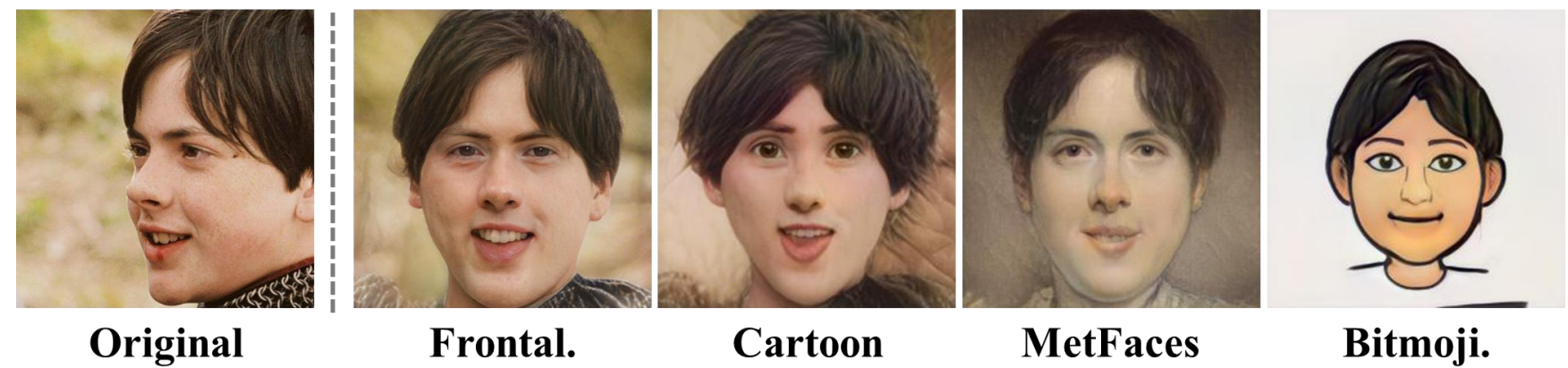


Generate and Edit Your Own Character in a Canonical View

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Goal



- We propose a **unified framework** which generates **stylized** portraits in **canonical view** with a **novel latent mapper**.

