Scene Rendering for Autonomous Driving

The growing complexity of autonomous driving systems demands advanced simulation techniques that can accurately recreate real-world environments and edge-case scenarios. Neural rendering and Gaussian Splatting offer transformative potential by generating realistic sensor data, such as camera images and LiDAR point clouds, to enhance the testing and training of autonomous vehicles. Potential application areas include a) simulating safety-critical scenarios like sudden braking or lane merging in closed-loop systems, b) modelling sensor-specific phenomena such as rolling shutter, beam divergence, and ray dropping, significantly reducing the real-to-simulation gap and c) creating scalable data augmentation pipelines to strengthen model robustness.

We are seeking a talented Master's student to explore the transformative potential of Neural Rendering and Gaussian Splatting in advancing autonomous driving technologies. Your tasks will include (but not be limited to):

- Conducting literature survey and on methods for scene representation and rendering for autonomous driving scenarios.
- Benchmarking existing methods on available open datasets.
- Finding and addressing gaps in existing methodologies.
- Document findings in form of reports and presentations.

Requirements:

- Studying M.Sc. in Machine Learning, Systems Controls & Robotics, Computer Science, Engineering Physics or similar programs.
- Experience with machine learning frameworks eg. PyTorch
- Familiarity with Python and version control (eg. Git).
- Interest in 3D rendering, image analysis or computer vision.
- Interest in publishing or writing a research paper for computer vision conferences.

Excellent students might also be considered for a summer internship at Autonomous Transport Solutions Lab at Scania AB where we are trying to implement solutions for data collected on autonomous truck platforms.

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Reference:

[1] Tonderski, A., Lindström, C., Hess, G., Ljungbergh, W., Svensson, L., & Petersson, C. (2024). Neurad: Neural rendering for autonomous driving. In *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition* (pp. 14895-14904).