SketchMe: One Shot Face Stylization

by Souradeep Sarkar

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A PROJECT REPORT

on

"SketchMe: One Shot Face Stylization"

Submitted to

KIIT Deemed to be University

In Partial Fulfilment of the Requirement for the Award of

BACHELOR'S DEGREE IN

INFORMATION TECHNOLOGY

BY

Souradeep Sarkar	21051603
Kousik Chakraborty	21051902
Deepanshu Singh	21051890
Sagnik Sen	21051922
Shirsha Chakraborty	21051426
Amaranand Kumar	21051878
Harshit Shukla	21051894

UNDER THE GUIDANCE OF

Dr. Asif Uddin Khan

SCHOOL OF COMPUTER ENGINEERING

KALINGA INSTITUTE OF INDUSTRIAL TECHNOLOGY

BHUBANESWAR, ODISHA - 751024

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CERTIFICATE

This is certify that the project entitled

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is a record of bonafide work carried out by them, in the partial fulfilment of the requirement for the award of Degree of Bachelor of Engineering (Computer Sci-ence & Engineering OR Information Technology) at KIIT Deemed to be university, Bhubaneswar. This work is done during year 2022-2023, under our guidance.

Date: 09/04/2025

(Dr. Asif Uddin Khan)
Project Guide

Acknowledgements

We are profoundly grateful to **Dr. Asif Uddin Khan** of **School of Computer Engineering** for his expert guidance and continuous encouragement throughout to see that this project rights its target since its commencement to its completion.

A special word of appreciation goes to all the participants whose active involvement and provision of valuable data and insights have been pivotal in shaping this study. Their cooperation and willingness have significantly contributed to the project's success.

We also extend our gratitude to our colleagues and friends for their continuous support and motivation throughout the duration of this endeavor. Their constructive feedback and suggestions have played a crucial role in enhancing the quality of this report.

Souradeep Sarkar
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ABSTRACT

SketchMe is a deep learning-based face stylization framework that enables high-quality one-shot stylization of human faces using generative adversarial networks (GANs). The project builds upon the StyleGAN architecture to transfer artistic styles from reference images onto human faces while preserving facial identity. By leveraging adaptive instance normalization and fine-tuning strategies, SketchMe achieves state-of-the-art results in personalized stylization.

Additionally, SketchMe introduces a novel loss function that optimizes style preservation while maintaining high facial fidelity, improving results over previous methods like DeepFaceDrawing and AdaIN-based approaches.

Keywords: Face Stylization, Generative Adversarial Networks, Style Transfer, Deep Learning, One-Shot Learning, Image Translation

Contents

Chapter 1

Introduction

Face stylization using deep learning has gained significant attention in recent years. Traditional methods require extensive datasets for training, whereas SketchMe enables one-shot stylization with a single reference image. This report discusses the current challenges in facial stylization and how SketchMe addresses them using a fine-tuned StyleGAN approach. The project also highlights the trade-offs between realism and artistic abstraction and explores how SketchMe maintains a balance between these factors.

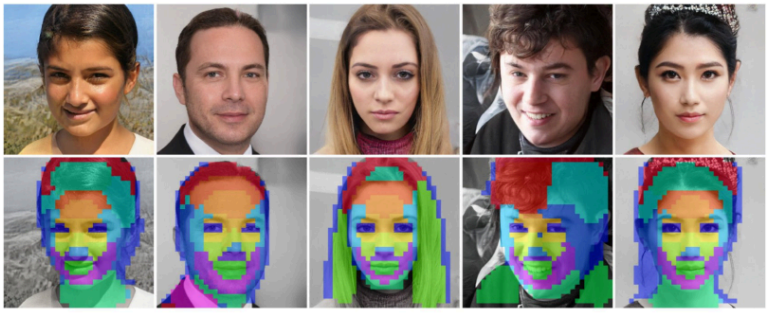


Figure 1.1: StyleGan blending

Chapter 2

Basic Concepts/ Literature Review

2.1 Traditional Face Stylization Methods

Earlier approaches to face stylization relied on rule-based algorithms and classical computer vision techniques. These methods required handcrafted features and struggled to generalize across different styles. Examples include edge-detection-based stylization and color transfer techniques.

2.2 GAN-Based Approaches

The introduction of GANs revolutionized image translation. Models like Pix2Pix and CycleGAN allowed for domain adaptation, enabling images to be transformed from one style to another. However, these methods required large datasets and extensive training.