Motivation

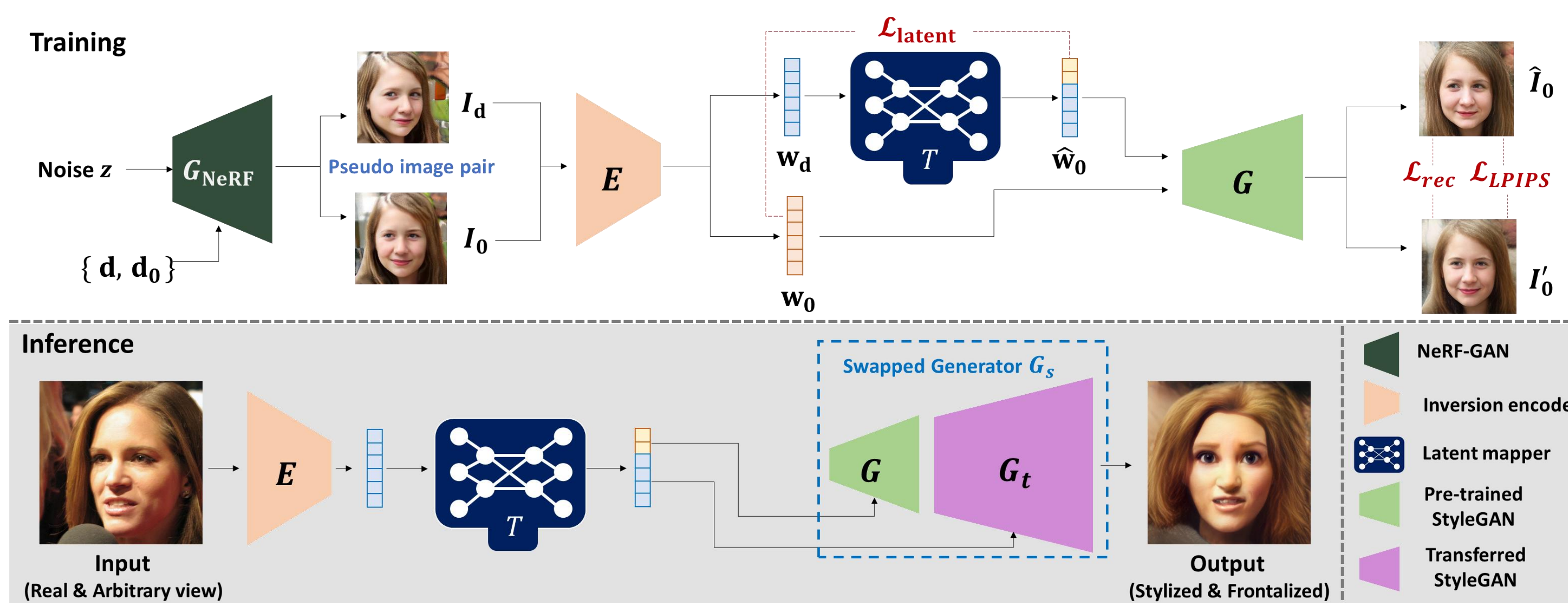
- Although the progress of generative models enables the stylization of a portrait image, obtaining the **stylized image in canonical (frontal) view** is still a challenging task.
- Applying the existing methods **sequentially** (Stylization → Frontalization or vice versa) shows degenerated results due to **domain gap** and **re-invert operation**. Many stylization (e.g., toonifying) methods are based on **StyleGAN**!
- Therefore, we started with the following question: How can we find the **frontal mapping automatically** which is done in **StyleGAN's latent space** instead of pixel space?

Related Work

- StyleGAN-based editing methods** can control the pose of image implicitly by finding **pose-related directions**, but they can't operate accurate mapping for frontalizing automatically (Need some continuous adjustments to find frontal image!)
- Among them, **InterFaceGAN** [1] can obtain canonical pose by using a semantic hyperplane, but it requires **3D supervision** for binary classification in order to calculate the hyperplane.
- Thanks to the notable successes in 3D-aware GANs (also in CVPR'22!) that can be trained without 3D label, we utilized [2] for the proposed **latent mapper** to learn **frontal mapping**.
- We utilized the idea of **'swapped generator'** [3] for stylization.

