Deep Learning Project:
Conditional Face Generation

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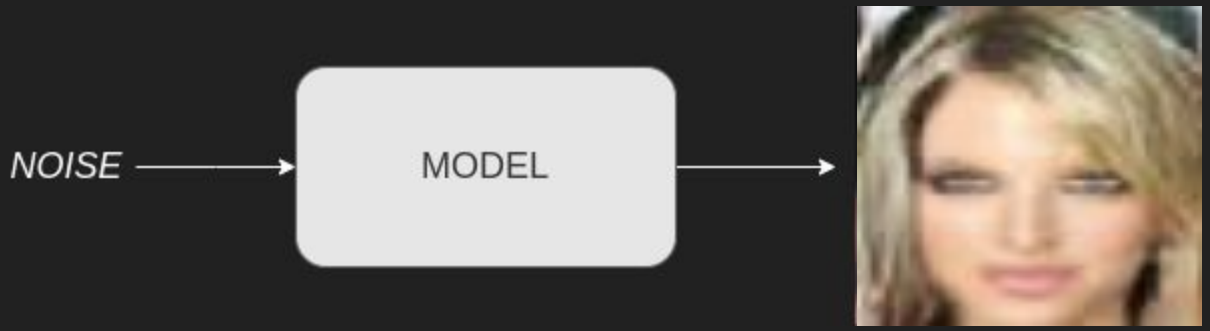
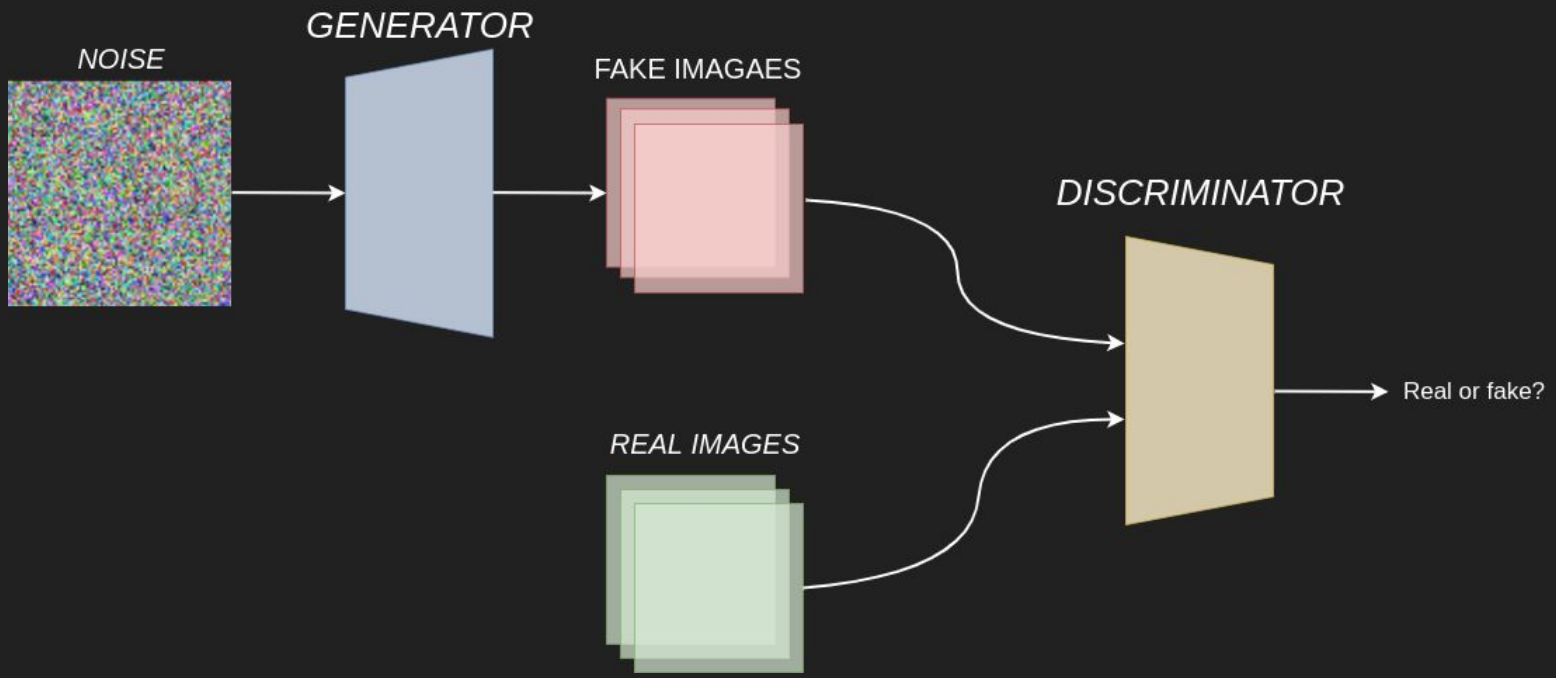
Assignment 1 - Unconditional face generation



