Towards Diverse and Faithful One-shot Adaption of Generative Adversarial Networks

Yabo Zhang[1], Mingshuai Yao[1], Yuxiang Wei[1], Zhilong Ji[2],
Jinfeng Bai[2], Wangmeng Zuo[1,3]

[1]Harbin Institute of Technology [2] Tomorrow Advancing Life [3]Peng Cheng Laboratory

Introduction

ConSinGAN

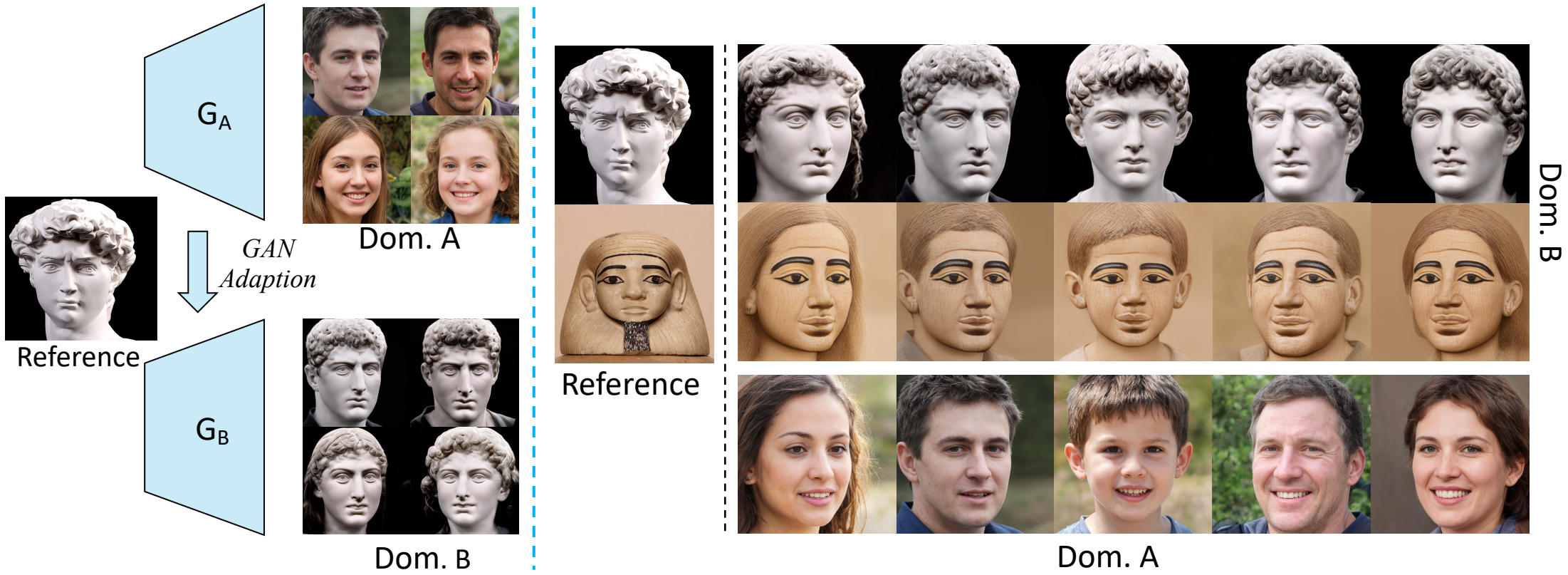
One training image

StyleGAN-ADA

~100 training image

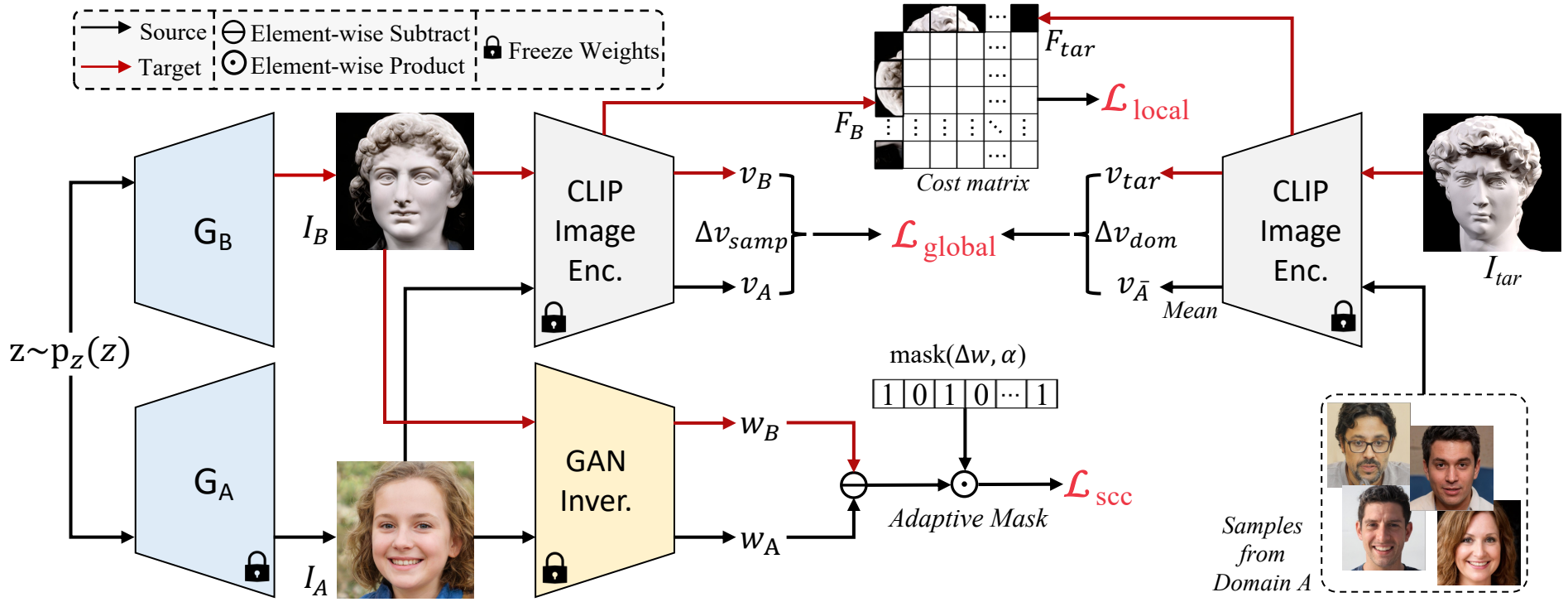
It is difficult to synthesize photo-realistic and highly diverse images
when training a generator from the scratch with very limited data.

Introduction