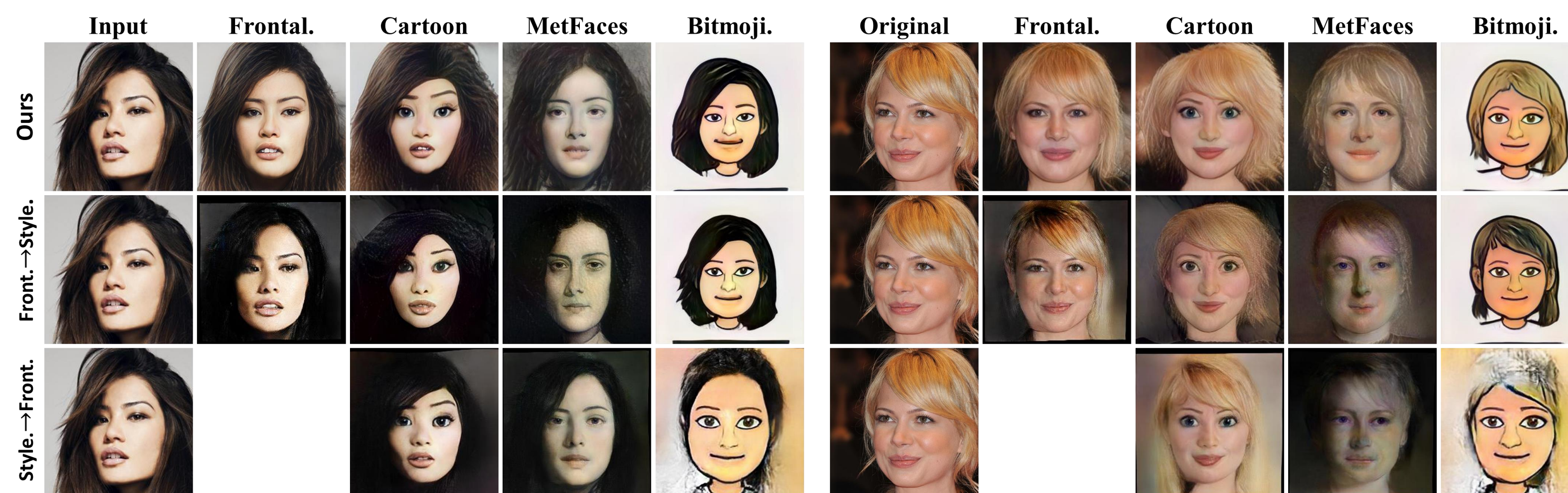
[1] Shen et al., "Interpreting the Latent Space of GANs for Semantic Face Editing", CVPR 2020.
 [2] Chan et al., "pi-GAN: Periodic Implicit Generative Adversarial Network for 3D-Aware Image Synthesis", CVPR 2021.
 [3] Pinkney and Alder, "Resolution Dependent GAN Interpolation for Controllable Image Synthesis between Domains", NeurIPS Workshop 2020.

