



Live Demo



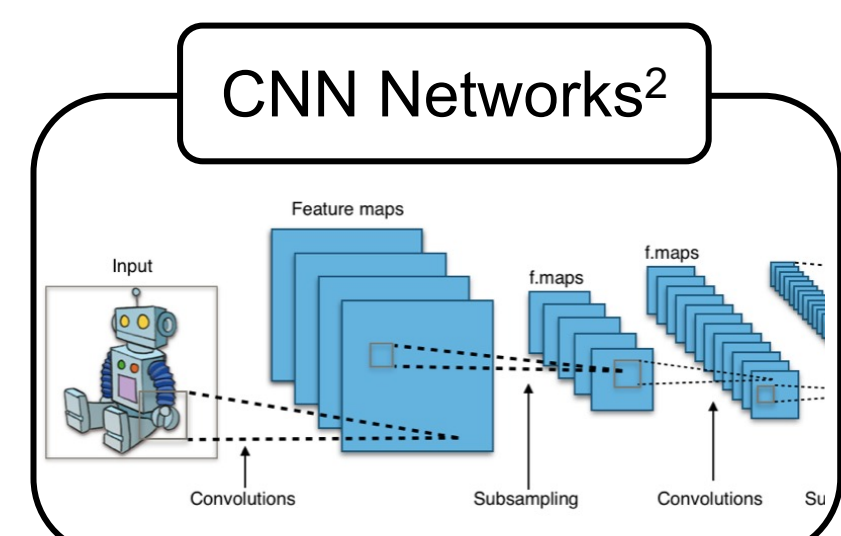
GEM Avatars



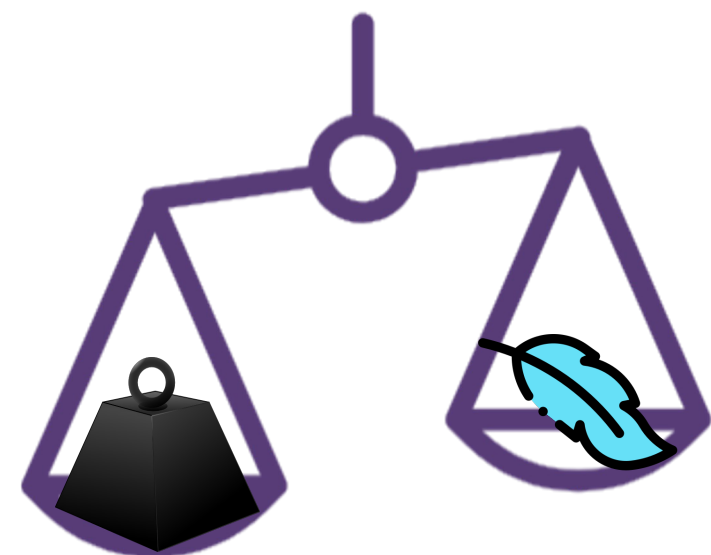
GEM: Gaussian Eigen Models for Human Heads

