



MaterialGAN: Reflectance Capture using a Generative SVBRDF Model

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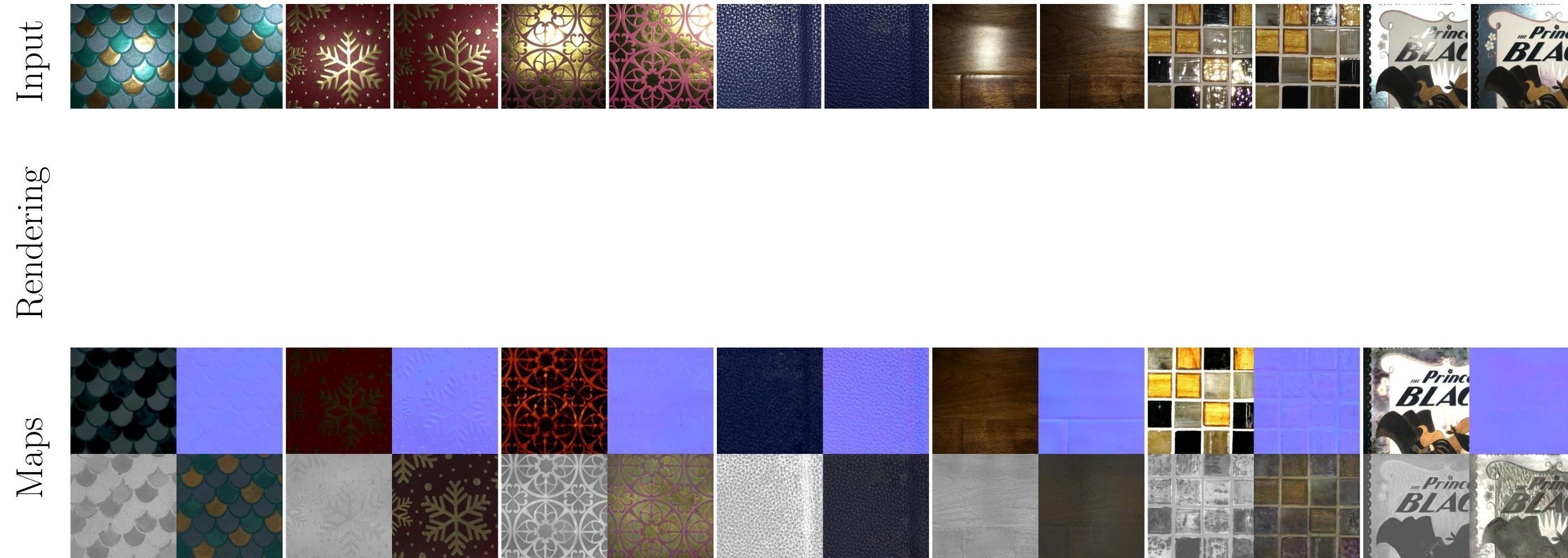


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ACM Transactions on Graphics (SIGGRAPH Asia 2020), 39(6), 2020