Proposed Method

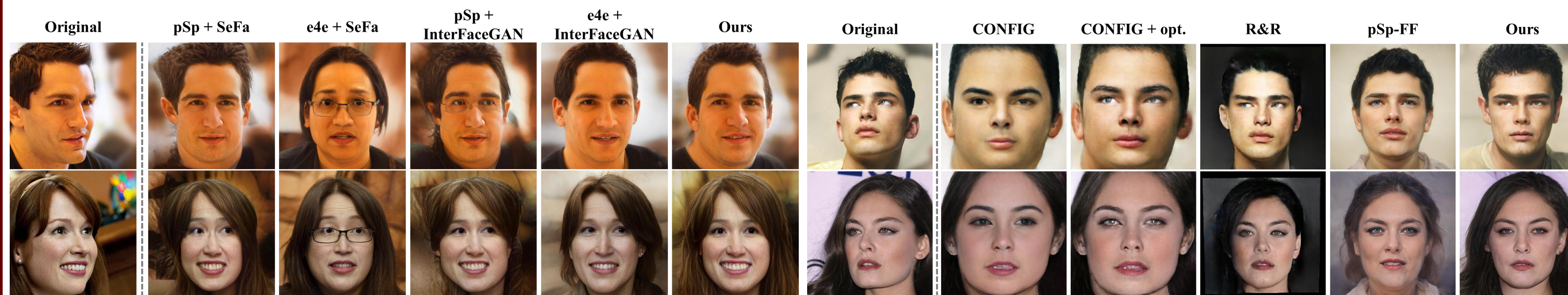


Experimental Result – Comparisons

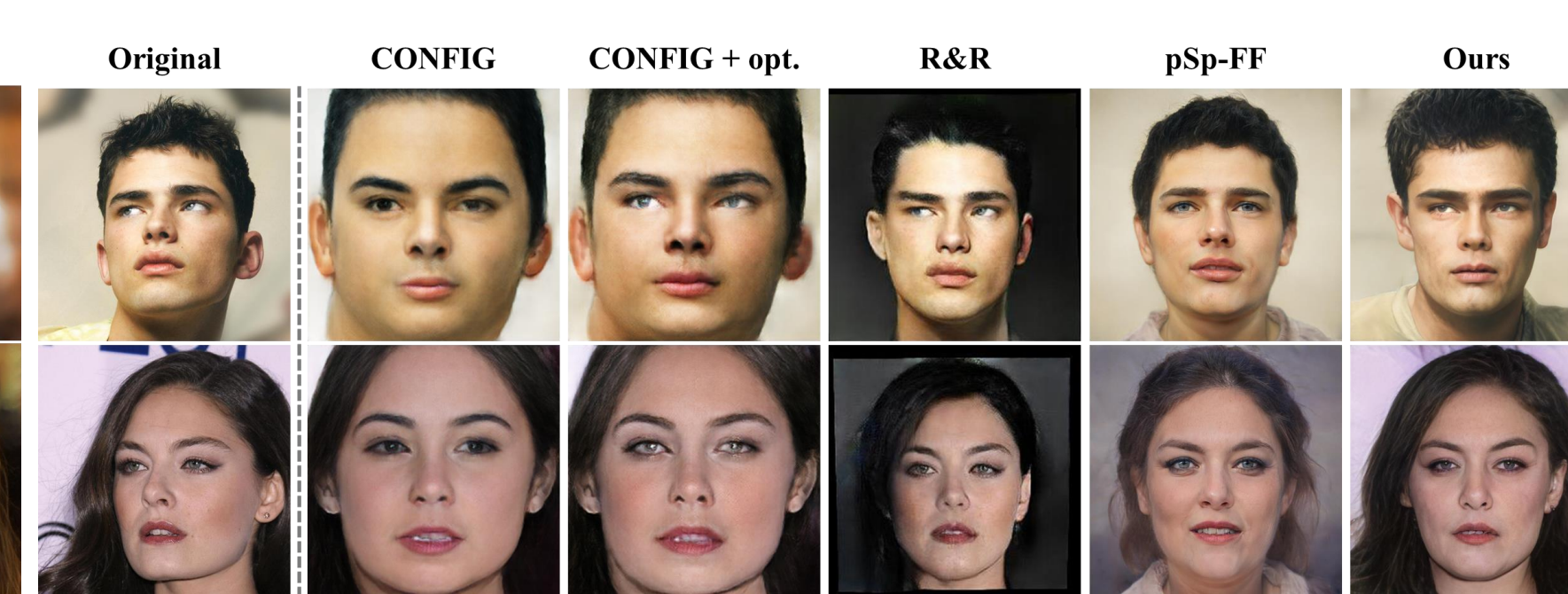
• Frontalization + Stylization (sequential) vs. Ours



