Paper Selection Proposal

Basil Ali Khan Ahsan Siddiqui

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Paper Details

- **Title:** *GAGAN: Enhancing Image Generation Through Hybrid Optimization of Genetic Algorithms and Deep Convolutional Generative Adversarial Networks*
- **Authors:** Despoina Konstantopoulou, Paraskevi Zacharia, Michail Papoutsidakis, Helen C. Leligou, Charalampos Patrikakis
- **Conference/Journal:** *Algorithms* (ISSN 1999-4893)
- **Year:** 2024
- **DOI/Link:** https://doi.org/10.3390/a17120584

Summary

This paper presents **GAGAN**, a hybrid approach that enhances **Generative Adversarial Networks (GANs)** by integrating **Genetic Algorithms (GAs)** to optimize the discriminator's weights. Traditional **Deep Convolutional GANs (DCGANs)** often suffer from training instability and mode collapse. By incorporating evolutionary techniques like crossover and mutation, GAGAN improves convergence stability and image quality. The model was tested on the **CelebA dataset**, generating high-quality **128 × 128 images**. The results showed lower generator loss and better image fidelity compared to standard DCGANs.

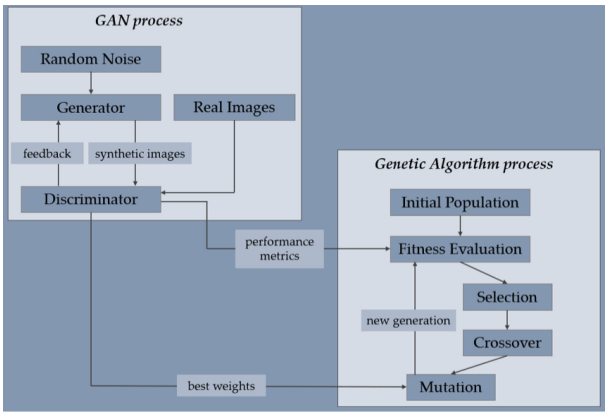

Figure 1: GAGAN Model Flowchart

Justification

This paper is highly relevant to our project because:

1. It explores a novel **hybrid learning** approach that combines **deep learning** and **evolutionary algorithms**.
2. It tackles key challenges in **GAN training** (mode collapse, instability), making it crucial for advancing generative models.
3. The integration of **Genetic Algorithms** in **deep learning** is an emerging research area with real-world applications in **image generation** and **AI creativity**.

Implementation Feasibility

- **Code & Resources:** The paper does not mention a public implementation, but we plan to implement the genetic algorithms ourselves and using built-in libraries for the neural network training part as discussed in the meeting with our instructor.
- **Datasets:** The CelebA dataset is publicly available and can be used for training. However, we might preferably choose to use another publicly available dataset
- **Computational Requirements:** Training GANs requires **high-end GPUs**, hence we will be using Google Colab for this project.

Team Responsibilities

We plan to divide work equally at every stage. Since Ahsan has previously worked in this domain, he will be taking the lead in the implementation stage.

- **Reading & Understanding:** Basil Ali Khan, Ahsan Siddiqui
- **Coding & Implementation:** Ahsan Siddiqui, Basil Ali Khan
- **Writing & Report Preparation:** Ahsan Siddiqui, Basil Ali Khan

GitHub Repository

The implementation and project code will be maintained at: https://github.com/basil-ali-khan/ADA-Project