Transfer a pre-trained generator to a new domain so that **inheriting** its ability to producing highly diverse images.

Method



Global-level adaption loss L_{global} and **attentive style loss L_{local}** encourage G_B to faithfully acquire both global and local representative domain-specific characteristics.

Selective cross-domain consistency loss L_{scc} selects and retains domain-sharing attributes.

Local-level adaption (attentive style loss)

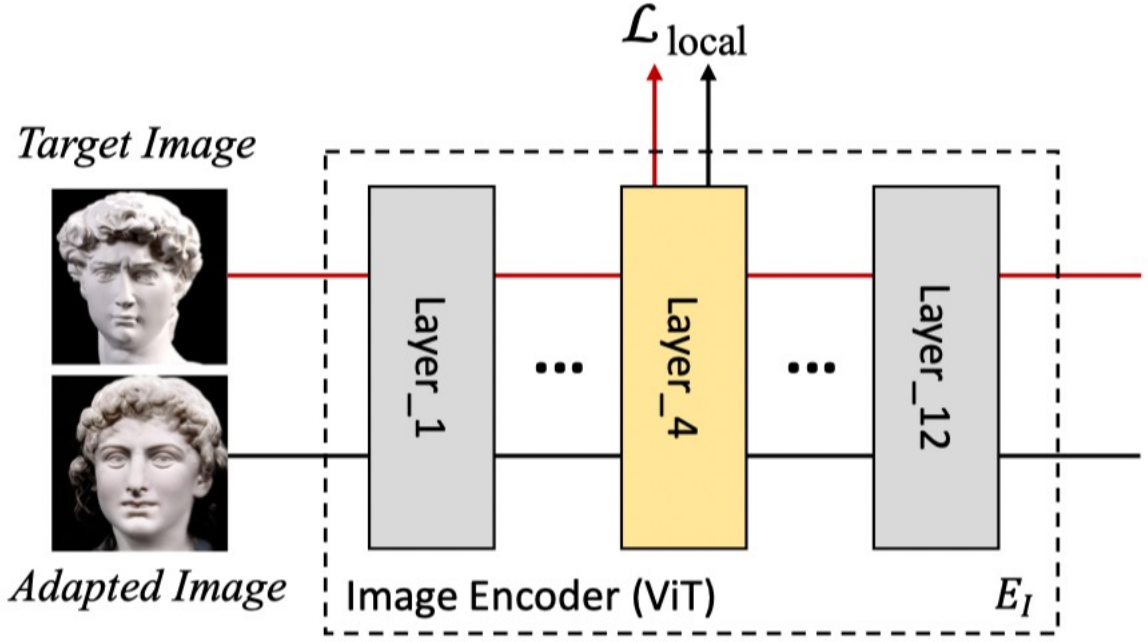
Each part of adapted image attentively captures its corresponding style in target image