• Comparison with latent-based methods

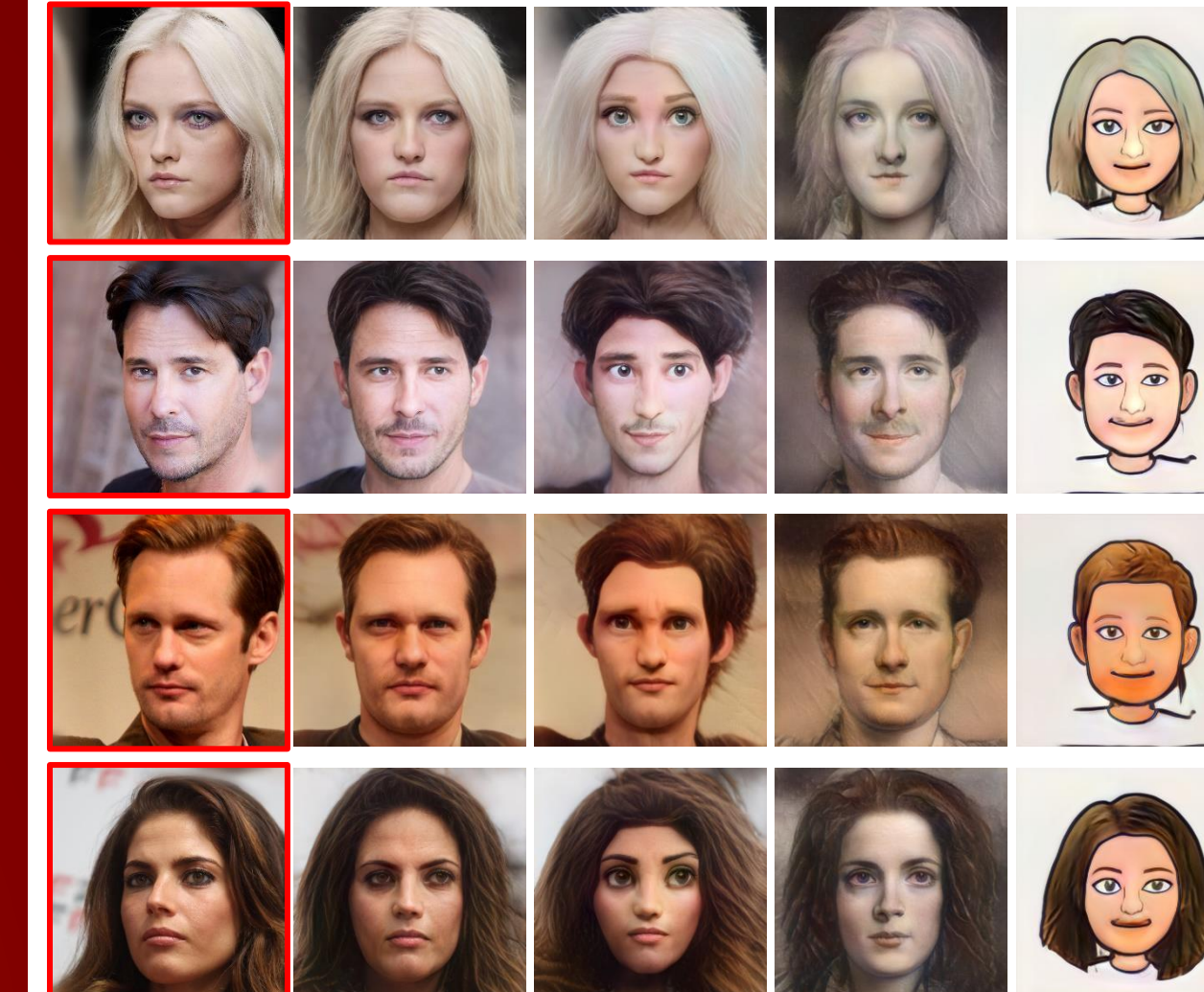


• Comparison with frontalization methods

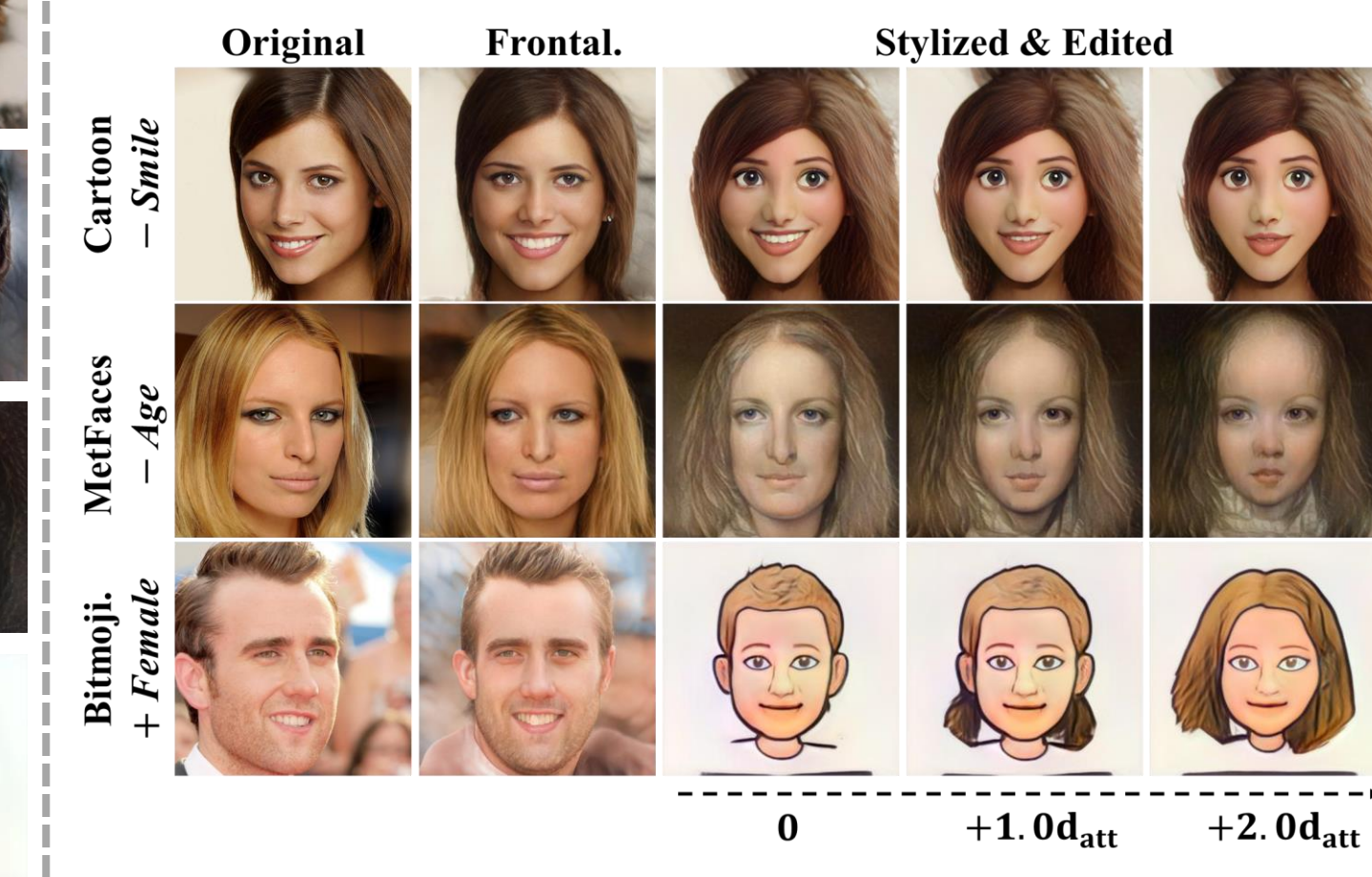


Experimental Result – Qualitative & Application

• Extra results (red boxes denote originals)



• Application: Our method is compatible with many well-studied StyleGAN-based techniques!



Experimental result – Quantitative

• Quantitative comparison

	Front. → Style.	Style. → Front.	Ours
FID (↓)	95.25	86.64	65.21
ID (↑)	77.10	-	82.26
Runtime (↓)	1.84	4.63	0.26

• Ablation study

	Ours	w.o./ \mathcal{L}_{latent}	w.o./ \mathcal{L}_{rec}	w.o./ \mathcal{L}_{LPIPS}
FID (↓)	65.21	75.76	71.52	68.32
ID (↑)	82.26	80.41	79.82	76.37

