Dayu Yu, Ph.D. Candidate

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Research Interests: GIS, 3D Reconstruction, High Performance Computing

Education

2023 – Current **Visiting Student**, National University of Singapore, Singapore.
Current Study: *The 3D Reconstruction and Lightweighting for Photo-Realistic Buildings*.

2020 – 2024 **Ph.D. Cartography and Geographic Information Engineering**, Wuhan University, China.
Dissertation: *Lightweight Generation and Service Methods for Photo-Realistic 3D Building Models.*

2017 – 2020 **M.Eng. Survey and Mapping Engineering**, Fuzhou University, China.
Thesis title: *Simulation and Analysis of Tailing Dam Failure Based on Virtual Geographic Environment*.

2013 – 2017 **B.Eng. Land Resource Management**, Henan Polytechnic University, China.

Research Publications

Manuscripts In Process

1. **D. Yu**, P. Yue, F. Biljecki, L. Lu, and B. Wu, *Towards an integrated approach for cloud-optimized 3d data management and service in spatial data infrastructure*, International Journal of Geographical Information Science, Status: Out For Review, 2024.
2. **D. Yu**, F. Biljecki, and P. Yue, *Rooformer: Reconstructing sophisticated 3d roof meshes from high-resolution remote sensing imagery using transformer*, Status: Under Preparation, 2024.
3. **D. Yu**, *Lightweighting of 3d geomesh with minimal visual discrepancy by combining differentiable rendering and self-supervised learning*, Status: Under Preparation, 2024.

Journal Articles

1. **D. Yu**, P. Yue*, F. Ye, D. Tapete, and Z. Liang, "Bidirectionally greedy framework for unsupervised 3d building extraction from airborne-based 3d meshes," *Automation in Construction*, vol. 152, p. 104 917, 2023, ISSN: 0926-5805. DOI: https://doi.org/10.1016/j.autcon.2023.104917.
2. **D. Yu**, L. Tang*, and C. Chen, "Three-dimensional numerical simulation of mud flow from a tailing dam failure across complex terrain," *Natural Hazards and Earth System Sciences*, vol. 20, no. 3, pp. 727–741, 2020. DOI: 10.5194/nhess-20-727-2020.
3. **D. Yu**, L. Tang*, F. Ye, and C. Chen, "A virtual geographic environment for dynamic simulation and analysis of tailings dam failure," *International Journal of Digital Earth*, vol. 14, no. 9, pp. 1194–1212, 2021. DOI: 10.1080/17538947.2021.1945151.
4. **D. Yu**, L. He*, F. Ye, L. Jiang, C. Zhang, Z. Fang, and Z. Liang, "Unsupervised ground filtering of airborne-based 3d meshes using a robust cloth simulation," *International Journal of Applied Earth Observation and Geoinformation*, vol. 111, p. 102 830, 2022, ISSN: 1569-8432. DOI: 10.1016/j.jag.2022.102830.
5. L. Qiu, D. Yu*, C. Zhang, and X. Zhang, "A local–global framework for semantic segmentation of multisource remote sensing images," *Remote Sensing*, vol. 15, no. 1, 2023. DOI: 10.3390/rs15010231.

6. L. Tang*, D. Yin, C. Chen, **D. Yu**, and W. Han, "Optimal design of plant canopy based on light interception: A case study with loquat," *Frontiers in Plant Science*, vol. 10, 2019. DOI: 10.3389/fpls.2019.00364.

7. M. Wang, D. Yu*, W. He, P. Yue*, and Z. Liang, "Domain-incremental learning for fire detection in space-air-ground integrated observation network," *International Journal of Applied Earth Observation and Geoinformation*, vol. 118, p. 103 279, 2023, ISSN: 1569-8432. DOI: https://doi.org/10.1016/j.jag.2023.103279.

8. L. Qiu, D. Yu*, X. Zhang, and C. Zhang, "Efficient remote-sensing segmentation with generative adversarial transformer," *IEEE Geoscience and Remote Sensing Letters*, vol. 21, pp. 1–5, 2024. DOI: 10.1109/LGRS.2023.3339636.

9. L. Qiu, D. Yu*, C. Zhang, and X. Zhang, "A semantics-geometry framework for road extraction from remote sensing images," *IEEE Geoscience and Remote Sensing Letters*, vol. 20, pp. 1–5, 2023. DOI: 10.1109/LGRS.2023.3268647.