Introduction

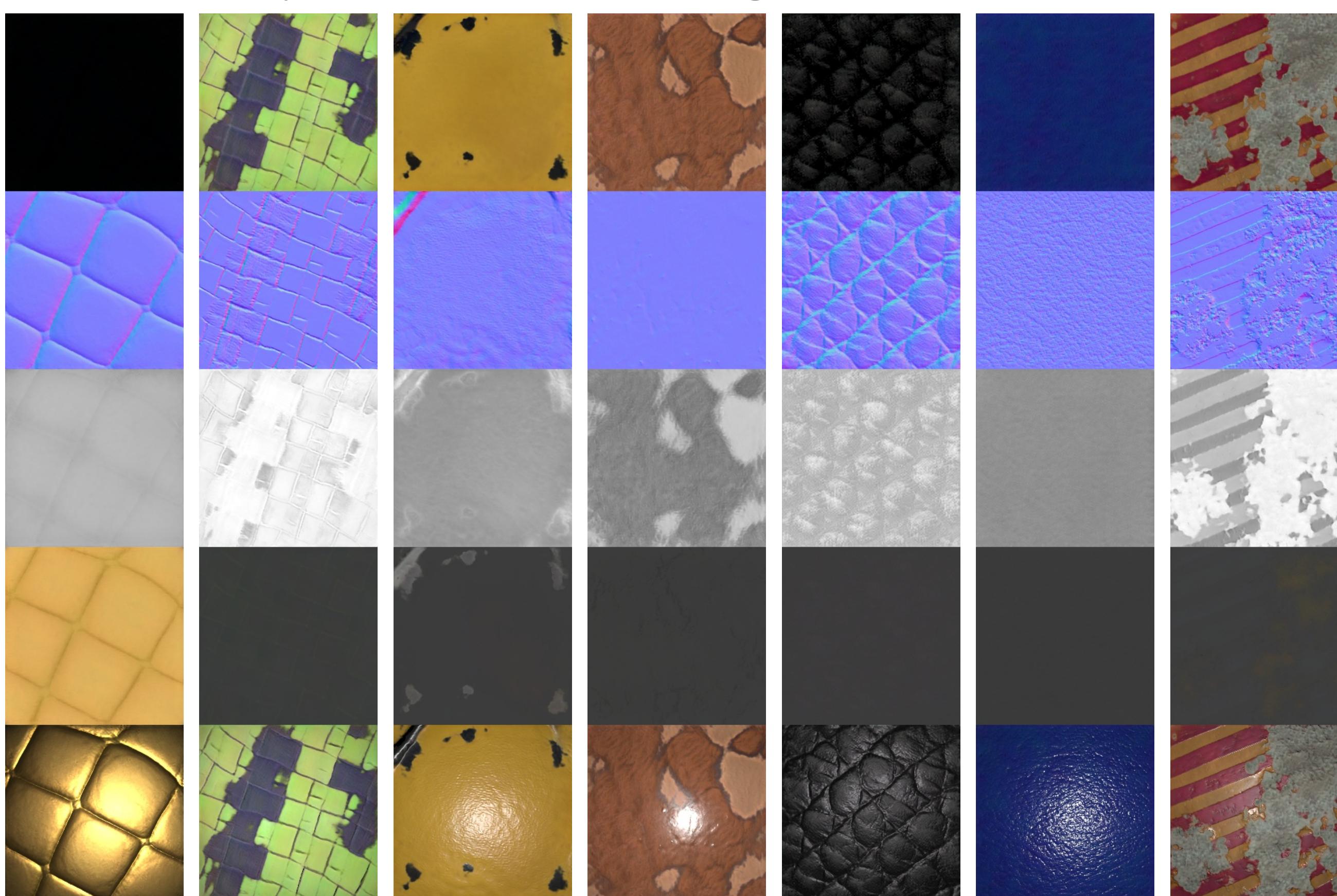


We introduce a method to capture SVBRDF material maps from a small number of mobile flash photographs, achieving high quality results both on original and novel views. Our key innovation is optimization in the latent space of MaterialGAN, a generative model trained to produce plausible material maps; MaterialGAN thus serves as a powerful implicit prior for result realism. Here we show re-rendered views for several different materials under environment illumination. We use 7 inputs for these results (with 2 of them shown). (Please use Adobe Acrobat and click the renderings to see them animated.)