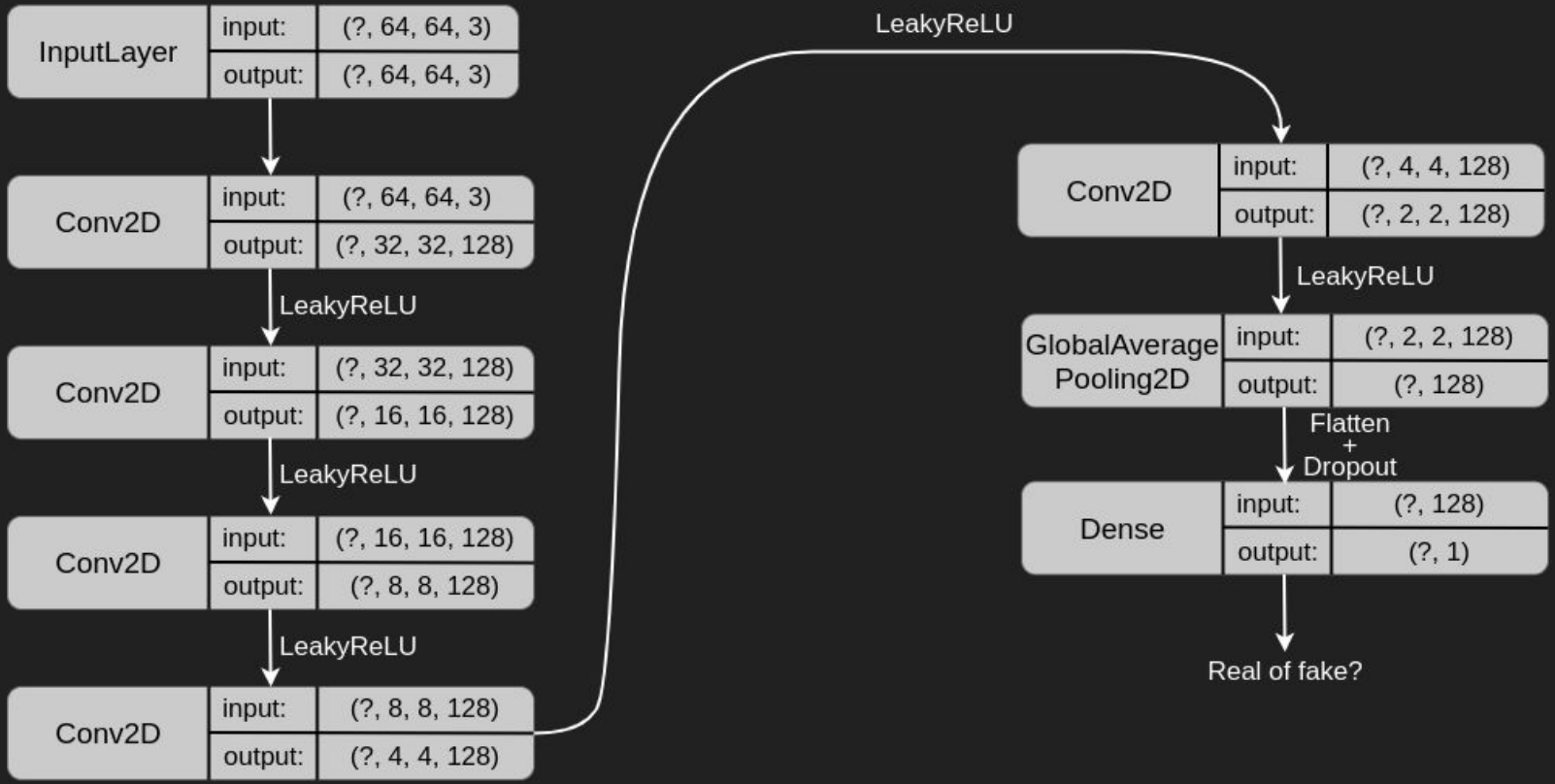
Generative Adversarial Networks (GANs)



