Image Generation for E-Commerce

1 Introduction

Image generation for e-commerce aims to leverage machine learning techniques to automatically create realistic and visually appealing images of products, designs, or creative assets. These generated images can be used for online retail, digital marketing, or creative works. The challenge is to train a model that can produce high-quality, domain-specific images without requiring manual effort for each new product or design.

2 Dataset: DeepFashion or eBay Product dataset

The **DeepFashion dataset** is a large-scale collection that contains over 800,000 images of clothing and fashion items. It is annotated with labels for category, landmarks, and other key attributes, making it ideal for generating high-quality fashion product images. The dataset provides a diverse range of fashion images with various styles, poses, and clothing types, which is essential for training a model to produce realistic and varied outputs in the fashion domain. This dataset will be particularly useful if the goal is to create fashion-related product images or creative assets.

On the other hand, the **eBay Product Dataset** is a collection of product images and metadata scraped from eBay, which includes a wide variety of e-commerce product categories such as electronics, clothing, home goods, and more. This dataset is beneficial for training models that can generate e-commerce images across different product types. Since it spans a broader range of categories compared to DeepFashion, it is a great option if the goal is to develop a more general-purpose e-commerce image generation model. The dataset can be accessed through Kaggle, where pre-made versions are available, or product images can be scraped directly from eBay using APIs.

3 Baseline Model: StyleGAN2

For the image generation task, the **StyleGAN2** architecture will serve as the baseline model. StyleGAN2 is a powerful Generative Adversarial Network (GAN) that produces state-of-the-art results in generating high-quality, high-resolution images. It was developed by NVIDIA and has been widely used in both research and industry for tasks such as generating faces, objects, and even entire scenes. The model is particularly well-suited for tasks where image quality and fidelity are paramount, which makes it an ideal candidate for e-commerce and creator-focused applications.

Why StyleGAN2?

The StyleGAN2 model excels in producing high-resolution images with realistic details, making it well-suited for generating e-commerce product photos. It operates in a latent space that allows for fine-grained control over different image attributes, such as texture, shape, and color. This makes it possible to generate diverse product images while maintaining high visual consistency, an essential characteristic for any e-commerce platform.

Additionally, StyleGAN2 has been optimized for stable training and improved image quality, overcoming common issues seen in earlier GAN models like mode collapse or blurry outputs. This stability, combined with its ability to produce photorealistic results, makes it a strong choice for generating high-quality product images for commercial use.

4 Scientific Paper

The **StyleGAN2** architecture is detailed in the paper titled **"Analyzing and Improving the Image Quality of StyleGAN"**, authored by Tero Karras, Samuli Laine, and Timo Aila, researchers at NVIDIA. This paper presents significant improvements over the original StyleGAN, resulting in better image quality and more stable training. Key innovations include adaptive discriminator augmentation (ADA) and a reworked loss function, both of which contribute to the enhanced performance of the model, especially when training on smaller datasets.

5 Code Implementation

The official **StyleGAN2** codebase, available on GitHub, provides an easy-to-use implementation of the mode. The repository includes scripts for training the model from scratch, as well as tools for fine-tuning it on custom datasets. The code is written in Python and utilizes TensorFlow for training.

- **GitHub Repository**: StyleGAN2 by NVIDIA