2.3 Neural Style Transfer

Neural Style Transfer (NST) methods, such as those introduced by Gatys et al., use deep neural networks to extract content and style features separately. While effective, these methods often fail to preserve facial identity, leading to unnatural distortions.

2.4 SketchMe's Innovations

SketchMe builds upon the strengths of GANs and NST by incorporating adaptive instance normalization and perceptual loss. Unlike traditional methods, SketchMe enables one-shot stylization, meaning it requires only a single reference image for style adaptation while maintaining high fidelity.

Chapter 3

Problem Statement / Requirement Specifications

Face stylization has traditionally required large datasets and extensive computational resources to train deep learning models capable of transferring artistic styles onto images. Existing models like StyleGAN and CycleGAN require multiple examples of an artistic style to generalize effectively, making them unsuitable for one-shot learning. This project aims to address the problem by leveraging SketchMe, which can stylize faces using only a single reference image while maintaining identity preservation and artistic consistency. The main objectives include:

Enabling high-quality stylization with minimal training data.

Reducing computational overhead without compromising stylization quality.

Improving identity retention during the style transfer process.

3.1 Project Planning

The project follows an iterative development approach, focusing on data preprocessing, model training, and performance evaluation. The methodology includes dataset preparation, training SketchMe using a reference image, and conducting ablation studies to determine optimal model parameters. Key stages include:

Requirement Analysis: Understanding project needs and defining objectives.

Development Phase: Implementing the model, optimizing training techniques, and integrating style transfer mechanisms.

Testing & Evaluation: Assessing the accuracy of stylization using qualitative and quantitative metrics.

Deployment & Future Enhancements: Ensuring usability and planning future improvements.

3.2 Project Analysis (SRS)

The system adheres to IEEE SRS guidelines and includes functional requirements such as input image processing, model inference, and output visualization. The non-functional requirements focus on performance optimization, minimal latency, and scalability. The core functional requirements include:

- Image pre-processing and feature extraction.
- Model fine-tuning using a reference image.
- Generation of stylized facial outputs.
- Evaluation metrics for comparing results.

3.3 System Design

Design Constraints: The project uses Python, TensorFlow/PyTorch, and NVIDIA GPUs for computation. System constraints include the need for high VRAM GPUs and stable internet connectivity for model fine-tuning.

System Architecture: The architecture involves a pre-trained StyleGAN model fine-tuned with an artistic reference image, incorporating perceptual loss and identity preservation modules. A modular approach ensures flexibility, allowing for future enhancements such as real-time processing and support for multiple styles in a single pipeline.

Chapter 4

Implementation

4.1 Methodology/Proposal

The implementation methodology includes three primary phases: data preparation, model training, and evaluation/testing:

- Data Preparation: Reference style images are collected from diverse artistic domains such as anime or sketches and preprocessed using standard augmentation techniques like resizing or normalization.
- Model Training: Pretrained StyleGAN models are fine-tuned using discriminator perceptual loss applied on paired data generated through GAN inversion.
- Evaluation: Stylized outputs are tested on unseen datasets using qualitative metrics like visual inspection and quantitative metrics like FID scores.

