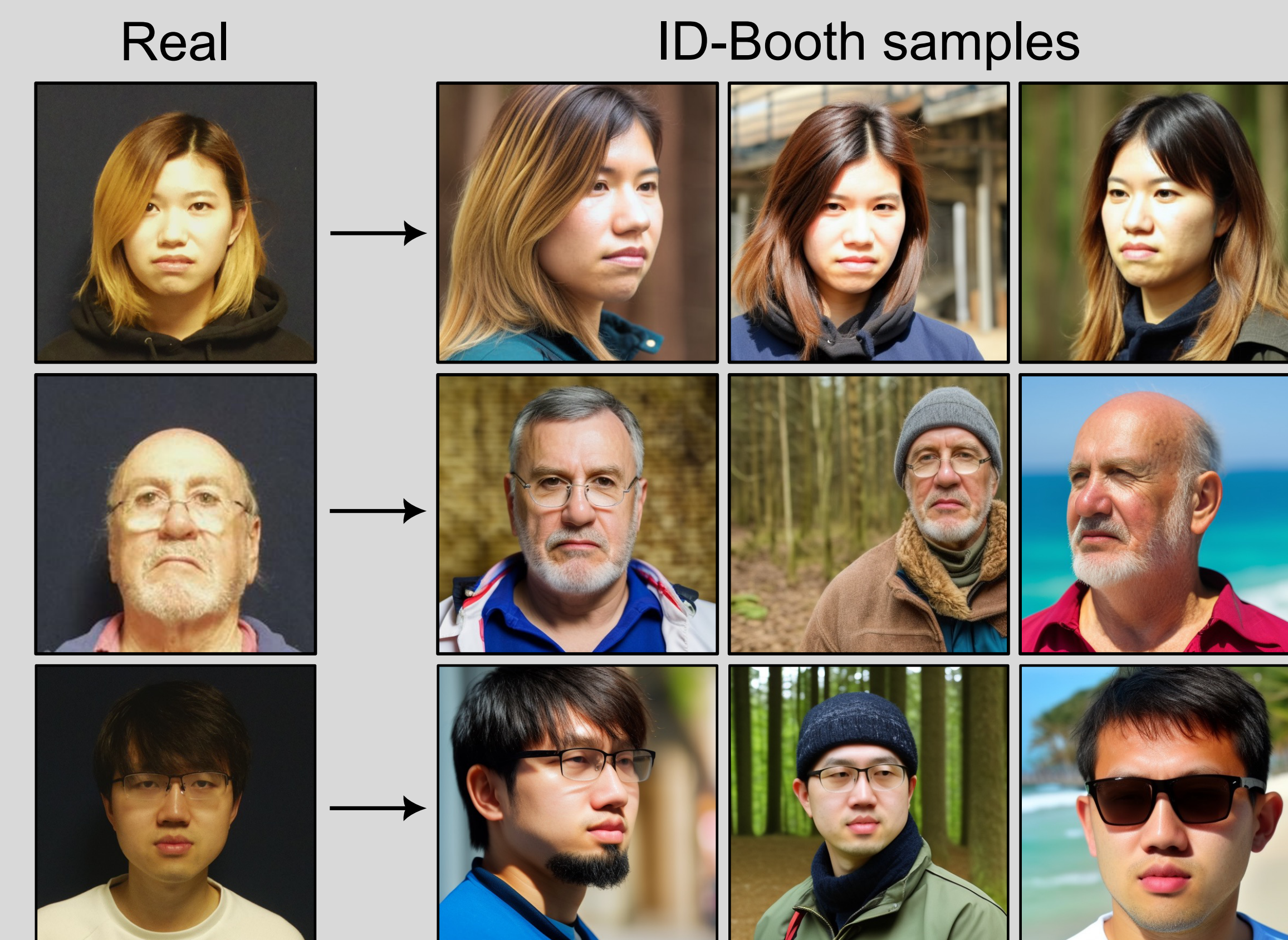


Motivation:

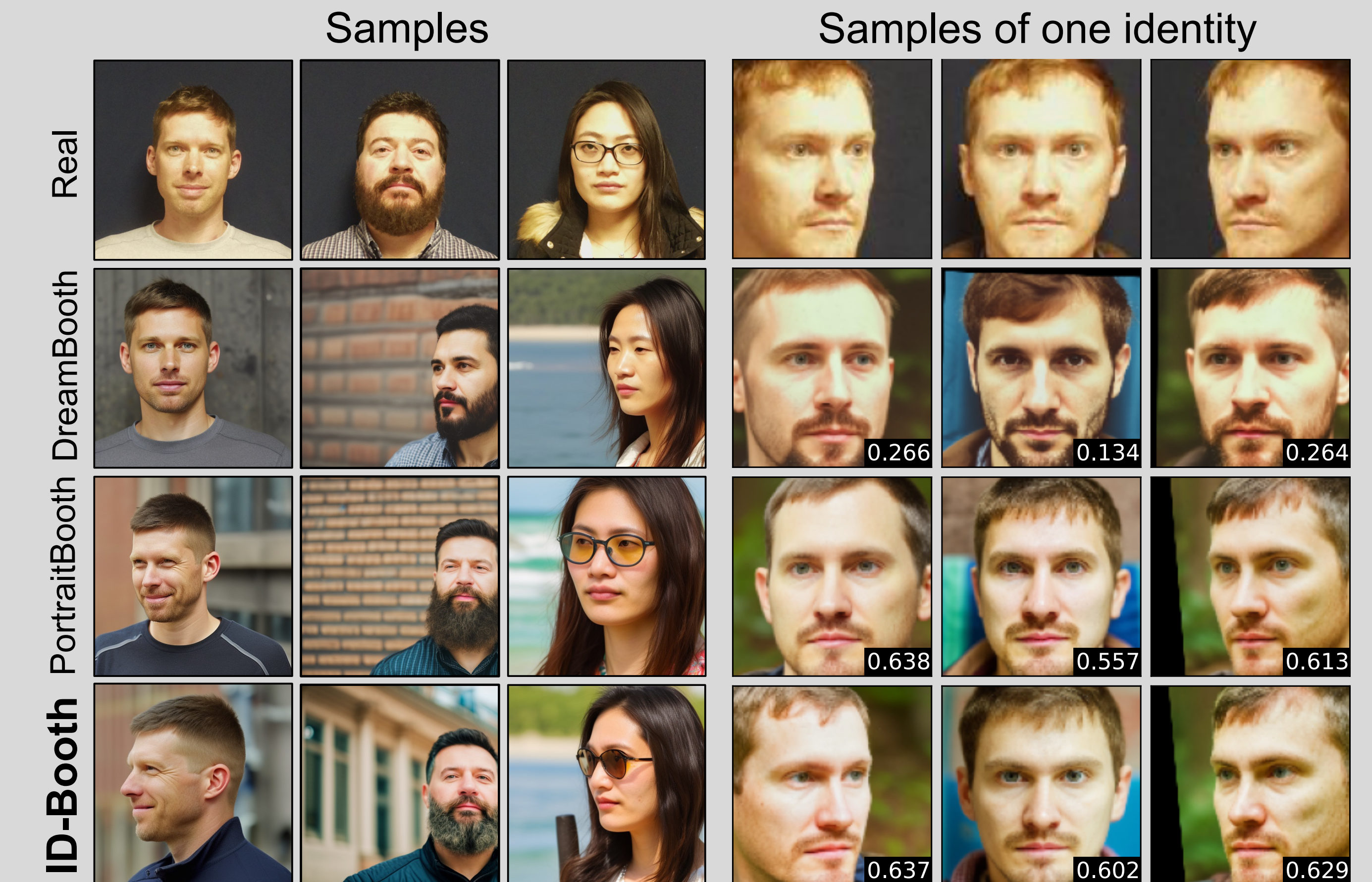
- Deep models need **large & diverse** training data
- GDPR** restricts use & sharing of biometric data
- Gathering **in-the-wild** data with **consent** is difficult
- Solution:** Synthetic data of consenting subjects



ID-Booth: Identity-consistent Face Generation with Diffusion Models

darian.tomasevic@fri.uni-lj.si

Darian Tomašević¹, Fadi Boutros², Chenhao Lin³,
 Naser Damer^{2,4}, Vitomir Štruc⁵ and Peter Peer¹



Results:

Versus DreamBooth & PortraitBooth:

- Improved **identity consistency**
- Greater **diversity** (Pose, Accessories, Age)
- Higher **FR accuracy** when **augmenting**

Existing solutions:

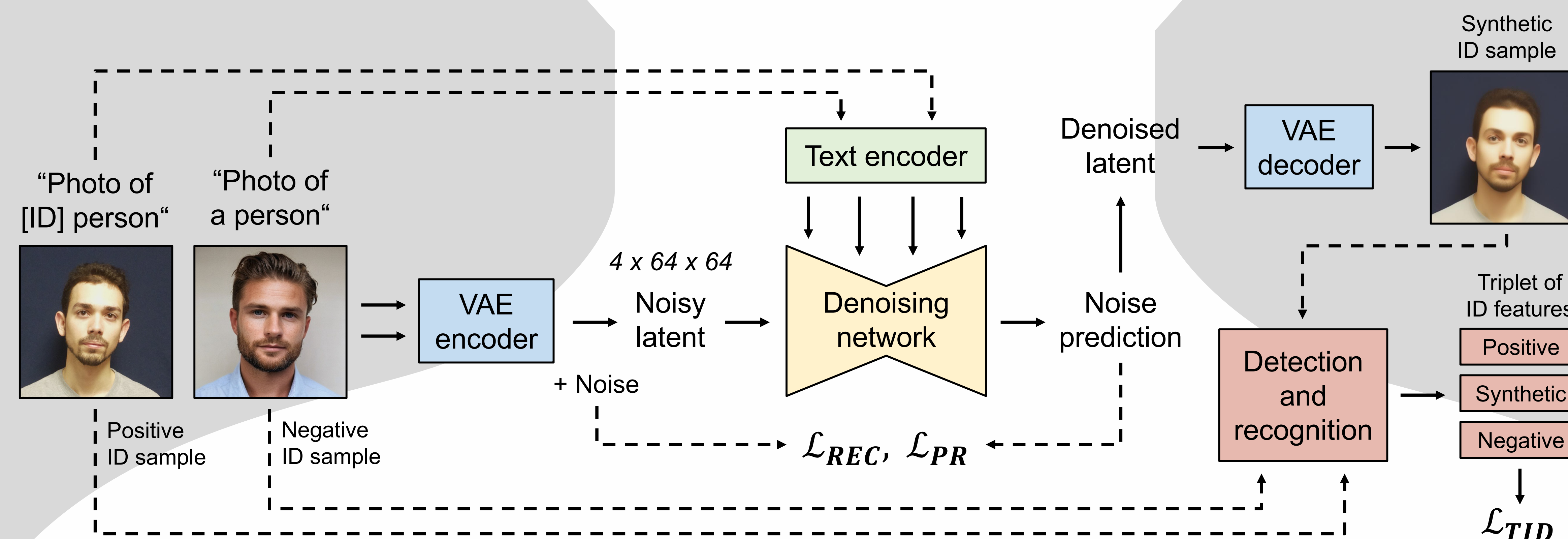
- Fine-tune diffusion models for identity-specific images
- DreamBooth:** Poor identity consistency
- PortraitBooth:** Overfits and impacts diversity
- Arc2Face, InstantID:** Need large training datasets

Experiments:

- Fine-tune **Stable Diffusion 2.1**
- Tufts Face Database (TFD):**
 - 2299 images, 107 IDs
 - Gathered with **consent**
 - Lacks** in-the-wild **diversity**
- Diversity via **prompts:**
 - face [Pose] photo of [Gender] [Identity] person, [Background] background
- Compare synthetic to **FFHQ**
- Augment TFD** for FR training

How it works:

- Triplet identity loss**
 - Positive:** Image of target ID
 - Anchor:** Denoised sample
 - Negative:** Prior model images
- Reconstruction loss (Pos.)**
- Prior preservation loss (Neg.)**



Takeaways:

- ID-Booth** can generate **in-the-wild** images of **consenting subjects**
- Triplet identity loss** balances identity **consistency & diversity**
- Augmenting** small laboratory-setting datasets with diverse **synthetic data** leads to training of **better performing recognition models**

Data from	Kernel Dist. ↓	Vendi Score ↑	FNMR 100 ↓	Fisher DR ↑	AgeDB-30 Acc. ↑	CP-LFW Acc. ↑
TFD (Real)	7.056	2.536	0.001	70.969	0.500	0.540
Non fine-tuned	2.201	—	—	—	—	—
DreamBooth	4.134	7.264	0.286	5.132	0.531	0.576
PortraitBooth	3.000	12.192	0.133	6.987	0.561	0.576
ID-Booth	2.778	13.510	0.110	7.402	0.595	0.587