

Assignment 2: GAN Ablation Studies

Fake Face Generation

September 6, 2025

1 Overview

In this assignment, you will conduct ablation studies on a Generative Adversarial Network (GAN) for fake face generation. You will systematically vary different hyperparameters and analyze their impact on training dynamics and output quality.

2 Objectives

- Understand the effect of different hyperparameters on GAN training
- Practice systematic experimentation and documentation
- Analyze trade-offs between training time, computational resources, and output quality
- Present findings in a clear, scientific manner

3 Requirements

3.1 Computational Resources

- **Google Colab Pro Account Recommended:** Free Colab has limited GPU hours that may not suffice for multiple training runs
- **Alternative:** Use multiple free Colab accounts (ensure compliance with Google's terms of service)
- **GPU Recommendations:** NVIDIA T4 or better (16GB VRAM recommended)
- **Expected Training Time:** 1-3 hours per configuration

3.2 Dataset

To use the “140k Real and Fake Faces” dataset from Kaggle:

```
kagglehub.dataset_download("xhlulu/140k-real-and-fake-faces")
```

Focus on the real faces in: `fake_vs_real/train/real/` directory.

You can also feel free to use any other similar dataset.

4 Implementation Guidelines

4.1 Code Organization

- Start with the provided face GAN implementation
- Create a systematic way to modify hyperparameters
- Save generated samples
- **Important:** Save model checkpoints to resume training if needed

5 Image Quality Assessment (NOT FOR THE ASSIGNMENT !)

5.1 Criterias

Rate generated faces on:

- **Realism:** Do they look like real faces?
- **Diversity:** Variety in age, gender, ethnicity, expressions
- **Artifacts:** Presence of visual artifacts or distortions

6 Submission Requirements

1. **PDF Report:** Report should contain your inference from the ablation studies and sample generations for all your configurations
2. **Colab Notebook Link:** Public link to one complete, successful training run

7 Tips for Success

7.1 Resource Management

- Start with shorter training runs (10-25 epochs) to test configurations
- Use checkpointing to resume training if GPU quota runs out
- Monitor GPU usage and adjust batch size accordingly

7.2 Experimental Strategy

- Run baseline configuration first to establish reference point
- Test extreme values to understand parameter sensitivity
- Document everything immediately - don't rely on memory

7.3 Common Pitfalls to Avoid

- Don't just vary one parameter at a time (try some combinations)
- Don't ignore failed experiments - analyze why they failed
- Don't forget to save intermediate results

8 Note

- You may discuss approaches with classmates, but all code and analysis must be your own
- You can make use of AI code, but please make sure that you are not "vibe coding" and you properly understand all code that AI generates.

Good luck! Remember, the goal is not just to generate good faces, but to understand how different choices affect the training process. Document your journey, not just your destination.