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IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing

Special Issue on “Towards Deep Learning-based Reconstruction and Interpretation of Real-World Scenes from LiDAR Point Clouds”

Reconstruction of real-world scenes from point clouds acquired by airborne and ground-based Light Detection and Ranging (LiDAR) sensors has been widely studied in the past few decades. Despite two decades of research, 3D reconstruction is still far from being satisfactory, and calls for further investigations. In recent years, deep learning (DL) algorithms have proven to be successful in many research areas, e.g., image-based classification, semantic segmentation, and shape recognition. While DL has dramatically affected many domains, most DL frameworks are designed for organized data and thus not directly applicable to irregular and discrete LiDAR point clouds, which obstructs the progress of applying DL to LiDAR data processing. However, with the introduction of novel DL frameworks, such as PointCNN, PointNet, PointSIFT, and VoxelNet, computer vision and remote sensing communities have started to explore deep learning on unorganized point clouds. In addition, one can find many DL architectures for 3D object detection in the context of autonomous driving, e.g., PointPillars, STAR-net or PointGCN. However, due to a lack of available training data or benchmark repositories, scant attention has been given to deep learning for 3D reconstruction from LiDAR point clouds. As of now, point cloud processing using DL has only limited datasets designed specifically for semantic segmentation, e.g., Semantic3D, and object recognition, e.g., KITTI vision benchmark. This special issue focuses on consolidating the recent advancements in DL based 3D reconstruction from LiDAR, and promoting open-source projects and datasets for LiDAR data processing.

The broad topics include (but are not limited to):

- Satellite-based (e.g., ICESat-2) and airborne LiDAR point clouds for urban and forest reconstruction.
- Airborne and Ground-based LiDAR (e.g., Terrestrial, Mobile, and Wearable SLAM systems) point clouds for the reconstruction of real-world scenes.
- DL frameworks for point clouds processing including registration, denoising, radiometric calibration, ground filtering, classification, object detection, semantic segmentation, and instance-level segmentation.
- DL frameworks for geometric primitive abstraction/representation, e.g., point consolidation, line delineation, plane segmentation and interpretations.
- DL frameworks for generating 2D semantic maps, e.g., driving lanes, road networks, and building footprints from LiDAR point clouds.
- DL frameworks for 2D and 3D forest mapping, monitoring, and management, e.g., individual tree detection, tree species classification, estimation of canopy closure, wood volumes and biomass.
- Other LiDAR-based applications using DL frameworks, such as heritage documentation, change detection, high-definition map generation, and autonomous driving.

Schedule

March 1, 2021 Submission system opening
August 30, 2021 Submission system closing

Format

All submissions will be peer reviewed according to the IEEE Geoscience and Remote Sensing Society guidelines. Submitted articles should not have been published or be under review elsewhere. Submit your manuscript on <http://mc.manuscriptcentral.com/jstars>, using the Manuscript Central interface and select the “Towards Deep Learning-based Reconstruction and Interpretation of Real-World Scenes from LiDAR Point Clouds” special issue manuscript type. Prospective authors should consult the site <https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=9082768> for guidelines and information on paper submission. All submissions must be formatted using the IEEE standard format (double column, single spaced). Please visit http://www.ieee.org/publications_standards/publications/authors/author_templates.html to download a template for transactions. Please note that as of Jan. 1, 2020, IEEE J-STARS has become a fully open-access journal charging a flat publication fee \$1,250 per paper.

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