tries to distinguish between real and fake images. The two components are trained in an adversarial manner, where the generator aims to maximize the probability of the discriminator being wrong, and the discriminator aims to minimize it.



**Figure 1** – Structure of GAN Model (<https://medium.com/analytics-vidhya/coding-your-first-gan-algorithm-with-keras-ab2bdf761746> )

The goal of GANs is to find a balance where the generator produces realistic images and the discriminator cannot tell them apart from the real ones (shown below [1]).



REFERENCE

[1] Goodfellow, I., Pouget-Abadie, J., Mirza, M., Xu, B., Warde-Farley, D., Ozair, S., Courville, A., &amp; Bengio, Y. (2020). Generative Adversarial Networks. Communications of the ACM, 63(11), 139–144. <https://doi.org/10.1145/3422622>