Smart Face Age Editing with GANs

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Problem Statement, Scope and Users

Problem Statement:

- Facial age progression and regression system transforming appearance across 8 distinct age categories
- Age categories: 0-5, 6-12, 13-19, 20-29, 30-39, 40-49, 50-69, and 70+ years

Users: Public, VFX studios, forensics, digital creators.

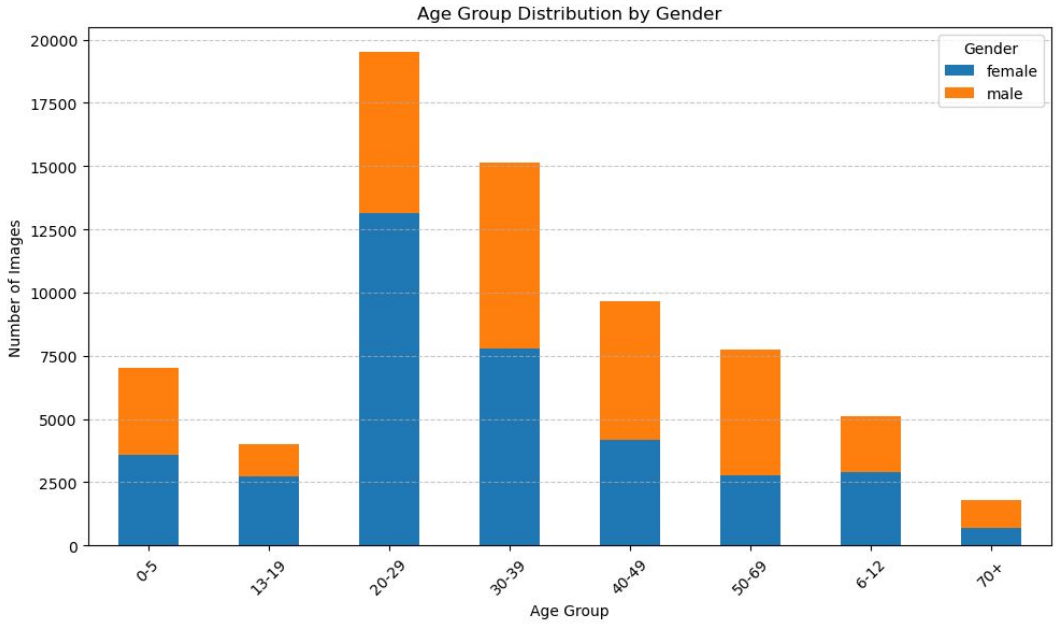
Scope:

- Frontal facial images with neutral expressions
- Preservation of identity-specific features while simulating age-related changes
- Web interface for easy interaction

Dataset and Evaluation Metrics

Dataset:

- FFHQ dataset with age labels (70,000 high-quality images)
- Pre-processing: MTCNN alignment, resized to 128×128
- Class imbalance: middle-age categories over-represented (undersampled images)



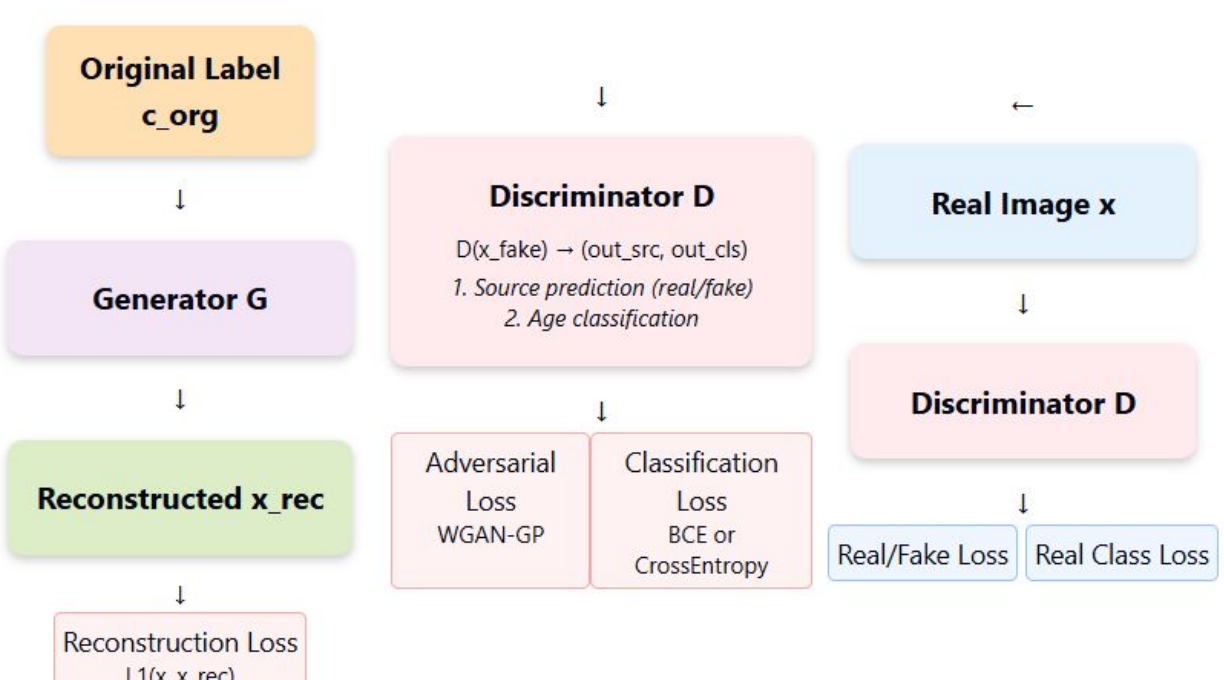
Evaluation Metrics:

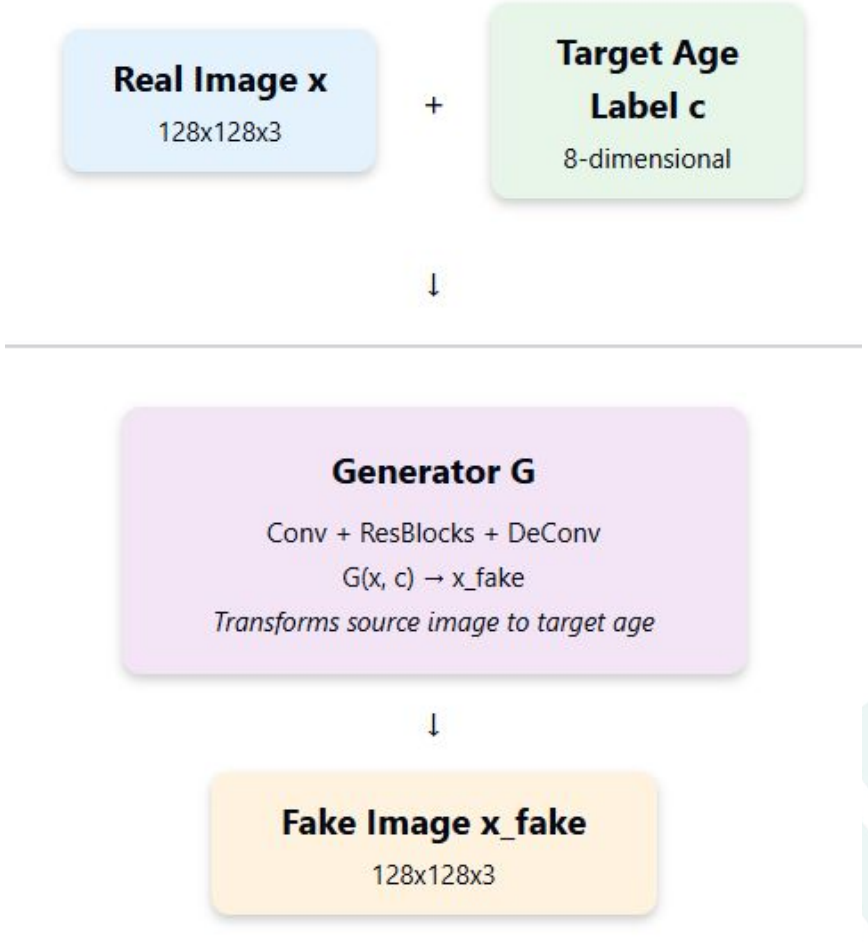
- Qualitative: Visual assessment of realism and identity preservation
- Loss Convergence Analysis:
  - Discriminator losses (real/fake classification, gradient penalty)
  - Generator losses (adversarial, reconstruction, classification)

System Architecture

Modified StarGAN Architecture:

- Generator: Takes input image and target age label
- Discriminator: Classifies real/fake and determines age category
- Loss Functions:
  - Adversarial loss for realism
  - Reconstruction loss for identity preservation
  - Classification loss for age accuracy