Wojciech Zielonka, Timo Bolkart, Thabo Beeler, Justus Thies

Motivation

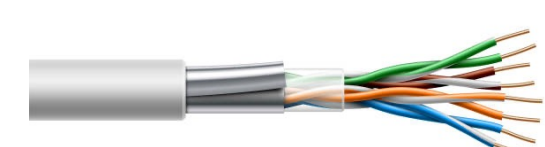


CNN Networks²



Challenges

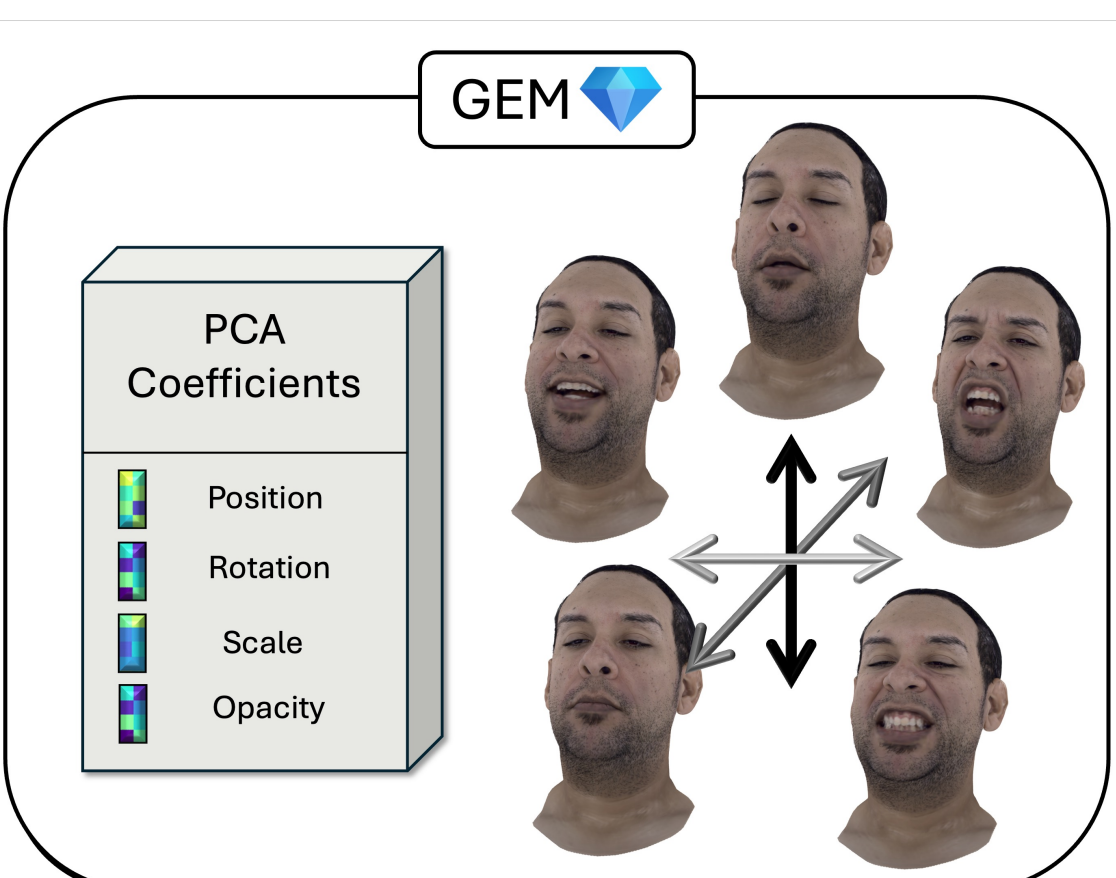
Neural head avatars trade off detail for efficiency: lightweight models lack realism, while high-quality ones are too resource-intensive for commodity devices like VR glasses.



Solution



To address this gap, we introduce Gaussian Eigen Models, a compact, single-layer representation distilled from high-quality CNNs, enabling fast face synthesis via simple dot products.