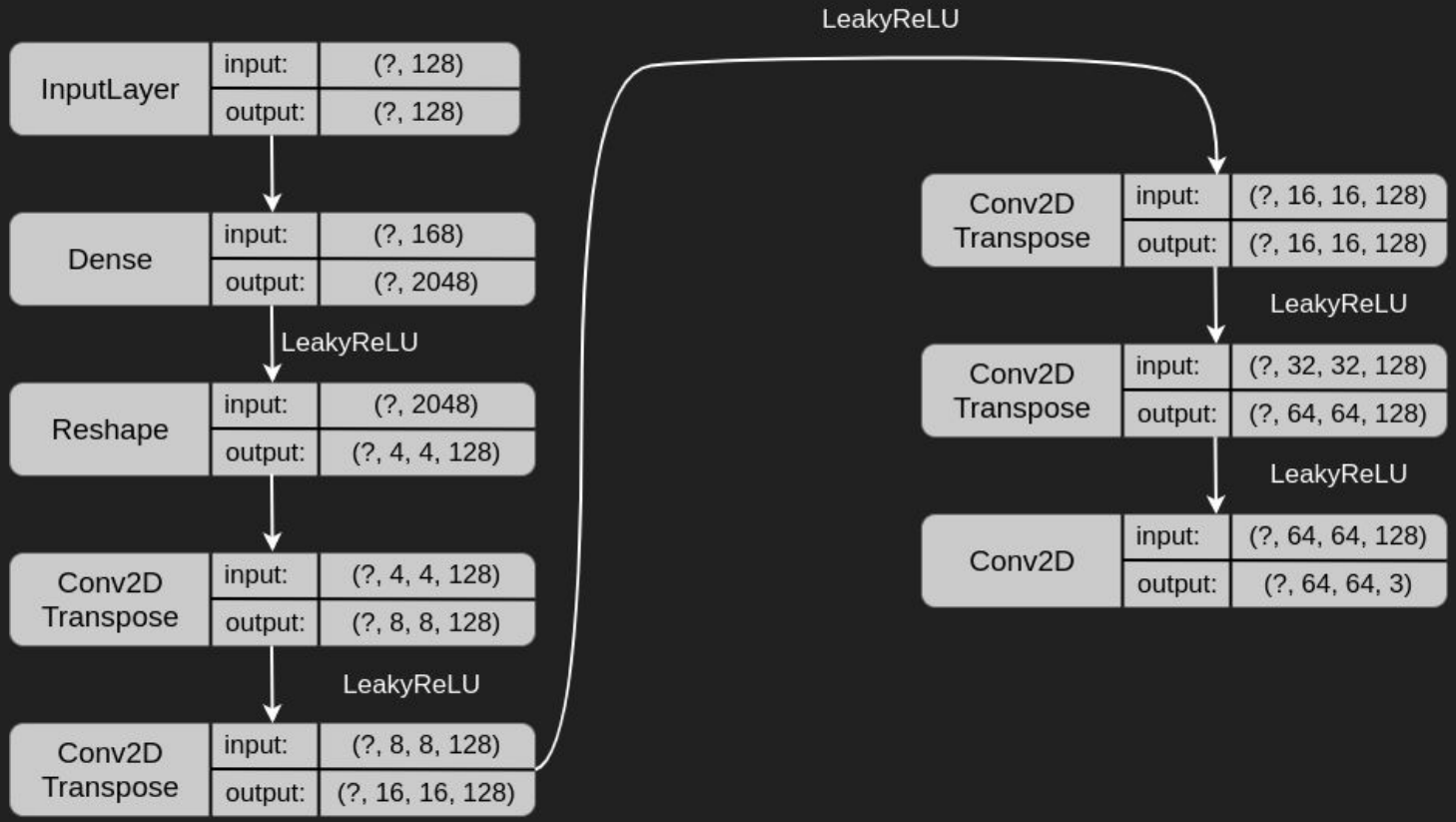
Data pre-processing

- CelebA dataset, 180k for training and 20k for FID
- Images resized to 64x64 pixels
- Images cropped at the coordinates [45:173, 25:153] to have the faces centered
- Transformed the attributes file from [-1, 1] to [0, 1]

GAN - Discriminator



GAN - Generator



GAN - Training

- Training dataset: 180k images
- Batch size: 64
- Latent space dimension: 128
- Loss function: binary cross-entropy
- Optimizer: Adam (lr=0.0002, beta_1 = 0.5)
- Epochs: 100

GAN - Improvements

Unstable Training

- To have a more stable training, we applied a a weight normalization technique called *Spectral Normalization* to each Convolutional layer of the Generator and Discriminator.

- In order to control the magnitude of the activations of the generator model we applied a technique called *Pixel Normalization*: it normalizes the feature vector in each pixel to unit length after each convolutional layer.

Similar images

- To increase the diversity of the generated images we used a technique which consists in adding a layer, which we called "*MinibatchStdev*", in the discriminator model. This layer computes and exploits some statistics about the whole input minibatch.

