

DeepMasterPrints

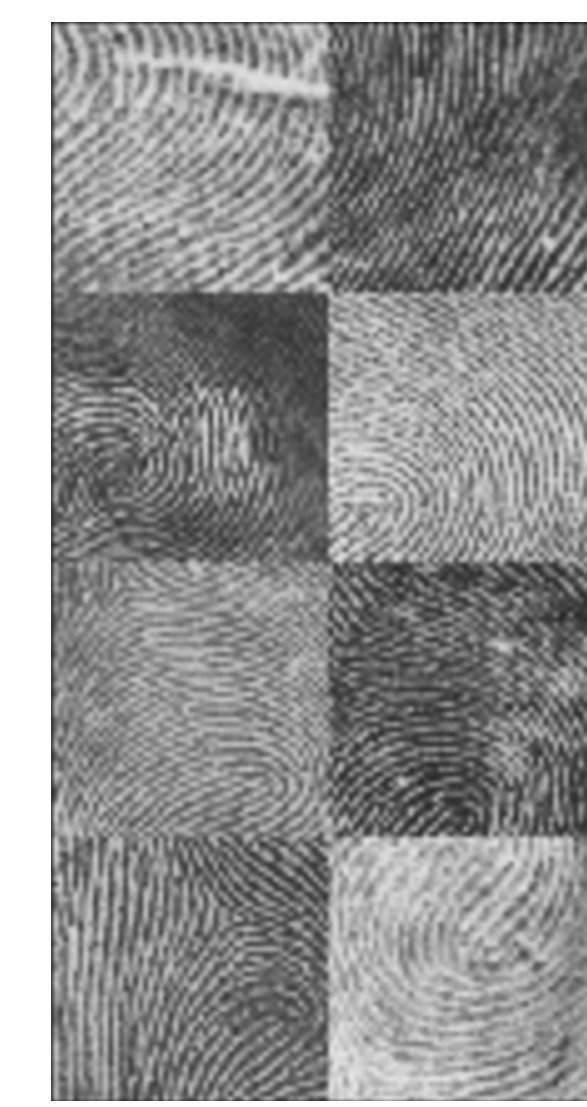
- Many mobile devices have small fingerprint sensors that only require a partial fingerprint for verification.
- MasterPrints are partial fingerprints that fortuitously match with a large number of identities.
- DeepMasterPrints are MasterPrints created with a new method we propose, Latent Variable Evolution.
- MasterPrints demonstrate a need to harden systems to adversarially designed synthetic biometrics