10. Z. Cao, L. Jiang, P. Yue*, J. Gong, X. Hu, S. Liu, H. Tan, C. Liu, B. Shangguan, and **D. Yu**, "A large scale training sample database system for intelligent interpretation of remote sensing imagery," *Geo-spatial Information Science*, vol. 0, no. 0, pp. 1–20, 2023. DOI: 10.1080/10095020.2023.2244005.

11. F. Ye, Q. Cheng*, W. Hao, **D. Yu**, C. Ma, D. Liang, and H. Shen, "Reconstructing daily snow and ice albedo series for greenland by coupling spatiotemporal and physics-informed models," *International Journal of Applied Earth Observation and Geoinformation*, vol. 124, p. 103 519, 2023, ISSN: 1569-8432. DOI: https://doi.org/10.1016/j.jag.2023.103519.

12. A. Luo, B. Shangguan, C. Yang, F. Gao, Z. Fang, and **D. Yu**, "Spatial-temporal diffusion convolutional network: A novel framework for taxi demand forecasting," *ISPRS International Journal of Geo-Information*, vol. 11, no. 3, 2022. DOI: 10.3390/ijgi11030193.

13. F. Ye, Y. Sun*, C. Chen, and **D. Yu**, "A personalized attraction recommendation method based on geotagged photos," *Journal of Geo-information Science (In Chinese)*, vol. 23, no. 8, 1391, pp. 1391–1400, 2021. DOI: 10.12082/dqxxkx.2021.200608.

14. X. Peng, L. Tang*, and **D. Yu**, "Recommendation and 3d simulation of urban green space landscape scheme," *Journal of Fuzhou University (In Chinese)*, vol. 47, no. 5, p. 617, 2019. DOI: 10.7631/issn.1000-2243.18542.

Conference Proceedings

1. R. Liu, D. Yu, and P. Yue, "A disaster information service for damaged road networks using dynamic segmentation," in *2022 10th International Conference on Agro-geoinformatics*, 2022, pp. 1–6. DOI: 10.1109/Agro-Geoinformatics55649.2022.9859082.

2. R. Liu, P. Yue, **D. Yu**, K. Wang, H. Deng, and H. Li, "A cube-enabled cloud geoprocessing engine for big earth data," in *2023 11th International Conference on Agro-Geoinformatics*, 2023, pp. 1–6. DOI: 10.1109/Agro-Geoinformatics59224.2023.10233597.

3. F. Ye, Q. Cheng, W. Hao, and **D. Yu**, "Greenland daily ndsi data reconstruction based on spatio-temporal extreme gradient boosting model," in *IGARSS 2023 - 2023 IEEE International Geoscience and Remote Sensing Symposium*, 2023, pp. 102–105. DOI: 10.1109/IGARSS52108.2023.10283400.

4. K. Wang, P. Yue, **D. Yu**, R. Liu, H. Deng, and H. Liu, "Ogescript: An ogc-oriented interoperable script api for online geospatial analysis," in *2023 11th International Conference on Agro-Geoinformatics*, 2023, pp. 1–5. DOI: 10.1109/Agro-Geoinformatics59224.2023.10233317.

5. H. Deng, P. Yue, **D. Yu**, Z. Cao, R. Liu, and K. Wang, "A geospatial data and model hub for online geospatial analysis," in *2023 11th International Conference on Agro-Geoinformatics*, 2023, pp. 1–6. DOI: 10.1109/Agro-Geoinformatics59224.2023.10233547.

6. H. Tan, P. Yue, **D. Yu**, S. Boyi, and Z. Cao, "A provenance-aware method for updating earth observation training data," in *2022 10th International Conference on Agro-geoinformatics*, 2022, pp. 1–6. DOI: 10.1109/Agro-Geoinformatics55649.2022.9859187.

7. Y. Pan, B. Shangguan, **D. Yu**, and P. Yue, "Quality considerations for ai training data: Case studies on semantic segmentation of eo imagery," in *2022 10th International Conference on Agro-geoinformatics*, 2022, pp. 1–6. DOI: 10.1109/Agro-Geoinformatics55649.2022.9859230.

Standards And Specifications

1. P. Yue, J. Gong, R. Liu, **D. Yu**, S. Lavender, J. Antonisse, L. Di, E. Yu, D. Ziébelin, B. Shangguan, L. Hu, L. Jiang, M. Zhang, and K. Yan, Eds., *OGC Training Data Markup Language for Artificial Intelligence (TrainingDML-AI) Part 1: Conceptual Model Standard*. Open Geospatial Consortium (OGC), 2023.

