

Different simulations of the same frame

What is it?

Reconstruction from sensor data. Typically 360° camera and lidar. **Goal:** Render novel views.

Why?

Scalable simulation of sensor data. Every selected sequence of data creates countless scenarios. **Low-cost exploration.** Shorter development cycles. Reduced need of physical testing.

NeuRAD: Neural Rendering for	SplatAD: Real-Time Lidar and Camera Rendering with 3D Gaussian Splatting for		
Autonomous Driving	Autonomous Driving		
TL;DR NeRF-based method tailored to AD data. Sensor modeling of both camera and lidar.	TL;DR 3DGS-based method for efficient image and lidar rendering.	 ★ Sensor modeling using 3D Gaussians. ★ More efficient than previous methods. ★ CUDA-accelerated sensor-specific rendering. 	More results

- ★ Rendering lidar and 360° camera rigs.
- \star Modeling key sensor characteristics.
- ★ Robustness across multiple popular AD datasets.

Core ideas

Rolling shutter: Modeling rolling shutter for both camera and lidar to account for a fast moving sensor rig.



Camera-specific embeddings: Accounting for appearance variations between different cameras.



Modeling ray dropping: Rays can travel far without hitting a surface, or hit a surface but bounce off.



Core ideas

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Faster rendering, better results: Adopting effective rendering techniques to AD data.



Rolling shutter: Approximates the effects directly in 2D image space.



Unified representation, purpose-built rendering: A shared set of 3D Gaussians are projected, tiled, and rasterized with sensor-specific operation.



More results

Are NeRFs ready for autonomous driving? Towards closing the real-to-simulation gap

TL;DR

Study of the real-to-sim gap, and methods for addressing it.



- ★ Methods for addressing it.
- ★ Techniques for data augmentation.

More results



When can we trust the simulation? Need to ensure that behaviour in sim = behaviour in real world.



Biases in real data: Evaluating with simulated data of rare scenarios can help highlight learned biases.



Predictions from network trained on online mapping