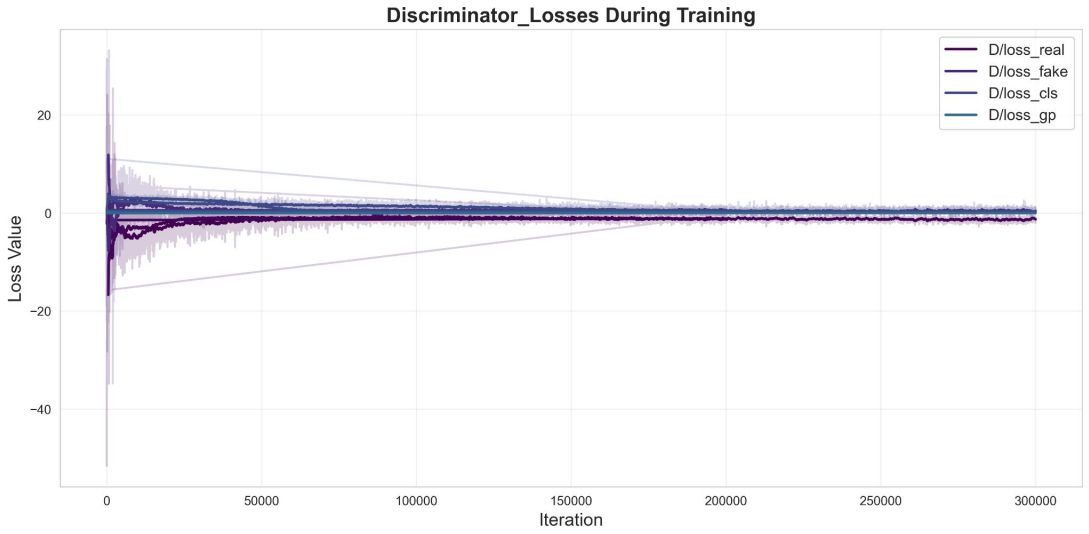
Training

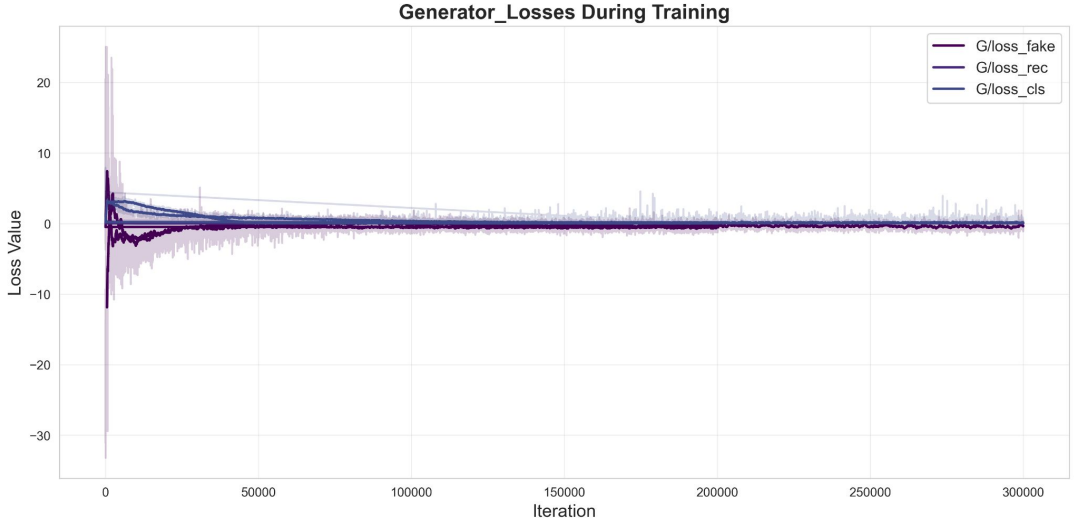
300,000 total iterations

Batch size: 16

Loss Convergence:

- Discriminator effectively distinguishes real/fake images
- Classification loss converges to low values (accurate age features)
- Low reconstruction loss (strong identity preservation)





Results – Visual Examples

Qualitative Results:

- Successful transformation across all age categories
- Maintenance of identity-specific features
- Age-appropriate changes in facial structure, skin texture, and hair patterns

Key Observations:

- Youngest (0-5) and oldest (70+) categories show most dramatic changes
- Adult transitions (20-49) more subtle but still discernible