4.2 Testing/Verification Plan

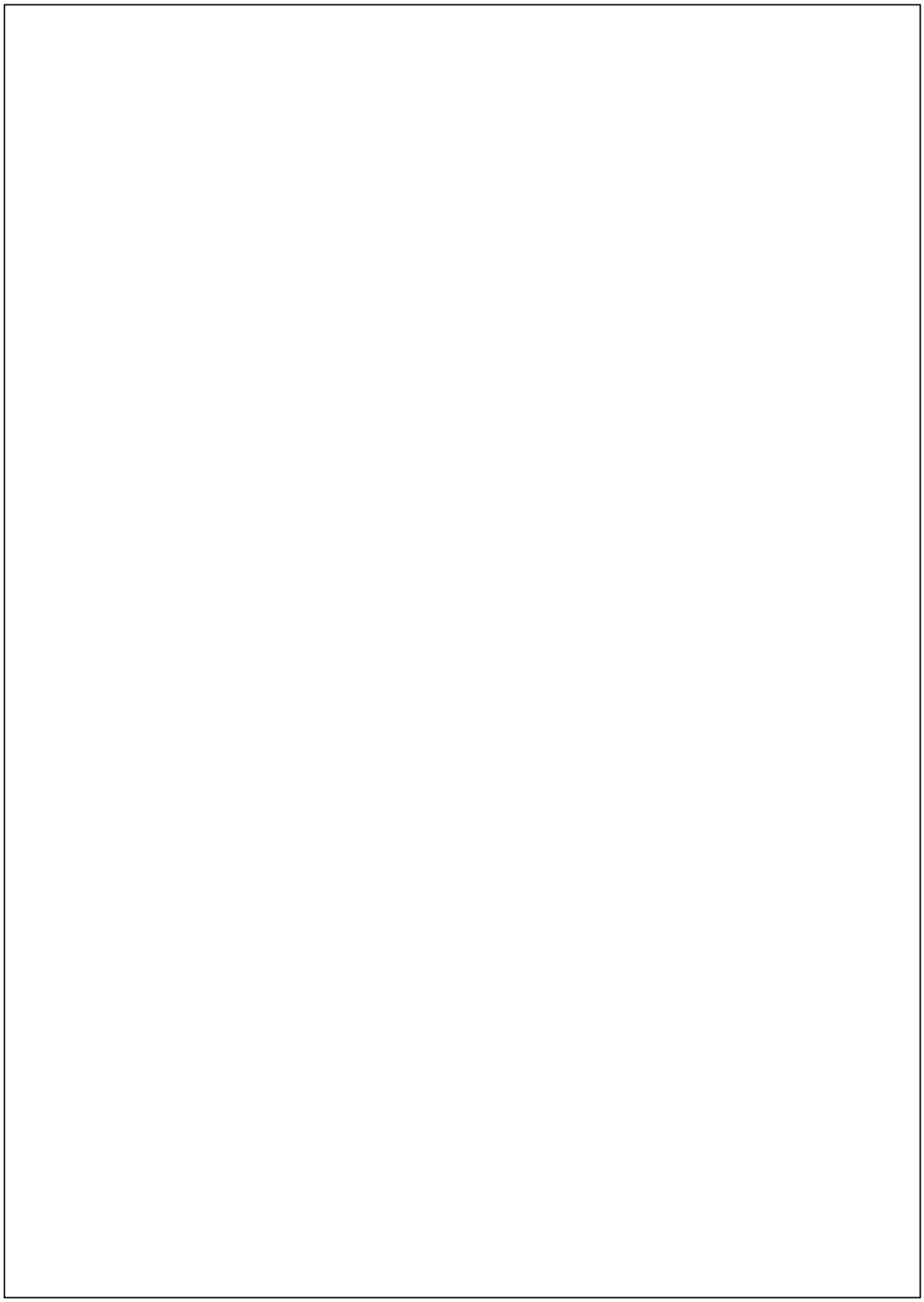
Testing involves verifying output quality through both qualitative evaluation (visual inspection) and quantitative metrics such as Fréchet Inception Distance (FID) scores that measure similarity between generated images and real datasets.

4.3 Result Analysis/Screenshots

Results demonstrated high-quality stylizations with preserved facial features and intricate stylistic details such as bold lines or unique eye shapes (see Figures below). Screenshots of outputs were captured using Gradio UI integration.

4.4 Quality Assurance

Code quality was ensured through adherence to Python best practices such as modular design principles, efficient GPU resource utilization during training processes, and thorough testing across diverse datasets.



Chapter 5

Standards Adopted

5.1 Design Standards

The design process followed IEEE standards for system documentation and UML diagrams for architectural representation.

5.2 Coding Standards

Coding standards adhered to best practices in software development such as modular code structure, proper naming conventions, indentation rules for readability, efficient use of GPU resources during training processes, and avoidance of lengthy functions.

5.3 Testing Standards

Testing adhered to ISO guidelines for software verification processes including unit testing frameworks integrated within PyTorch workflows.

Chapter 6

Conclusion and Future Scope

6.1 Conclusion

The SketchMe project successfully addresses limitations in few-shot image stylization techniques by introducing a robust one-shot solution capable of capturing intricate stylistic details under constrained data settings while preserving facial features effectively.

6.2 Future Scope

Future work includes exploring real-time video-based stylization techniques using advanced AI models like Temporal GANs or transformers designed specifically for sequential data processing tasks such as video frames or animations.

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5. NVIDIA CUDA Toolkit - https://developer.nvidia.com/cuda-toolkit

INDIVIDUAL CONTRIBUTION REPORT:

SketchMe: One Shot Face Stylization

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Abstract: A short description of the aim and objective of the project work carried out in 3-4 lines. This part should be common to all students in the group. The font size and style will remain same from this point onwards. The font size will be 12 and font style will be Times New Roman. The line spacing will be 1.5.
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Individual contribution for project presentation and demonstration: Student should mention his/her role in preparing presentations and part of the project demonstrated.

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