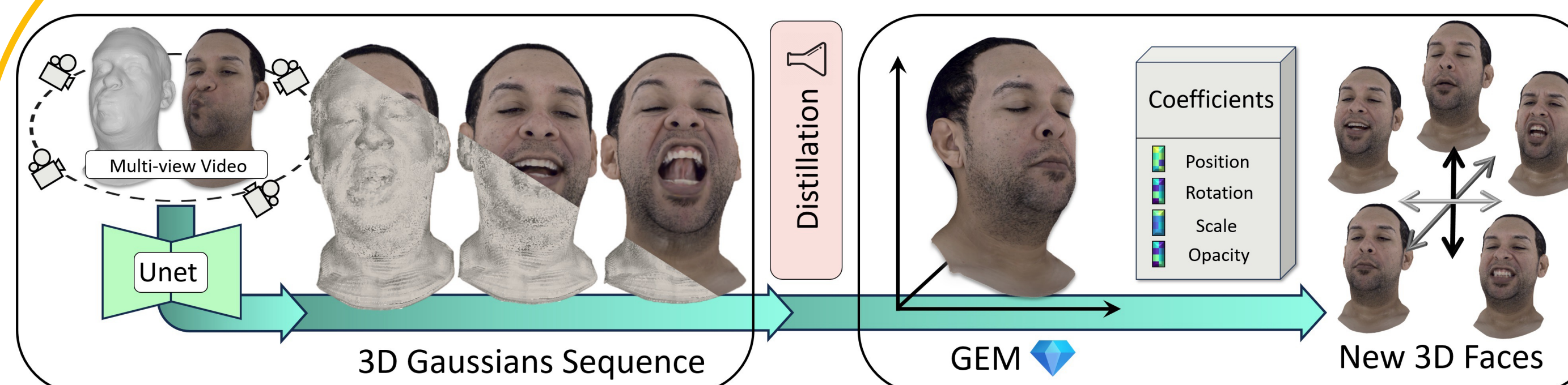


GEM



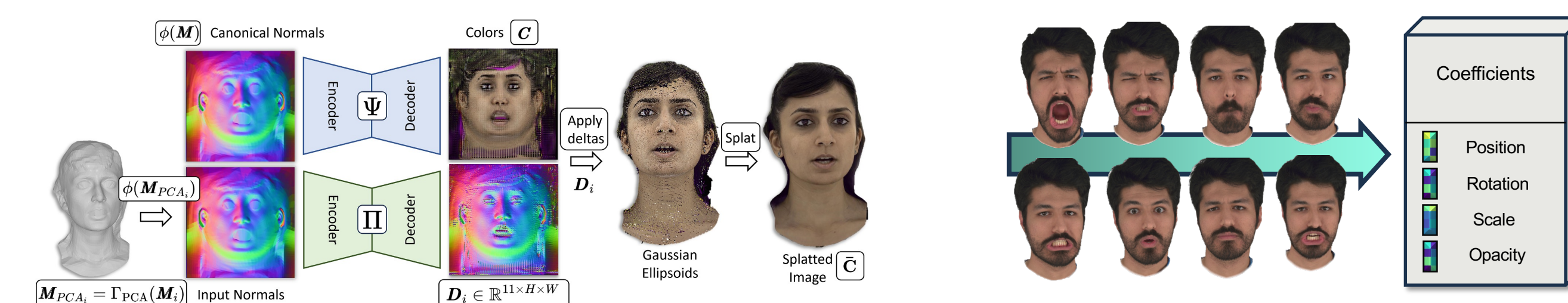
GEM Avatars

Method



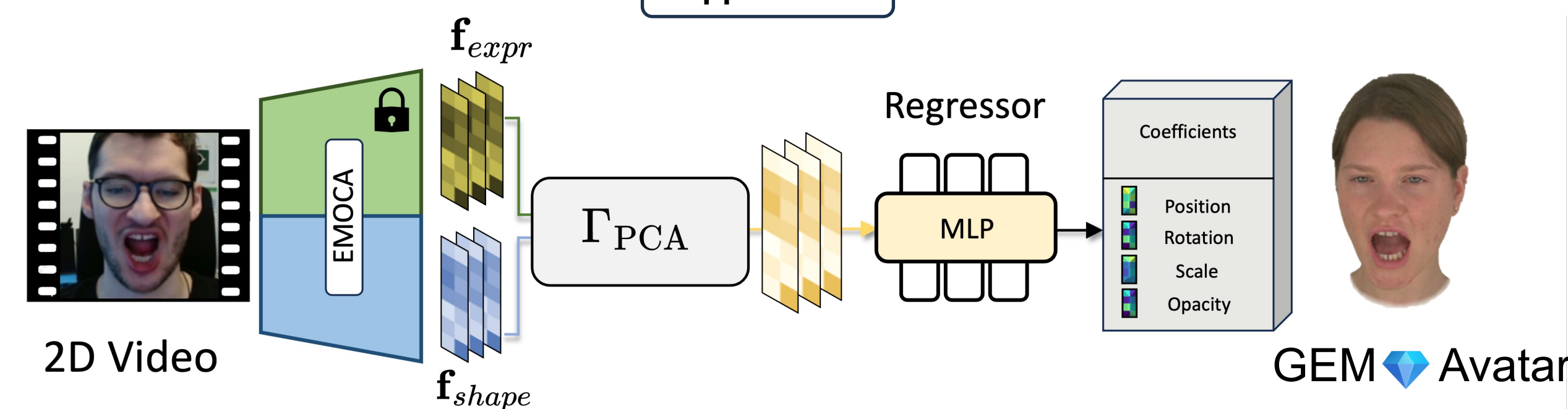
Stage 1

Stage 2



Based on our Gaussian regressor (Stage 1), we synthesize a dataset that is distilled into GEM (Stage 2).

Application



As an application of GEM, we show that the coefficients can be regressed from a single image, enabling real-time facial animation and cross-reenactment.