Firstly, define the cost matrix C to measure the token-wise distances from F_B to F_{tar}

$$\boldsymbol{C}_{i,j} = 1 - \frac{\boldsymbol{F}_B^i \cdot \boldsymbol{F}_{tar}^j}{|\boldsymbol{F}_B^i||\boldsymbol{F}_{tar}^j|}$$

Then, we compute the attentive style loss as:

$$\mathcal{L}_{local} = \max\left(\frac{1}{n}\sum_i \min_j \boldsymbol{C}_{i,j}, \frac{1}{m}\sum_j \min_i \boldsymbol{C}_{i,j}\right)$$



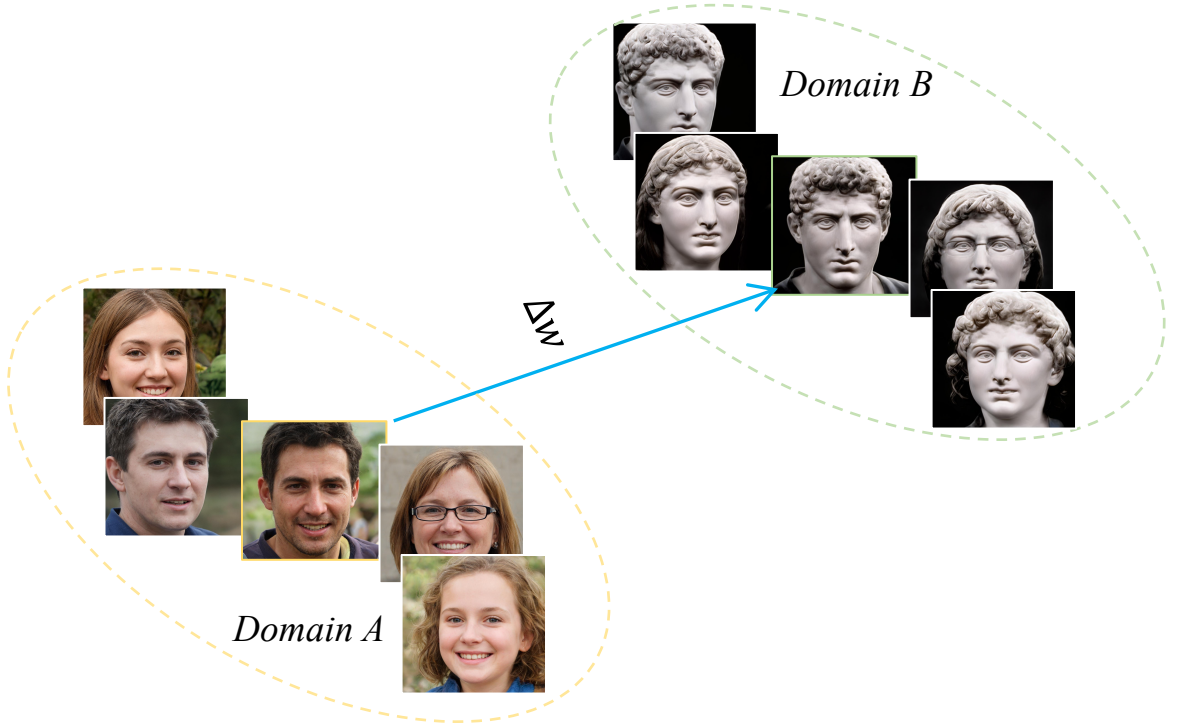
Selective cross-domain consistency loss

The key idea is to identify and retain **domain-sharing attributes** between domain A and B.