Fingerpass DB7



GAN Generated

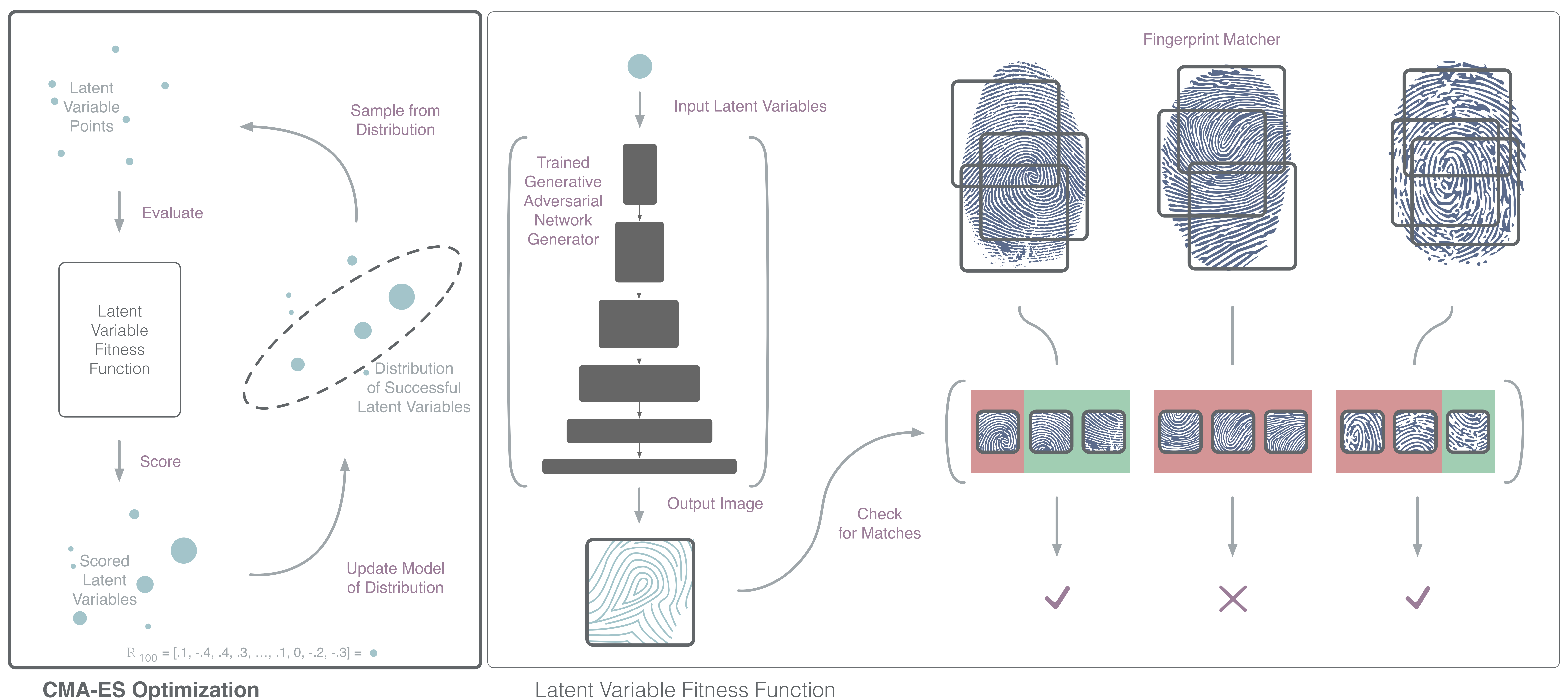


NIST Special Database 9



GAN Generated

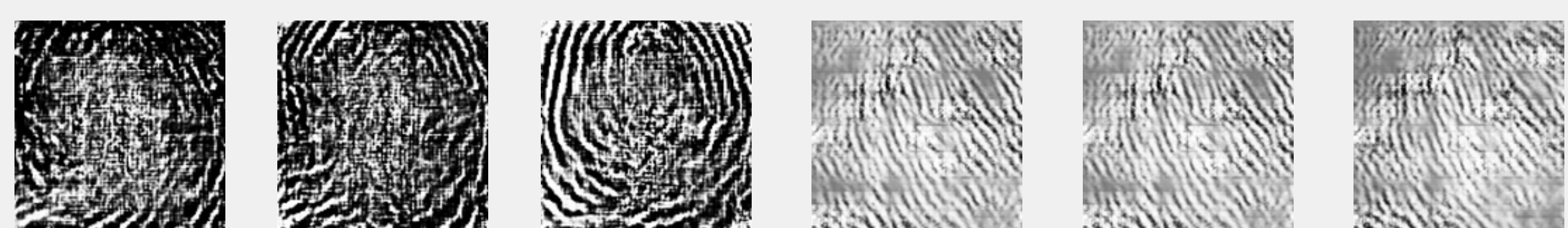
Designing DeepMasterPrints with Latent Variable Evolution



CMA-ES Optimization

Latent Variable Fitness Function

Evolved Partial Fingerprints



1.1%¹ 22.5%² 76.7%³ 0.3%¹ 8.6%² 78.1%³

DeepMasterPrint success rates for capacitive images (left) and rolled fingerprints (right) on the VeriFinger matcher.

1. 0.01% False Match Rate 2. 0.1% False Match Rate 3. 1% False Match Rate

Comparison To Previous Method

	0.01% FMR	0.1% FMR	1% FMR
1 MasterPrint*	1.9%	6.6%	33.4%
5 MasterPrints*	6.9%	30.7%	77.9%
1 DeepMasterPrint	1.1%	22.5%	76.7%

*Roy et al. 2017

Generalization Across Matchers

The DeepMasterPrints were optimized for the VeriFinger matching system. To understand how they generalize, we test the existing DeepMasterPrints on unseen identities using the Bozorth3 matcher and the Innovatrics matcher. Each matcher is evaluated at 3 security settings: 0.01%, 0.1%, and 1% False Match Rate (FMR). Evaluations done on 440 test fingerprints from the Fingerpass DB7 where each fingerprint is broken into 12 partial fingerprints.

Matcher	FMR	Rolled	Capacitive
Bozorth3	0.01%	0%	0%
	0.1%	23.1%	2.8%
	1%	89.7%	31.4%
Innovatrics	0.01%	0%	0.8%
	0.1%	0.8%	3.6%
	1%	10.6%	25.3%