Results



Ground Truth

Ours GEM

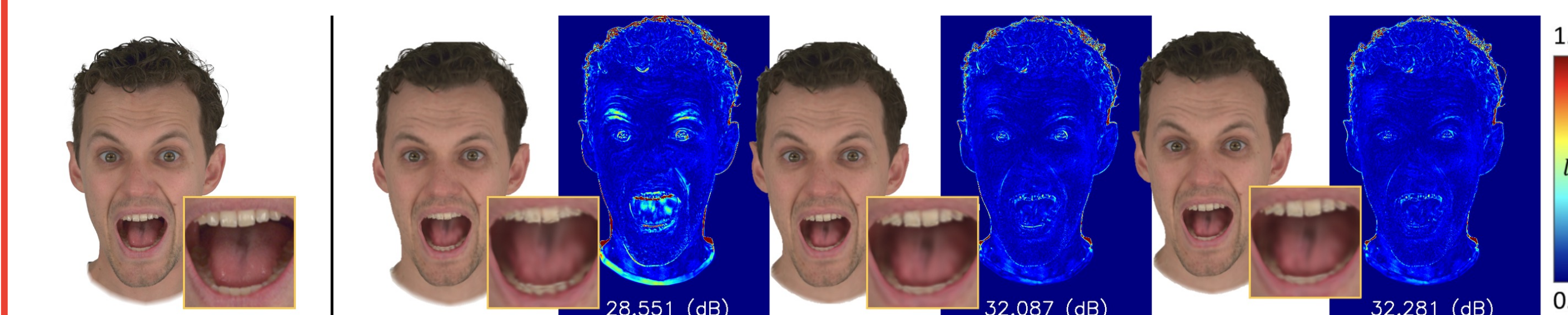
Ours Net

AG²

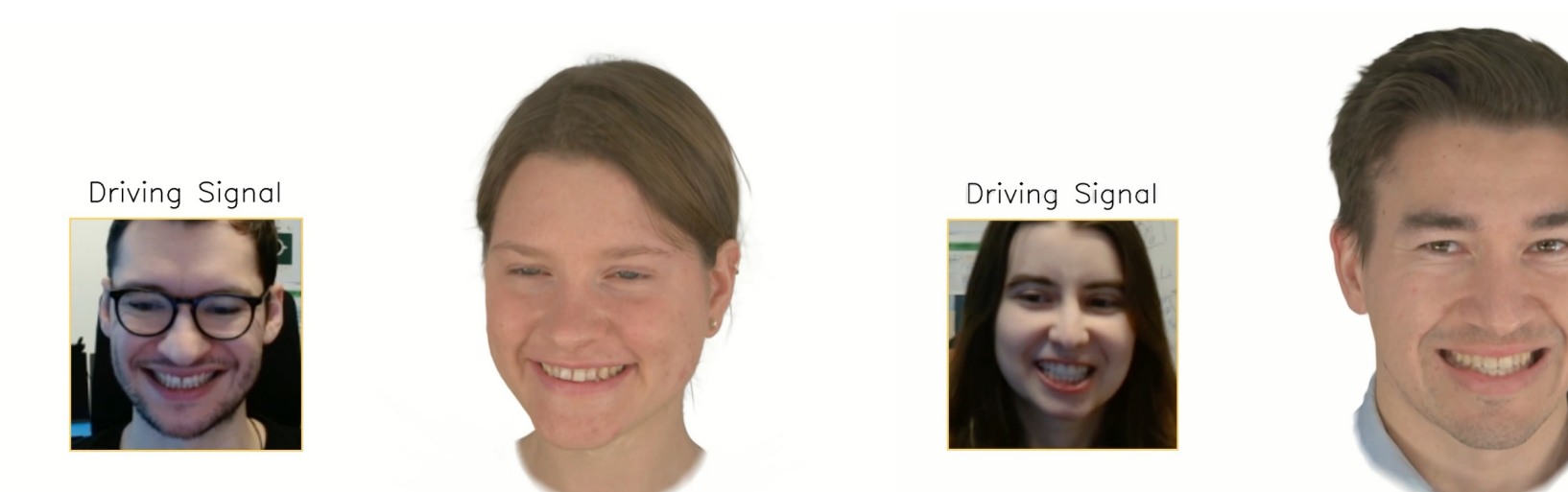
GA³

INSTA⁴

Both our CNN and GEM perform better on novel views, especially around the mouth and wrinkles.



Compression error depending on the number of used principal components in GEM.



One of the applications of our GEM is real-time (cross)-reenactment by utilizing image-based regressor.

1) Kerbl *et al.* 3D Gaussian Splatting for Real-Time Radiance Field Rendering

2) Li *et al.* Animatable Gaussians: Learning Pose-dependent Gaussian Maps for High-fidelity Human Avatar Modeling
3) Qian *et al.* GaussianAvatars: Photorealistic Head Avatars with Rigged 3D Gaussians
4) Zielonka *et al.* Instant Volumetric Head Avatars