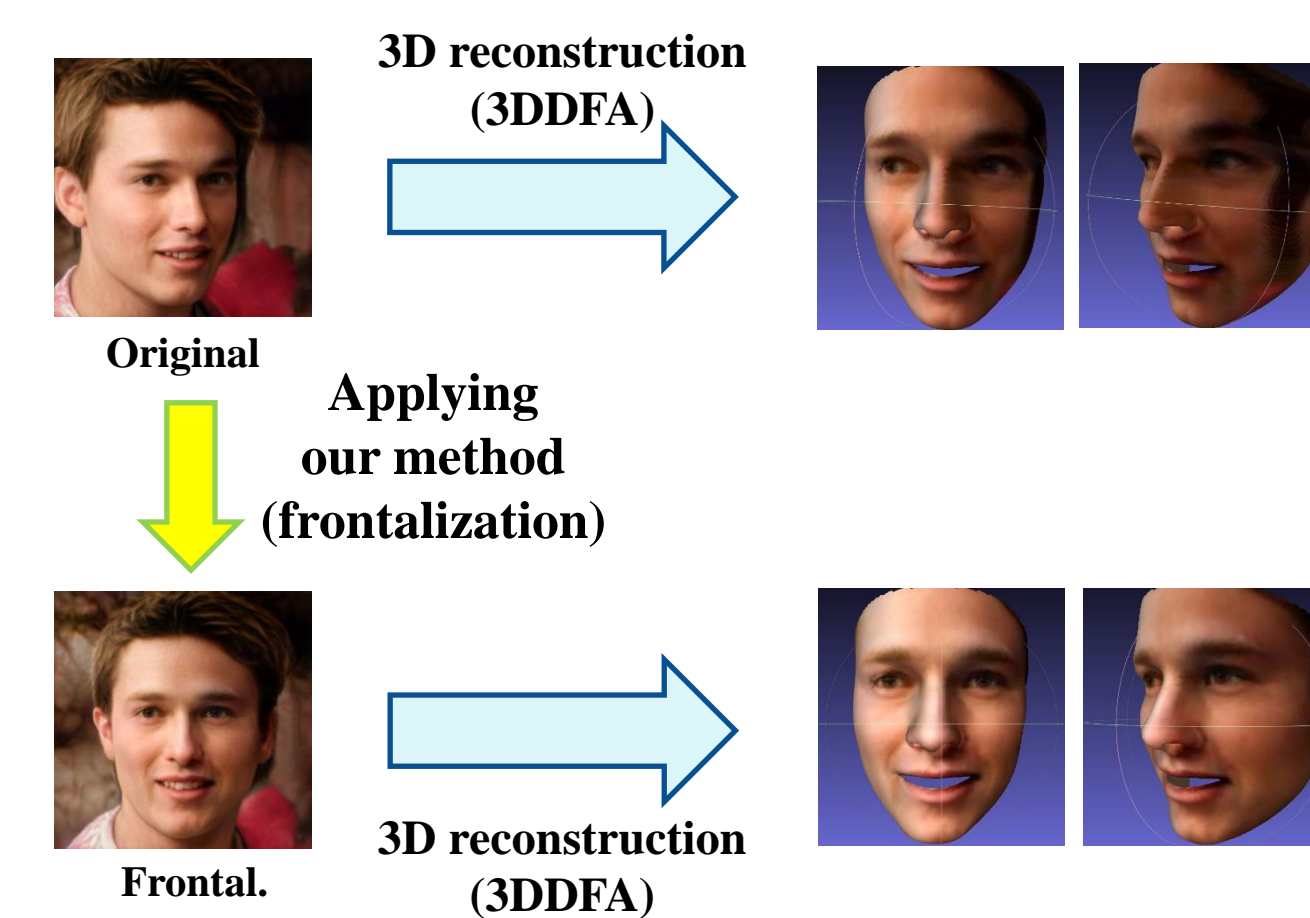
Conclusion

- In this paper, we have successfully demonstrated our novel **mapping network** for **frontalization** in **StyleGAN's latent space** instead of in pixel space.
- Our method is compatible with a number of **StyleGAN-based techniques**, thus it enables users to **stylize** or **edit** the frontalized image.

