3-year PhD position at Inria+Valeo.ai

Conditioned 3D scene generation

Work context

A 3-year PhD position (Cifre) is open in Astra-vision, the computer vision group of ASTRA, a newly-created joint Valeo+Inria research team on **autonomous and safe driving**. More precisely, the research will take place in the context of a collaboration between valeo.ai, an international team conducting AI research for Valeo automotive applications, in the Astra-vision group that focuses on **Vision and 3D Perception for Scene Understanding**. The PhD student will be colocated in the two institutes, that are both located in central Paris.

Topic

3D generation has significantly improved with dominant lines of research being GAN-based architectures (Tang et al., 2022; Chan et al., 2022), NERFs (Mildenhall et al., 2021) or Diffusion models (Luo et al., 2021). However, the generation process still lacks interpretability and controllability for practical applications. Besides, existing work mostly focuses on single objects, as opposed to complex scenes (Rematas et al., 2022).

In this PhD thesis, we wish to investigate how to condition the generation of 3D data, like textured meshes or point clouds, in an editable manner, for autonomous driving applications. The PhD student will have to make research contributions along some of the following directions:

- How to constrain generated 3D scenes ?
- How to generate editable representations ?
- What makes a 3D scene realistic for driving scenarios ?

Aside from close interactions with the supervisors both at Inria and valeo.ai, the PhD student is expected to actively participate in group readings, seminars, discussions, team spirit, etc.

Profile

Applicants should have defended or be finishing their MSc. They should have a solid background in computer vision (including 3D processing) and machine learning, particularly in deep learning, with strong PyTorch coding skills.

Applying

Candidates should send a mail to renaud.marlet@valeo.com, patrick.perez@valeo.com, raoul.de-charette@inria.fr with:

- a cover letter explaining their interest and adequacy for the thesis topic,
- their CV/resume,
- a transcript of grades from their MSc,
- ideally, a few references or recommendation letters.

Applications will be processed as they come in. Expected starting date is spring 2023, but work could start earlier..

(Just a few) References

(Chan et al., 2022) Eric R. Chan, Connor Z. Lin, Matthew A. Chan, Koki Nagano, Boxiao Pan, Shalini De Mello, Orazio Gallo, Leonidas Guibas, Jonathan Tremblay, Sameh Khamis, Tero Karras, Gordon Wetzstein (2022).

Efficient Geometry-aware 3D Generative Adversarial Networks. In IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR).

(Luo et al., 2021) Luo, S., & Hu, W. (2021). Diffusion probabilistic models for 3d point cloud generation. In IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR), pp. 2837-2845.

(Mildenhall et al., 2021) Mildenhall, B., Srinivasan, P. P., Tancik, M., Barron, J. T., Ramamoorthi, R., & Ng, R. (2021). NeRF: Representing scenes as neural radiance fields for view synthesis. Communications of the ACM (CACM), 65(1), 99-106.

(Rematas et al., 2022) Konstantinos Rematas, Andrew Liu, Pratul P. Srinivasan, Jonathan T. Barron, Andrea Tagliasacchi, Thomas Funkhouser, Vittorio Ferrari (2022). Urban Radiance Fields. In IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR).

(Tang et al., 2022) Tang, Y., Qian, Y., Zhang, Q., Zeng, Y., Hou, J., & Zhe, X. (2022). WarpingGAN: Warping Multiple Uniform Priors for Adversarial 3D Point Cloud Generation. In IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR), pp. 6397-6405.