ISPRS Technical Commission II <Photogrammetry> Online Talks.

# Efficient 3D Deep Learning

Feb/26/2024 (Mon) 10:00-11:00 AM (EST)

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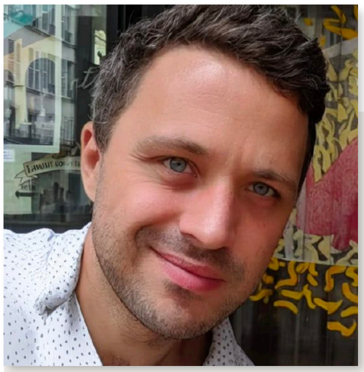

## Loic Landrieu

Loic Landrieu is a senior researcher at IMAGINE-LIGM (ENPC) and an associate researcher at IGN (UGE). His research primarily centers on machine learning for large-scale geospatial data, such as 3D and time series analysis. Loic has contributed in both the computer vision/machine learning domain, with 8 papers in conferences like ICML, CVPR, ICCV, and ECCV, and in the remote sensing community.

He is an ELLIS member and currently holds positions as co-chair of the ISPRS working group on Temporal Geospatial Data Understanding and as co-lead of the IEEE GRSS working group on Image and Signal Processing. Additionally, Loic has co-organized the EarthVision CVPR Workshop from 2021 to 2023 and was co-program chair for the XXIVth ISPRS congress, which published 750 papers.

Loic is the principal investigator of the ReADy3D ANR project focused on real-time 3D analysis. He is also a member of the Editorial Board for the ISPRS Journal and Remote Sensing. His reviewing contributions have been acknowledged as an outstanding reviewer for ICML (2021), ECCV (2022), CVPR (2022), and ISPRS Journal (2021, 2022).


## Abstract of the talk

Recent advancements in 3D deep learning have drastically increased the performance of automated 3D analysis, but also the size and requirement of models. These approaches suffer from long training times, substantial hardware requirements, and impractical runtimes for autonomous driving and mobile mapping applications. In this talk, we introduce two methods that leverage the unique structure of large 3D point clouds to improve efficiency and performance.

Our first superpoint-based strategy achieves state-of-the-art performance for 3D semantic segmentation with over 200 times fewer parameters than the best-performing networks. Our models can be trained in under 3h on low-level GPUs and perform 3D semantic and panoptic segmentation at an unprecedented scale: entire buildings or city blocks can be processed at once.

We also present a novel approach to processing 3D LiDAR data streams in real time. By exploiting the complex acquisition geometry of rotating sensors, our model achieves results comparable to models over 50 times larger. With a run time accelerated by over 5-fold, our method is the first real-time and high-precision model for mobile platforms.