MaterialGAN

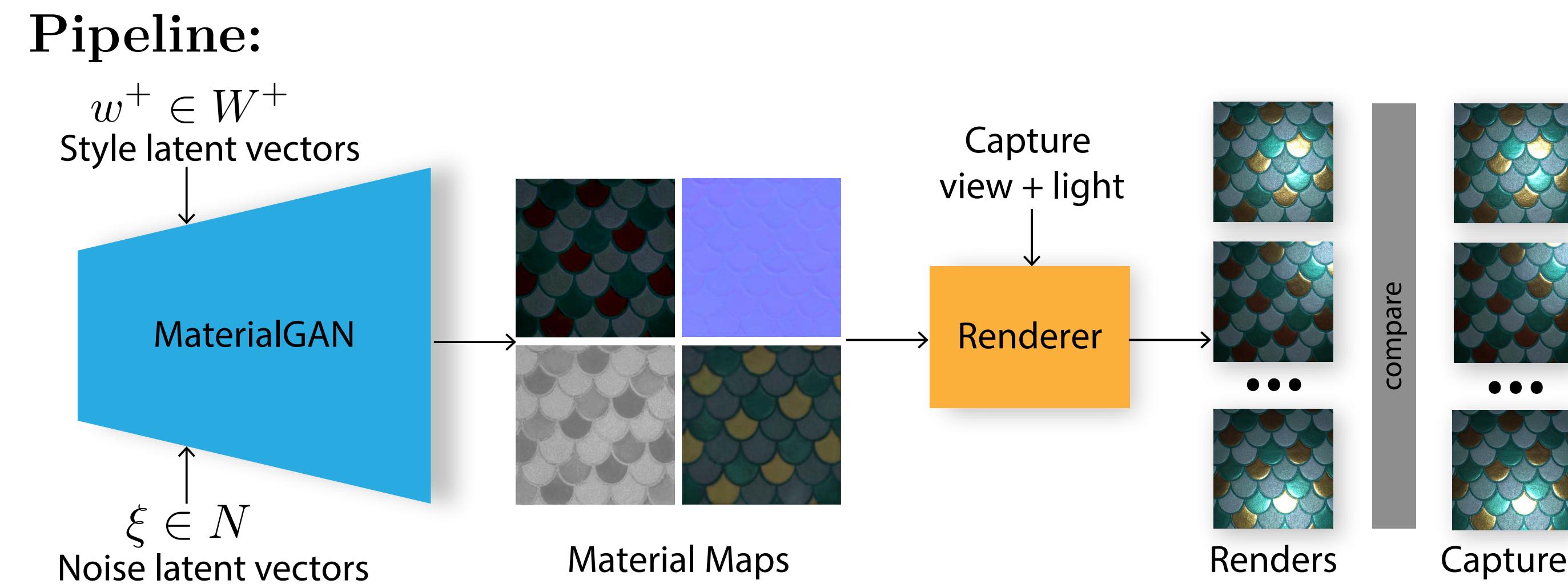
A GAN that is trained to generate plausible materials, thus implicitly learning an SVBRDF manifold. MaterialGAN is based on the architecture of StyleGAN2 [1].

The capability of MaterialGAN generator:



The material maps generated by randomly sampling MaterialGAN are high-quality with meaningful correlations both spatially and across materials parameters, and visually look like plausible real-world materials.

