KI DELTA LEARNING
Scalable AI for Automated Driving

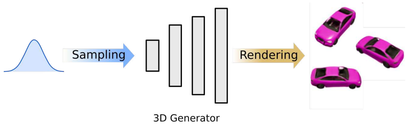
3D-Aware Image Synthesis with Generative Radiance Fields

Katja Schwarz, Axel Sauer, Michael Niemeyer, Yiyi Liao, Andreas Geiger

Semi- and Unsupervised Learning

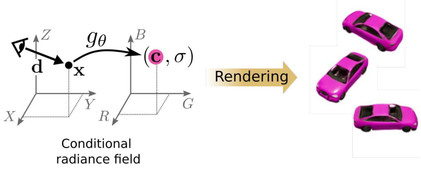
Task

While 2D generative neural networks enabled high-resolution image synthesis, they largely lack an understanding of the 3D world and the image formation process. To address this problem, 3D-aware generative adversarial networks combine 3D generators, differentiable rendering and adversarial training to **synthesize novel images with explicit control over the camera pose** and, potentially, other scene properties like object shape and appearance.

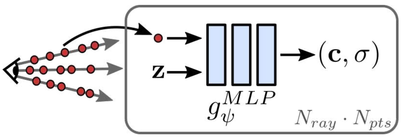


Can we learn a 3D-aware generative model **from 2D images only**?

Generative Radiance Fields (GRAF)



- 3D consistency
- Constant memory footprint
- Unposed 2D supervision

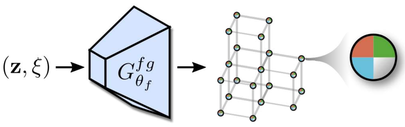


GRAF achieves high. multi-view consistency at image resolutions up to 256^2 pixels.

But: querying an MLP for every sample along each ray leads to **slow rendering**

VoxGRAF

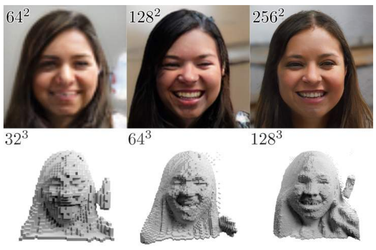
Motivated by recent results in voxel-based novel view synthesis, we investigate the utility of **sparse voxel grid representations** for **fast and 3D-consistent** generative modeling.



- 3D consistency
- Efficient rendering
- High-resolution geometry

Our method only requires **a single forward pass to generate a full 3D scene** which allows for efficient rendering from arbitrary viewpoints.

Progressive Growing



Results

	$R_I = 128^2$	$R_I = 256^2$
GIRAFFE [33]	–	5
StyleNeRF [11]	–	49
EG3D* [4]	–	27
GRAF [42]	219	878
π-GAN [5]	154	608
GOF [47]	199	742
GRAM [7]	136	418
VoxGRAF	58 + 3	58 + 6

Rendering times in ms per image.
VoxGRAF allows for separating scene generation (first number) and rendering (second number).

Partners

External partners

For more information contact:
katja.schwarz@uni-tuebingen.de
a.geiger@uni-tuebingen.de

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