Patents

1. P. Yue, **D. Yu**, L. Jiang, and Z. Liang, "An automatic method for separating ground and non-ground models for realistic 3d models," No. ZL202110490354.9, 2021.

2. P. Yue, **D. Yu**, and C. Liu, "Method, apparatus, and device for high-performance spatiotemporal trajectory correlation analysis," No. ZL202210920158.5, 2022.

3. P. Yue, **D. Yu**, and B. Shangguan, "Method, apparatus, and device for spatiotemporal correlation analysis based on communication big data," No. ZL202210913511.7, 2022.

Skills

Coding	C++, Python, Javascript
Dev Experience	GUI Software, Command-Line Toolkit, Web APP, Deep Leanring
Deep Learning	PyTorch
C++ Libraries	Qt, CMake, QMake, Vcpkg, OpenMP
3D Visualization	OpenSceneGraph, VTK, Cesium
3D Processing	CGAL, PCL, Pytroch3D
Cloud Computing	Kubernetes, Dcoker, OpenStack, MongoDB, Spark, Hbase, MinIO, Ray, MPI
CFD	OpenFOAM
Misc.	GIS, Photogrammetry, Computer Graphics, Machine Learning, GIServices, High Performance Geographic Computing, Computational Fluid Dynamics

Miscellaneous Experience

Awards and Achievements

2023
- **The 24th Wang Zhizhuo Innovative Talent Award**, Wuhan University
- **The Academic Innovation Award**, Wuhan University

2022
- **Top Prize of Science and Technology Progress in Surveying and Mapping**, Chinese Society for Geodesy, Photogrammetry and Cartography
- **National Scholarship for Doctoral Students**, Ministry of Education of China
- **The Excellent Graduate Honor**, Wuhan University

2021
- **The Second-Prize Award of Best Student Paper Competition**, The 10th International Conference on Argo-Geoinformatics
- **One-hundred Outstanding Graduation Thesis**, Fuzhou University

Miscellaneous Experience (continued)

- **First-class Academic Scholarship**, Wuhan University

2020

- **The Outstanding Graduate Honor**, Fuzhou University
- **Top Award of Academic Scholarship**, Fuzhou University

Journal Review

- ISPRS Open Journal of Photogrammetry and Remote Sensing
- Automation in Construction
- Transportation Letters: the International Journal of Transportation Research

Research Experience

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- **Open Geo-Spatial Engine**: Successfully directed a team of 20 skilled graduate students in developing OGE, a cloud-native, large-scale remote sensing data analysis platform similar to GEE. OGE can provide petabytes of analysis-ready remote sensing data, offer online analysis with hundreds of GIS operators, and enable online programming capabilities for users. **Website**: URL1 or URL2

- **Unsupervised Segmentation of Photo-Realistic 3D Mesh**: Developed a robust cloth simulation method to filter ground primitives from 3D meshes. Notably, the method exhibits robustness across diverse landscapes, remaining impervious to noise and fluctuations in vertex density.

  Developed a novel bidirectionally greedy framework to extract fine-grained building models from photo-realistic 3D Mesh, ensuring precise extraction of building models while considering their geometric integrity.

- **Cloud-Optimized 3D Spatial Data Management and Services**: Developed a information model for 3D data management, based on scene graph structure. Then an encoding method is developed to map the data model to a schema suitable for cloud-optimized storage architectures, while also incorporating an SDI service interface to enable the FAIR principles.

- **3D Roof Reconstruction**: Developed an all-Transformer network that can reconstruct fine 3D roof meshes directly from single remote sensing image.

- **Photo-Realistic 3D Mesh Lightweighting**: By coupling differential rendering and self-supervised learning, developed a method to generate lightweight meshes with minimal perceptual differences from the original photo-realistic 3D meshes.

- **Dam Failure Disaster 3D Simulation**: Developed a mathematical model for simulating tailing dam failures based on computational fluid dynamics (CFD), achieving a result with an error margin of only 1.42% compared to the actual measured inundation area.

  Developed a virtual geographic environment platform for dam failure disaster evolution simulation, which can simulate, predict, and visualize the route and disaster-causing range of tailings after a failure.