DENING LU

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RESEARCH SUMMARY

My research concentrates on **large-scale LiDAR data processing and analysis** to advance geospatial analytics in remote sensing. By integrating techniques from **Computer Vision, Computer Graphics, and LiDAR Remote Sensing**, I aim to enhance model accuracy and scalability for LiDAR point cloud classification and segmentation. This interdisciplinary work not only addresses the technical challenges of managing massive LiDAR point clouds, but also contributes to broader applications in environmental monitoring, urban planning, and infrastructure development. Through these efforts, my overarching goal is to bridge technological innovation with real-world impact, driving forward the frontiers of LiDAR remote sensing.

RESEARCH INTERESTS

3D Laser Scanning, Point Cloud Processing, Deep Learning, LiDAR Remote Sensing

EDUCATION

University of Waterloo, Canada *Sep. 2021 – Mar. 2025*
Ph.D. in the Department of Systems Design Engineering, Geospatial Intelligence and Mapping (GIM) Lab

- **Supervisors:** Prof. Jonathan Li & Prof. Lincoln (Linlin) Xu
- **Major courses:** Advanced Image Processing, Remote Sensing, Pattern Recognition

Nanjing University of Aeronautics and Astronautics, P.R. China *Sep. 2018 – Jun. 2021*
M.S. in the Department of Mechanical & Electrical Engineering

- **Supervisors:** Prof. Jun Wang & Prof. Mingqiang Wei
- **Major courses:** Matrix Theory, Digital Geometry Processing, Computer Vision

Nanjing University of Aeronautics and Astronautics, P.R. China *Sep. 2014 – Jun. 2018*
B.S. in the Department of Mechanical & Electrical Engineering

- **Major courses:** Advanced Mathematics, Linear Algebra, Probability Theory, Fundamentals of Mechanical Manufacturing

PUBLICATIONS

As of Feb. 26, 2025: total citations 872, h-index 13, i10-index 15.
17 published journal articles and 3 under-review journal articles, including 9 first-author and 7 second-author works.

- **1** first-author article in *IEEE Transactions on Intelligent Transportation Systems* (SJR Q1, IF = 7.9)
- **3** first-author articles in *International Journal of Applied Earth Observation and Geoinformation* (SJR Q1, IF = 7.6)

- **3** first-author articles in *IEEE Transactions on Geoscience and Remote Sensing* (SJR Q1, IF = 7.5)
- **1** first-author article in *Expert Systems with Applications* (SJR Q1, IF = 7.5)
- **1** first-author article in *Computer-Aided Design* (SJR Q2, IF = 5.5)

Below is a selection of my publications, including first-author and selected second-author articles. My authorship position is highlighted in **bold**.

1. **Lu, Dening**, et al. 3D-UMamba: 3D U-Net with state space model for semantic segmentation of multi-source LiDAR point clouds. *International Journal of Applied Earth Observation and Geoinformation* 136 (2025): 104401.
2. **Lu, Dening**, et al. Integrating deep transformer and temporal convolutional networks for SMEs revenue and employment growth prediction. *Expert Systems with Applications* 252 (2024): 124129.
3. **Lu, Dening**, et al. 3DGTN: 3D Dual-Attention GLocal Transformer Network for Point Cloud Classification and Segmentation. *IEEE Transactions on Geoscience and Remote Sensing* 62 (2024): 1–13.
4. **Lu, Dening**, et al. 3DCTN: 3D Convolution-Transformer Network for Point Cloud Classification. *IEEE Transactions on Intelligent Transportation Systems* 23.12 (2022): 24854–24865.
5. **Lu, Dening**, et al. Dynamic clustering transformer network for point cloud segmentation. *International Journal of Applied Earth Observation and Geoinformation* 128 (2024): 103791.
6. **Lu, Dening**, et al. Deep Feature-Preserving Normal Estimation for Point Cloud Filtering. *Computer-Aided Design* 125 (2020): 102860.
7. **Lu, Dening**, et al. 3D Learnable Supertoken Transformer for LiDAR Point Cloud Scene Segmentation. Under Revision, *International Journal of Applied Earth Observation and Geoinformation* (Submitted at Jan. 2025).
8. **Lu, Dening**, et al. Efficient Point Transformer with Dynamic Token Aggregating for Point Cloud Processing. Under Review, *Expert Systems with Applications* (Submitted at Mar. 2025).
9. **Lu, Dening**, et al. *Exploring Token Serialization for Mamba-based LiDAR Point Cloud Segmentation.* Under Review, *IEEE Transactions on Geoscience and Remote Sensing* (Submitted at Feb. 2025).
10. Gao, Kyle, **Lu, Dening**, et al. Enhanced 3D Urban Scene Reconstruction and Point Cloud Densification using Gaussian Splatting and Google Earth Imagery. *IEEE Transactions on Geoscience and Remote Sensing* (2025).
11. Wang, Lanying, **Lu, Dening**, et al. Individual tree species classification using low-density airborne multispectral LiDAR data via attribute-aware cross-branch transformer. *Remote Sensing of Environment* 315 (2024): 114456.

CONFERENCE ORAL PRESENTATIONS

- **Exploring State Space Models in LiDAR Point Cloud Processing for Vegetation Coverage Assessment.** ISPRS Geo-Spatial Week (GSW 2025), Dubai.
- **Tree Species Classification Using Deep Learning-Based 3D Point Cloud Transformer on Airborne LiDAR Data.** 2023 IEEE International Geoscience and Remote Sensing Symposium (IGARSS 2023), California, USA.
- **Deep Feature-Preserving Normal Estimation for Point Cloud Filtering.** Symposium on Solid and Physical Modeling (SPM 2020), Online.

RESEARCH PROJECTS

- **3D Mapping and Change Detection in Indoor Environments Using Multisource LiDAR Point Clouds**, NSERC Discovery Grants (RGPIN-2022-03741).

  Supervised by J. Li (PI) *Apr. 2022 – Mar. 2027*

- **AI to Improve IRAPs Performance Based on Portfolio**, NRC Industrial Research Assistance Program.

  Supervised by S. Schwartz (PI) *Mar. 2020 – Mar. 2023*

- **Explainable Artificial Intelligence (XAI) for IRAP Portfolio Predictions**, NRC Industrial Research Assistance Program.

  Supervised by S. Schwartz (PI) *Mar. 2023 – Mar. 2025*

SKILLS

- Subject expert in AI and LiDAR remote sensing, resulting in numerous publications
- Extensive experience with deep learning algorithms; proficient in TensorFlow and PyTorch
- Advanced programming skills in Python and C++
- Experienced in research project supervision
- Languages: Mandarin (native), English (fluent in speaking and writing)