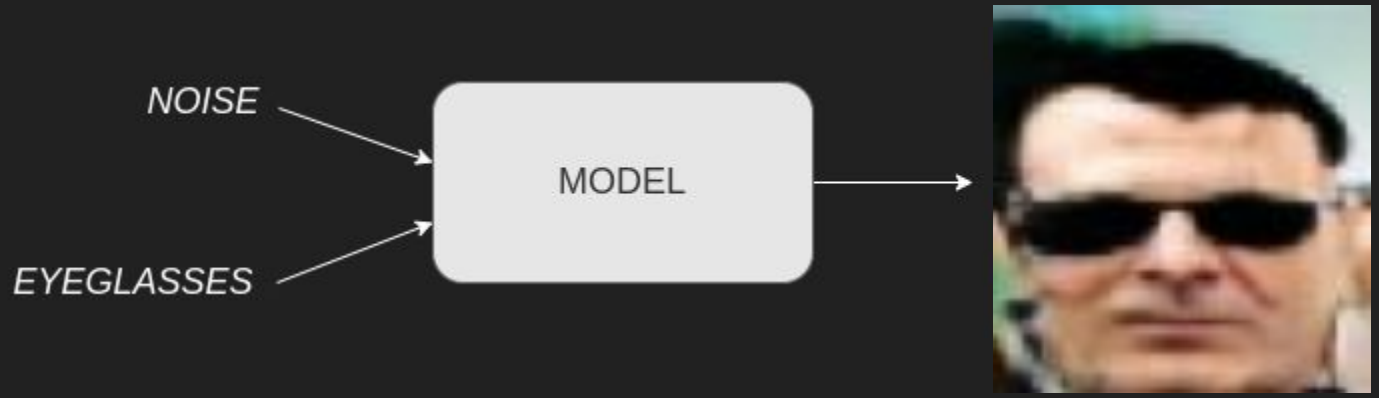
GAN - Results

GAN - Results

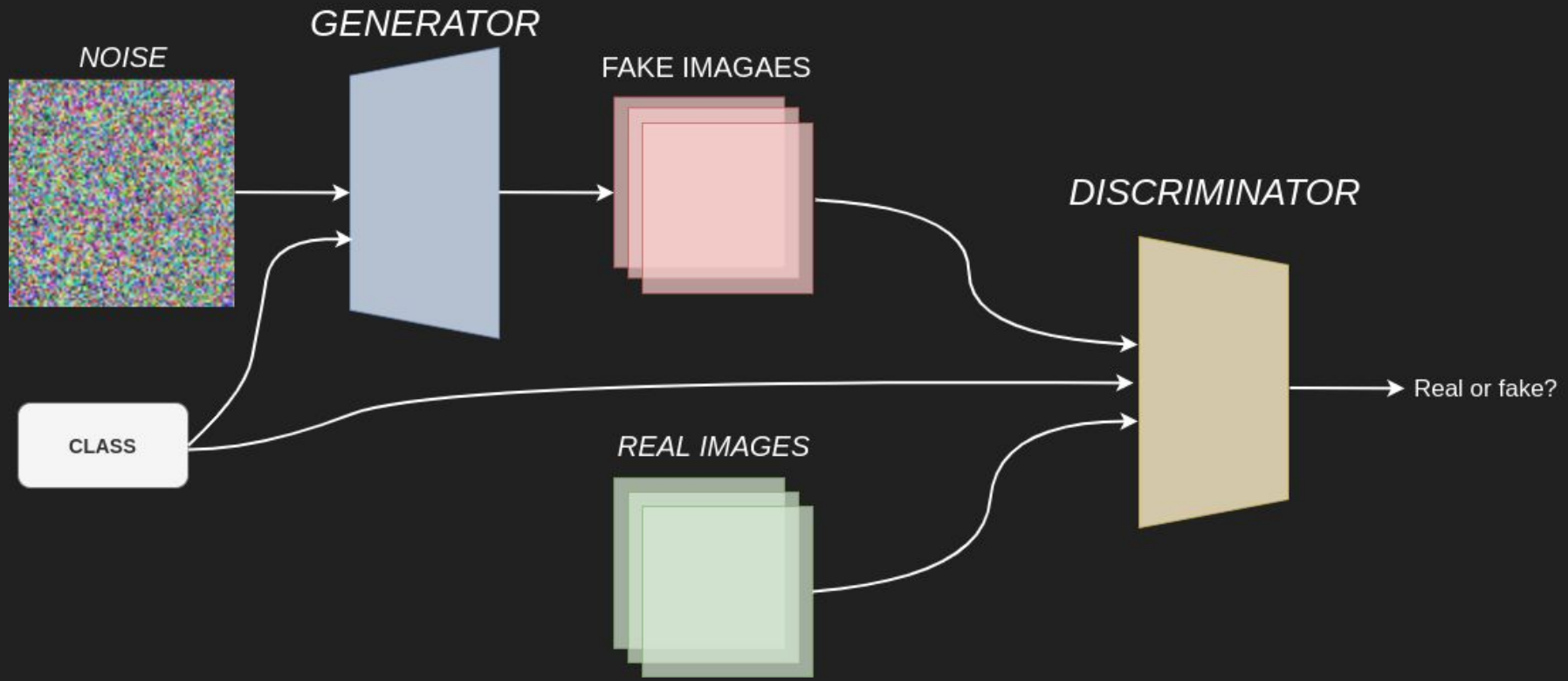
