

Fingerprint Identity Preserving Generative Adversarial Networks

MOTIVATION

Public latent fingerprint databases are relatively small

Dataset	Number of latent fingerprints
NIST SD302	9990
MOLF DB4	4400
IIITD Latent Fingerprint Database	1046
IIITD MSLFD	551
NIST SD27	258
IIITD SLF	240

TRAINING - FIRST STAGE

Binarized clean fingerprint

Generator

N(z)

Fake latent fingerprint

Discriminator 1

Real/Fake

Real latent fingerprint

Figure 2

OBJECTIVE

Generate more latent fingerprints

Same identity

Binarized clean fingerprint

N style vectors

Generator

Latent fingerprint 1

Latent fingerprint N

Figure 1

TRAINING - SECOND STAGE

Binarized clean fingerprint

Generator

Latent fingerprint

Encoder

Predicted style vector

N(z)

Style vector

L1 loss

Figure 3

TRAINING - THIRD STAGE

Real latent fingerprint

Encoder

Style vector

KL Divergence

N(z)

Same identity

Binarized clean fingerprint

Generator

Reconstructed latent fingerprint

Discriminator 2

Real/Fake

L1 loss

Figure 4

GENERATOR ARCHITECTURE

Output image

Input image

Input

Mapping network

FC32

FC64

FC128

FC256

FC512

FC512

FC512

FC512

FC512

Output

Generator

Sigmoid

K4C1S1

AdaIN

K4C64S1/2

Concat

AdaIN

K4C128S1/2

Concat

AdaIN

K4C256S1/2

Concat

AdaIN

K4C512S1/2

Concat

K4C512S1

3x

Mapping network

Latent vector

Figure 5

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CURRENT RESULTS - FIRST STAGE

Trained on subset of NIST SD302, 1455 latent fingerprints

Binarized clean fingerprint

Latent fingerprint 1

Latent fingerprint 2

Latent fingerprint 3

Latent fingerprint 4

Figure 6

CURRENT RESULTS - SECOND STAGE

Trained on MOLF DB4, 4400 latent fingerprints

Binarized clean fingerprint

Latent fingerprint 1

Latent fingerprint 2

Latent fingerprint 3

Latent fingerprint 4

Figure 7