Error Analysis and Limitations

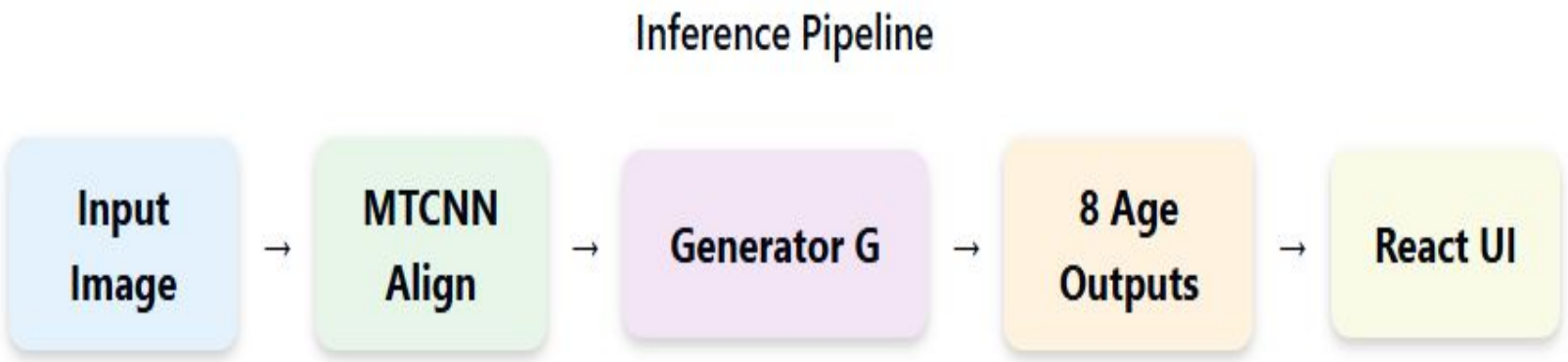
Failure Cases:

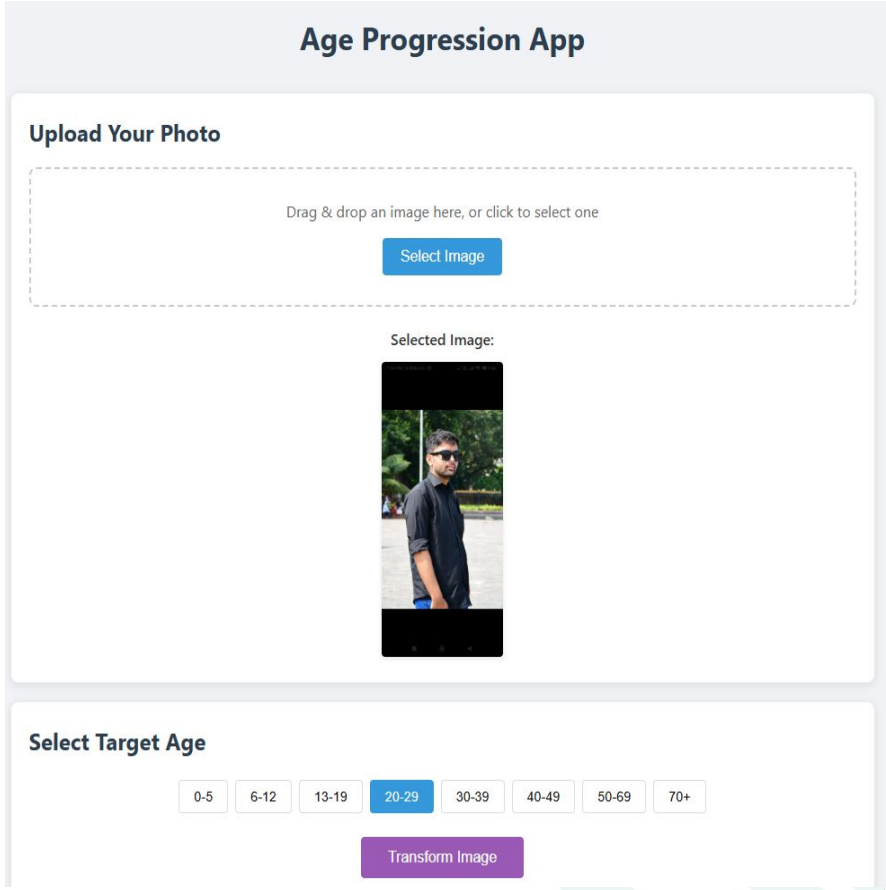
- Identity preservation issues with significant occlusions
- Occasional mode collapse for extreme age transformations
- Could not remove facial hair when converting to smaller age group

System Design (UI + Backend)

Frontend: React.js

Backend: Flask





Demo

Will run the system i.e. frontend + backend in the system to show the results