Future Work

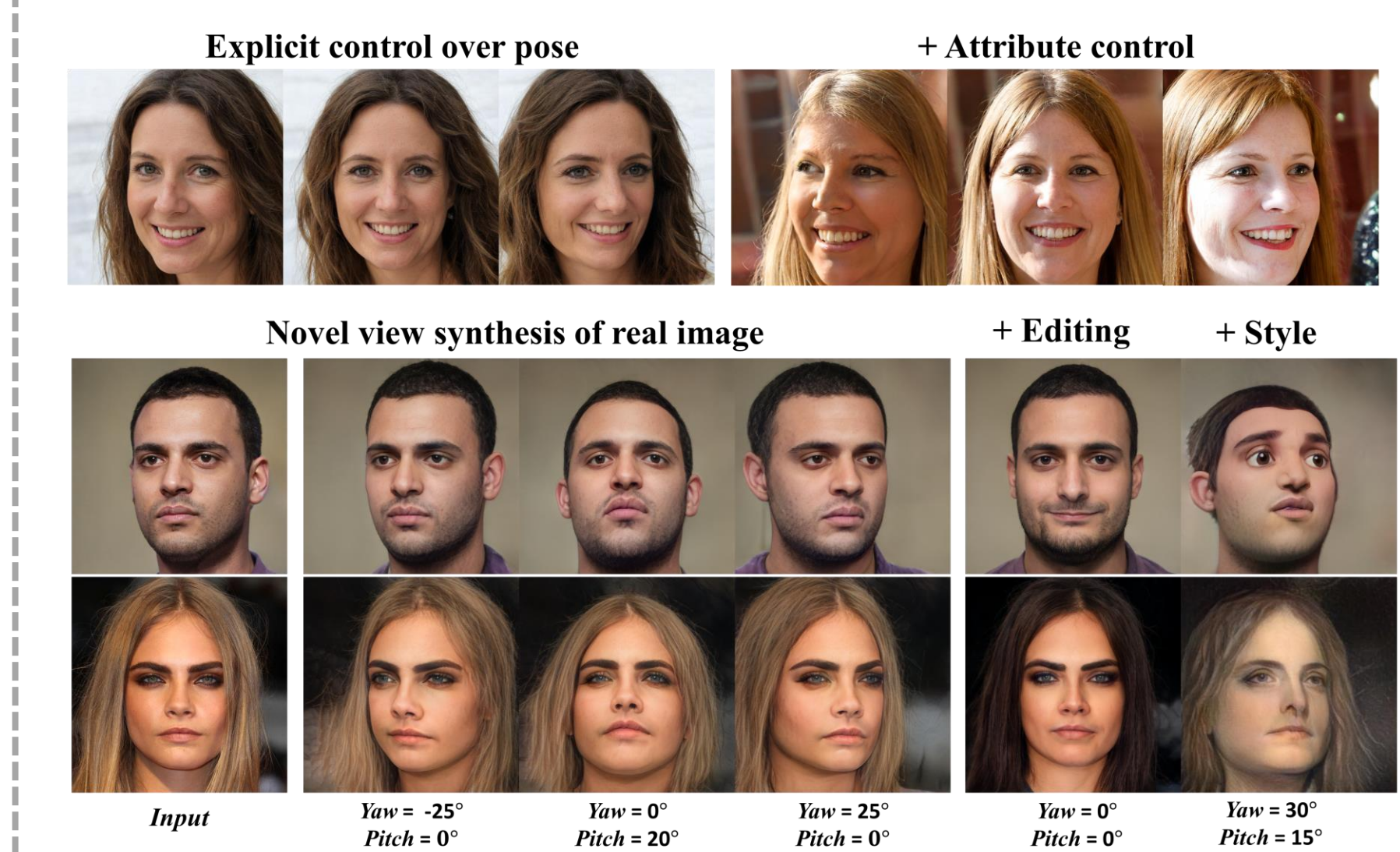
• Monocular 3D face reconstruction

Our model can provide canonical information to monocular 3D reconstruction models.



[4] Guo et al., "Towards Fast, Accurate and Stable 3D Dense Face Alignment", ECCV 2020

• 3D-controllable StyleGAN



[5] Kwak et al., "Injecting 3D Perception of Controllable NeRF-GAN into StyleGAN for Editable Portrait Image Synthesis", 2022, Under review