GAN - Evaluation

FID score: 11.21

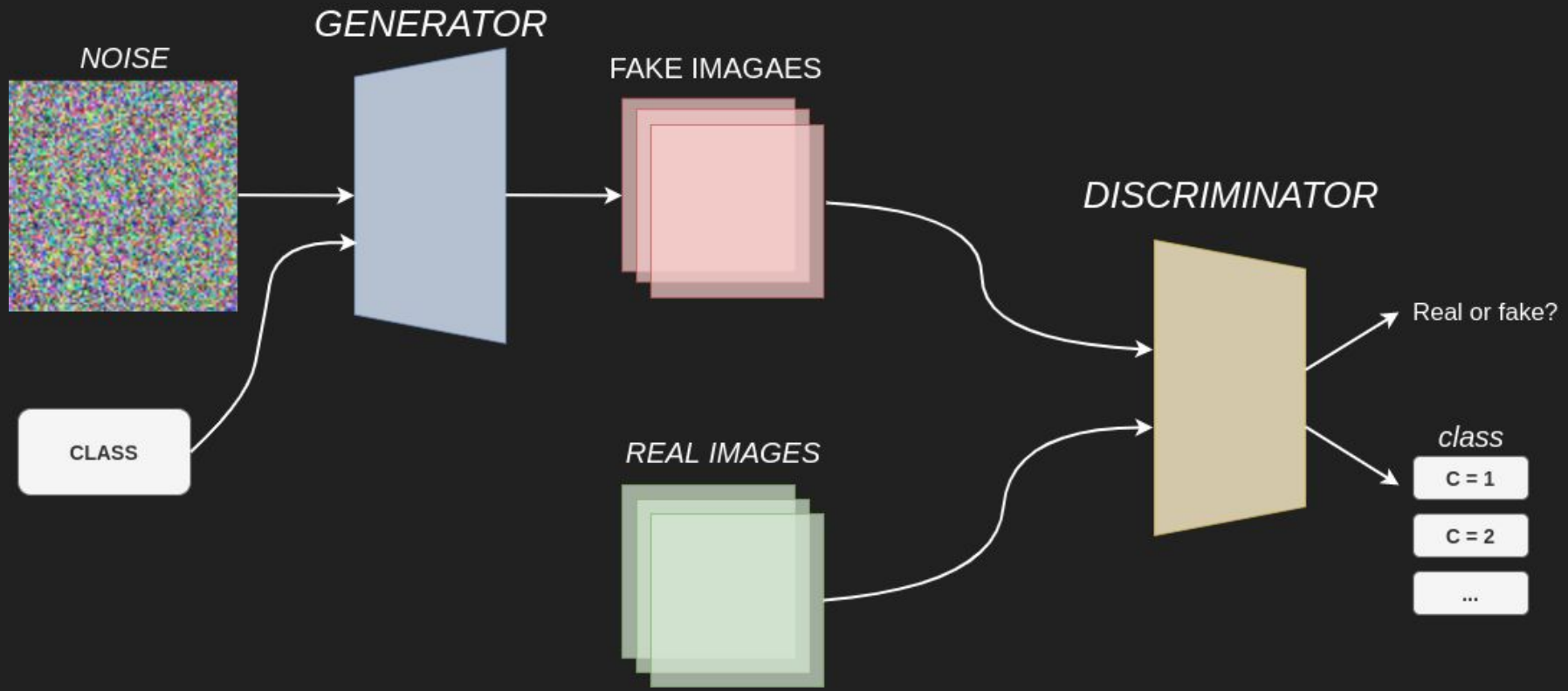
Assignment 2 - Conditional face generation