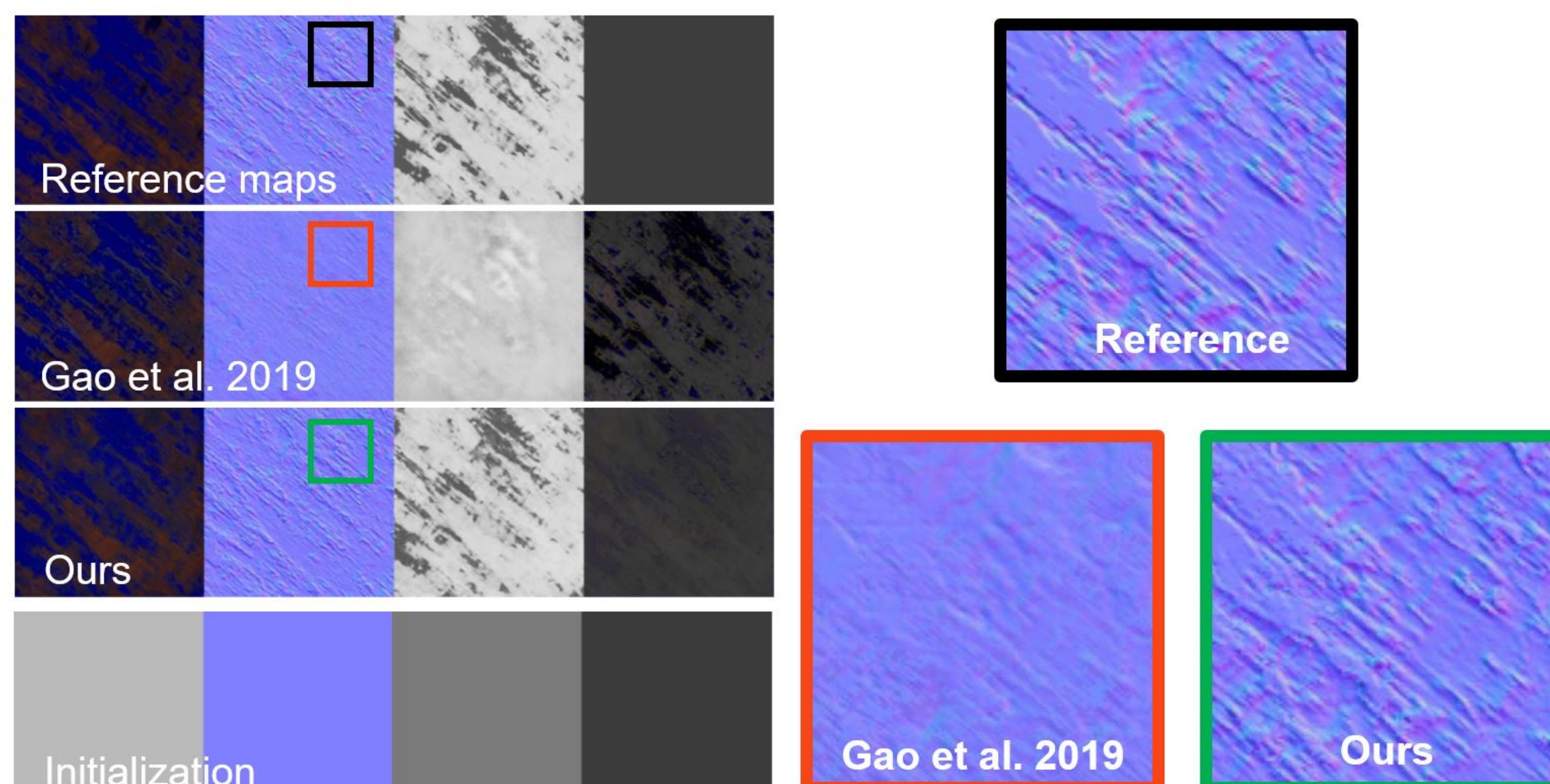
Inverse rendering



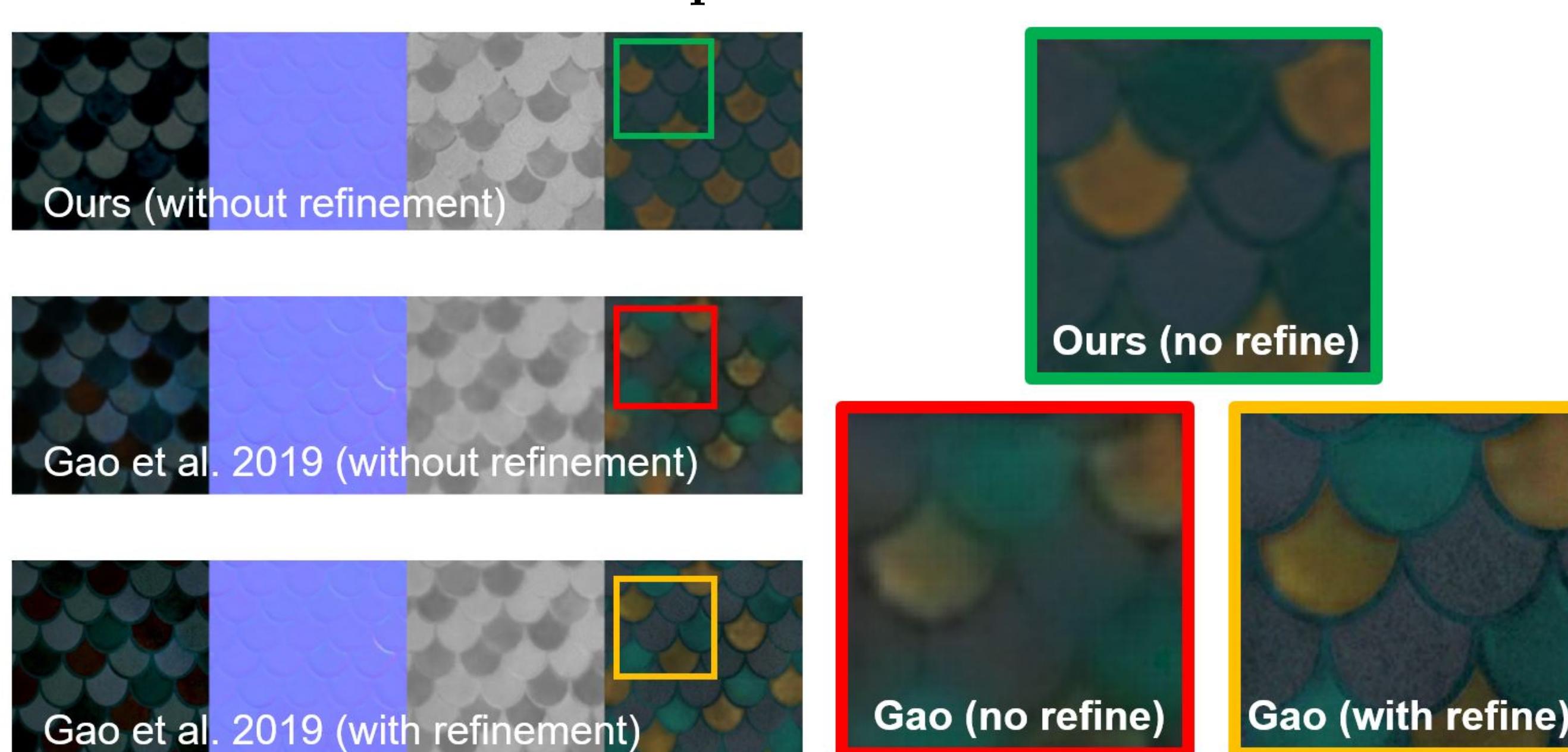
We optimize for latent vectors w^+ and ξ , that feed into the layers of the StyleGAN2-based MaterialGAN model. The MaterialGAN generator produces material maps (diffuse albedo, normal, roughness and specular albedo), that are rendered under the captured view/light settings. Finally, the renderings and measurements are compared using a combination of L2 and perceptual losses.

Comparison

Ours is less sensitive to initialization:



Post-refinement is less important in ours method:



Results

Large features:



Small features:



High specularity:



(Please see more results from our paper and supplemental materials.)

References

- [1] Tero Karras, Samuli Laine, Miika Aittala, Janne Hellsten, Jaakko Lehtinen, and Timo Aila. Analyzing and improving the image quality of stylegan. In *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition*, pages 8110–8119, 2020.
- [2] Duan Gao, Xiao Li, Yue Dong, Pieter Peers, Kun Xu, and Xin Tong. Deep inverse rendering for high-resolution svbrdf estimation from an arbitrary number of images. *ACM Transactions on Graphics (TOG)*, 38(4):1–15, 2019.