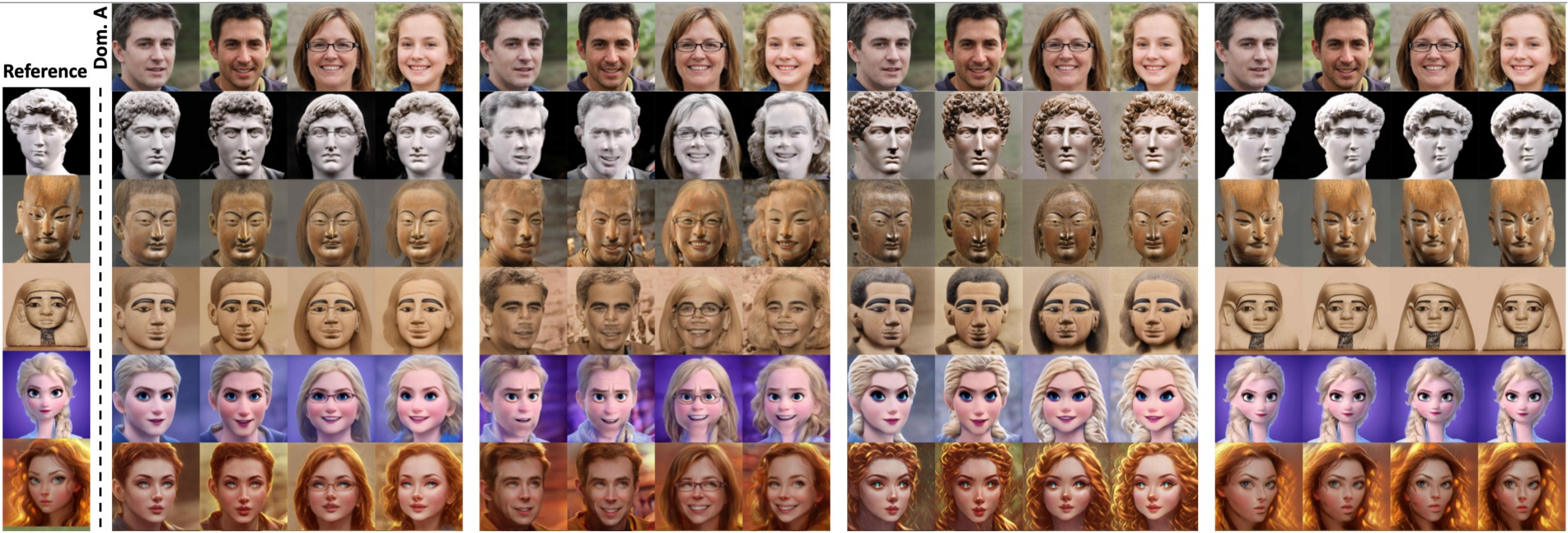
$$\mathcal{L}_{scc} = ||\text{mask}(\Delta \boldsymbol{w}, \alpha) \cdot (\boldsymbol{w}_B - \boldsymbol{w}_A)||_1$$

To identify them, we use two **queues** to memory pairs of latent codes from domain A and B. Dynamically choose the least-change channels.

$$\text{mask}(\Delta \boldsymbol{w}, \alpha)_i = \begin{cases} 1 & |\Delta \boldsymbol{w}_i| < |\Delta \boldsymbol{w}_{s_{\alpha N}}| \\ 0 & |\Delta \boldsymbol{w}_i| \geq |\Delta \boldsymbol{w}_{s_{\alpha N}}| \end{cases}$$



Qualitative results (Intra-category)



(a) Ours (b) Mind The Gap (c) StyleGAN-NADA (d) Few-Shot Adaption

Qualitative results (Inter-category)

(a) Ours (b) Mind The Gap (c) StyleGAN-NADA

More qualitative results

More qualitative results

Real Image Editing

Editing a real image in domain B

Extension

Extension to zero-shot generative domain adaption