CGAN


GENERATOR
NOISE
FAKE IMAGAES
DISCRIMINATOR
CLASS
Real or fake?
REAL IMAGES

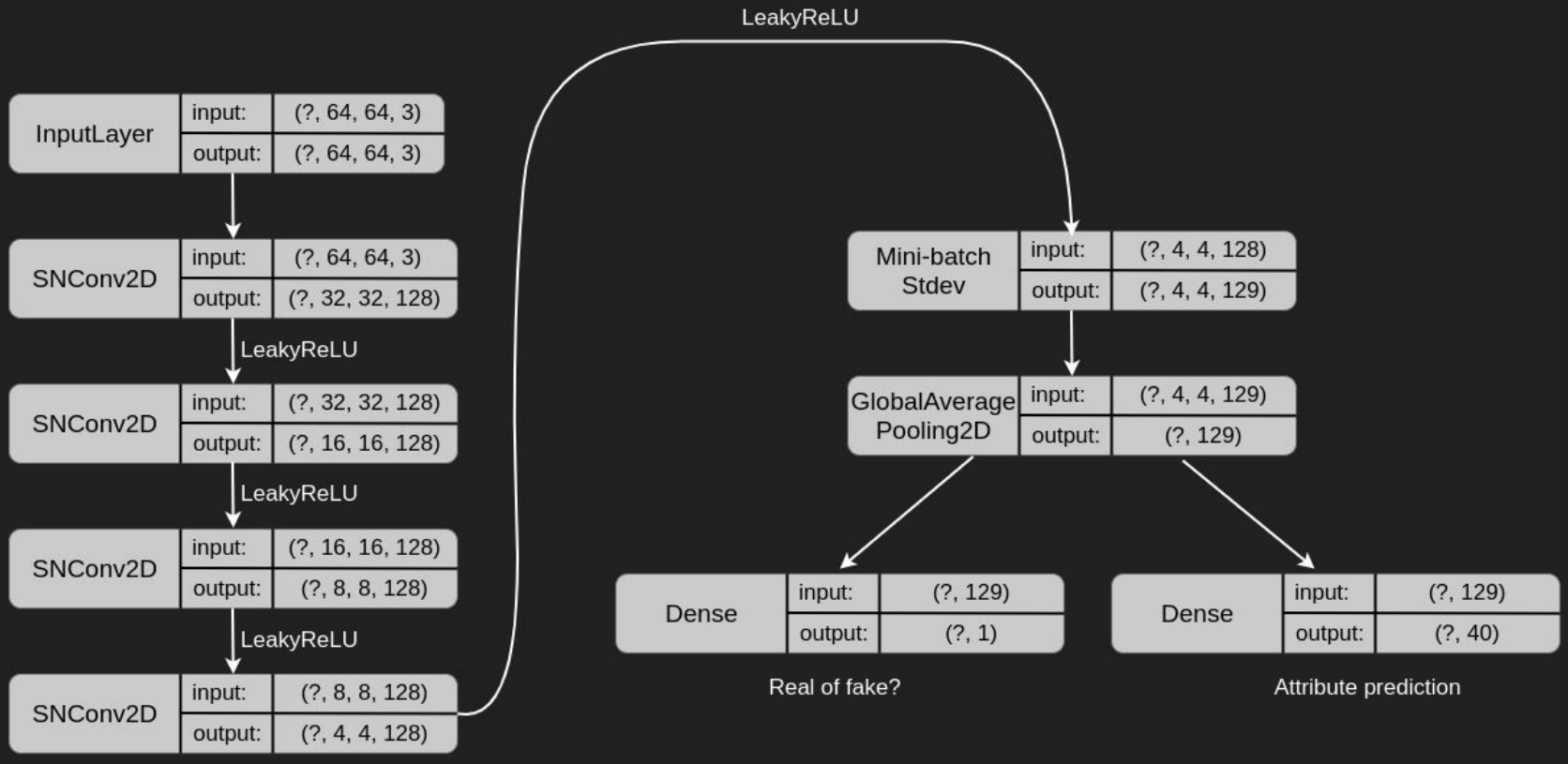
ACGAN - more stable training



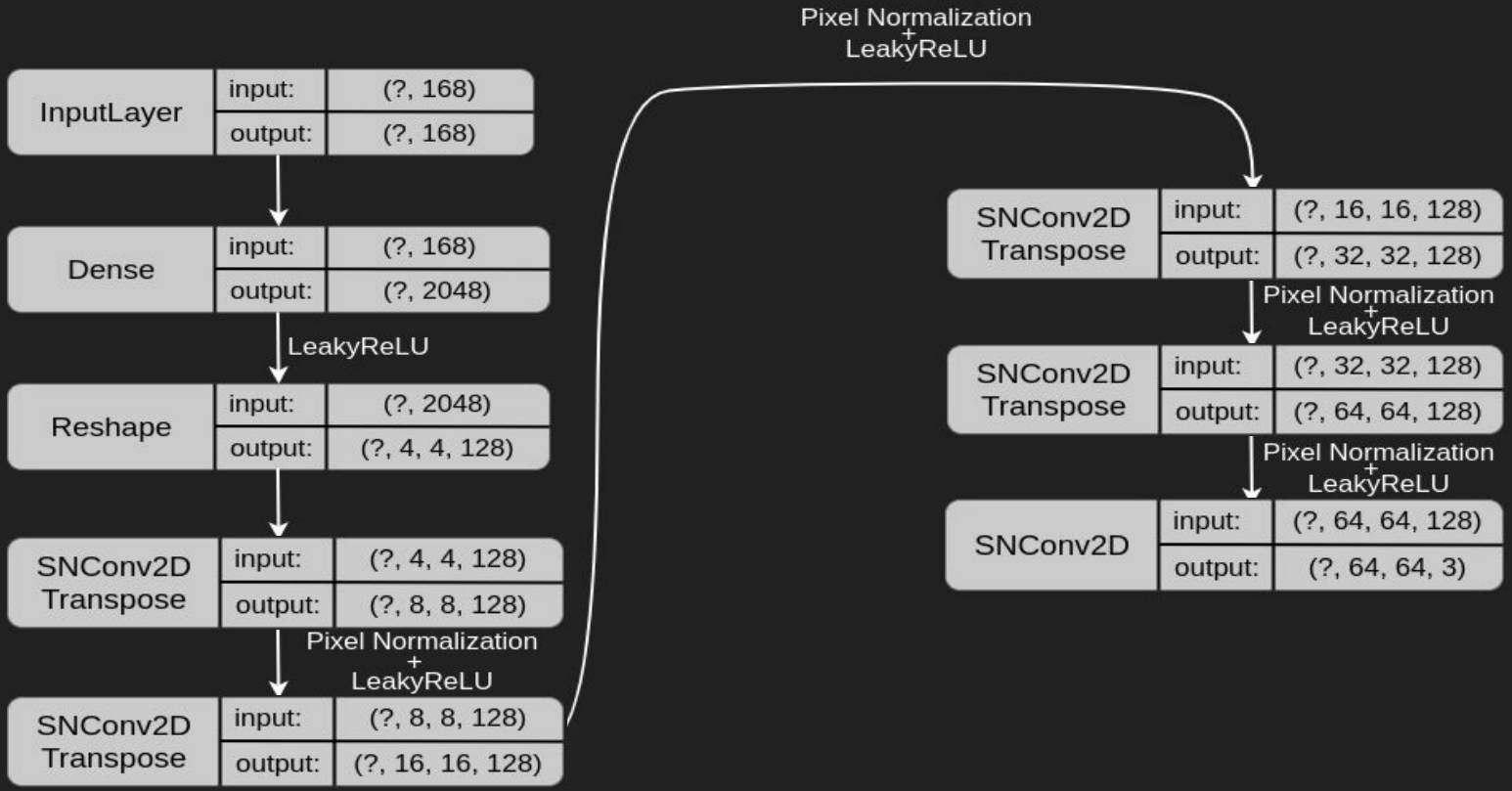
ACGAN - Training

- Training dataset: 180k images
- Batch size: 64
- Latent space dimension: 128
- Loss function: binary cross-entropy
- Optimizer: Adam (lr=0.0002, beta_1 = 0.5)
- Epochs: 100
- Attributes vectors: 40 attributes

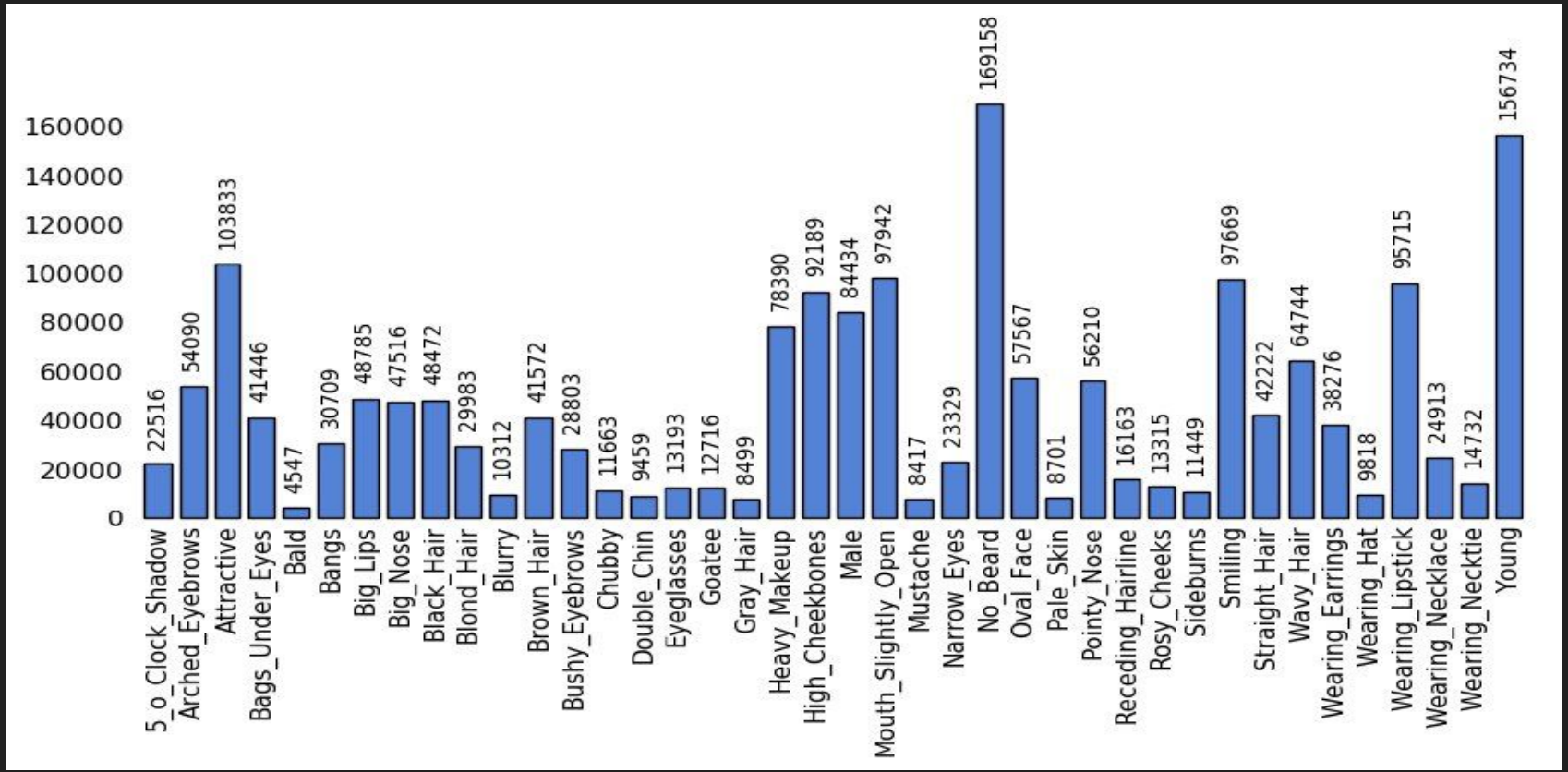
ACGAN - Discriminator



ACGAN - Generator



ACGAN - Issues



ACGAN - Worst results

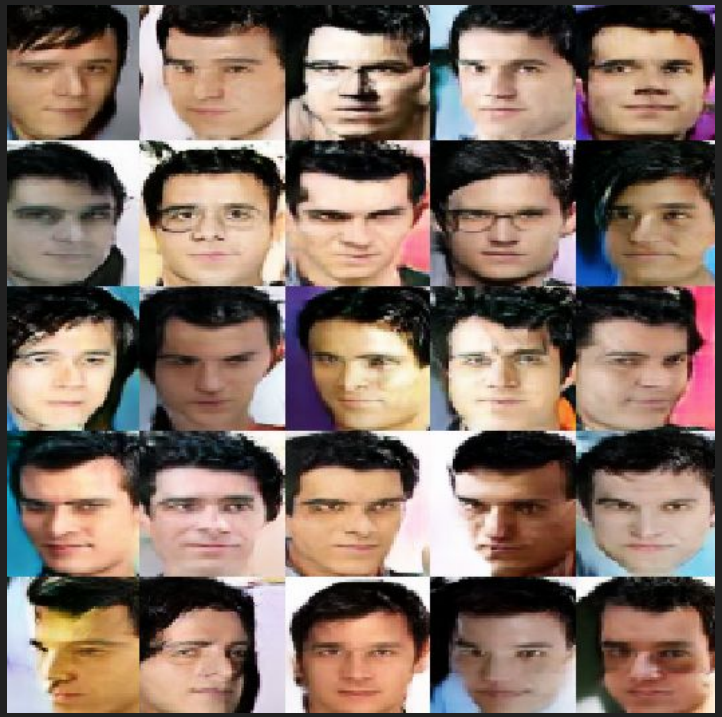
bald,male,no_beard,smiling

ACGAN - Rare attributes

male, gray_hair, smiling, straight_hair

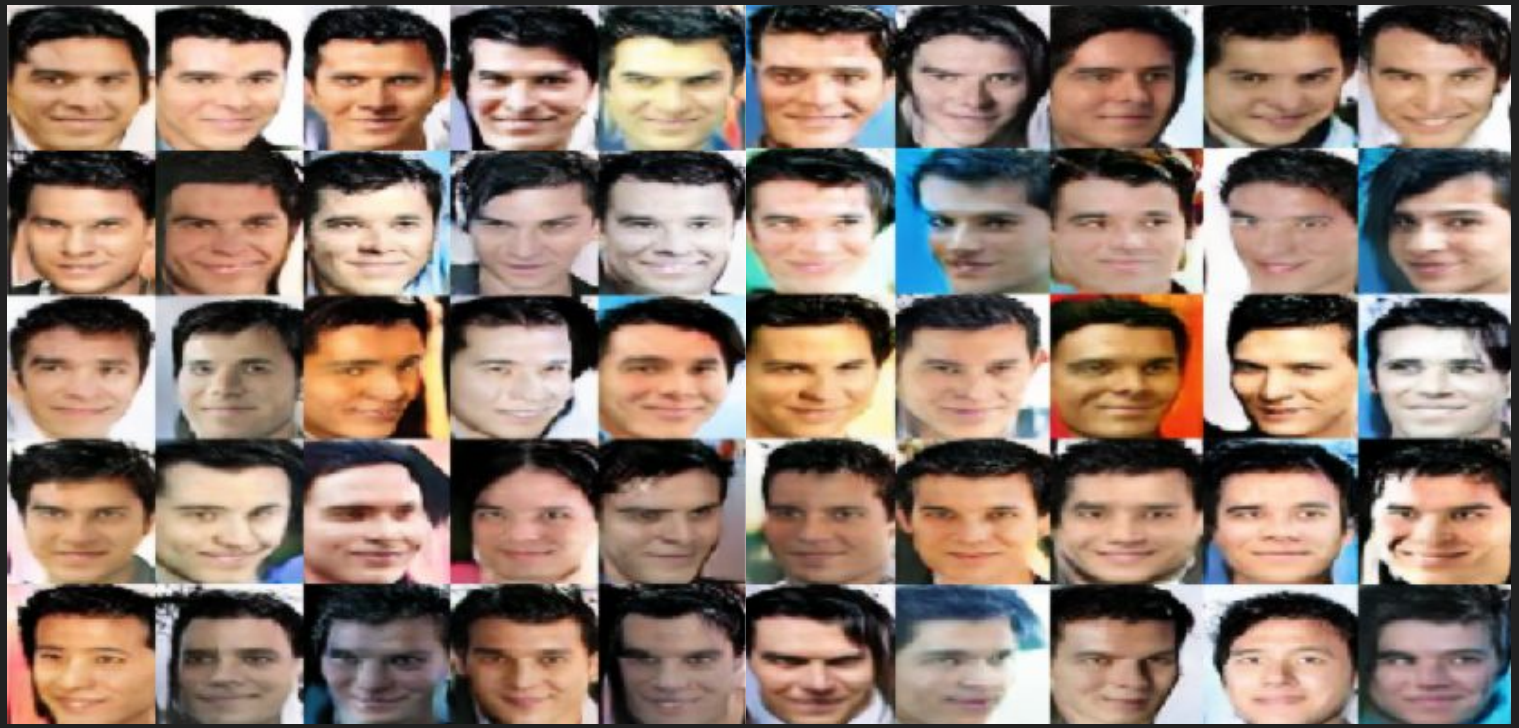
ACGAN - Rare attributes

male,black_hair,smiling, straight_hair, eyeglasses, no_beard



male,black_hair,smiling, straight_hair, eyeglasses, no_beard, attractive

ACGAN - Results



male, black_hair, straight_hair, attractive, young, high_cheekbones, smiling

ACGAN - Results

male,black_hair,smiling, straight_hair, no_beard, attractive, young, narrow_eyes

ACGAN - Results

big_lips, blond_hair, heavy_makeup, rosy_cheeks, smiling, wearing_lipstick, young, no_beard,straight_hair, chubby, oval_face, double_chin

ACGAN - Results

attractive, big_lips, blond_hair, heavy_makeup, rosy_cheeks, smiling, wearing_lipstick, young, no_beard, straight_hair

ACGAN - Results

big_lips, blond_hair, heavy_makeup, rosy_cheeks,wearing_lipstick, no_beard,straight_hair,bangs

ACGAN - Results

big_lips, black hair, heavy_makeup, rosy_cheeks, smiling, wearing_lipstick, young, no_beard, straight_hair

ACGAN: Results

attractive, big lips, blond hair, heavy_makeup, rosy_cheeks, smiling, wearing_lipstick, young, no_beard,straight_hair, mouth_slightly_open

ACGAN - Evaluation

FID score: 19.42

Thank you for the attention.