

Haoan Feng

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ABOUT ME

I am a dedicated researcher with a deep passion for exploring the interdisciplinary fields of computer vision and geospatial data analysis. My research interests broadly span **neural representations of geospatial data, neural rendering, topological analysis, generative models, and data visualization techniques**. Believing that collaboration across disciplines is key to driving innovation, my experience working with diverse teams has strengthened my commitment to interdisciplinary research. I am constantly expanding my knowledge in these areas, driven by curiosity and a desire to contribute to advancements in the field.

EDUCATION

Doctor of Philosophy in Computer Science 2021 - expect 2026

University of Maryland, College Park, United States

- ◇ *Thesis: (provisional) Neural Representations of Geospatial Data: Analysis, Generation, and Beyond. GPA: 4.0/4.0*

Master of Philosophy in Computer Science 2018 - 2020

Hong Kong University of Science and Technology, Hong Kong, China

- ◇ *Thesis: Linear structure vectorization in large-scale landscape point cloud*

Bachelor of Engineering in Computer Science Engineering and Electronic and Computer Engineering 2014 - 2018

Hong Kong University of Science and Technology, Hong Kong, China

- ◇ *Related coursework: Discrete Math Tools, Advanced Computer Graphics, Data Visualization, Probability and Random Processes in Engineering. GPA: 3.9/4.3*

RESEARCH PROJECTS

Neural Representations of Geospatial Data 2021 - Present

University of Maryland, College Park

Advisor: Prof. Leila De Floriani

- ◇ **Survey on Neural Representations of Geospatial Data (In progress):** Conducting a comprehensive survey on neural representations for geospatial data storage, rendering, and analysis. Evaluating implicit and explicit representations to enhance flexibility, scalability, parallel computation, and support for physical simulation in geospatial contexts.
- ◇ **Implicit Neural Representation for Terrain Surface Modeling:** Published a practical continuous surface model for terrain data using implicit neural representations. Achieved accurate surface reconstruction, topological analysis, and topographical feature extraction through a neural network pipeline, supported by progressive training strategies for efficiency.
- ◇ **Topological Feature Tracking on Triangulated Irregular Networks (TINs) Using a Scale-Space Approach:** Designed and implemented an adaptive scale-space algorithm to track topologically critical features on 2D manifolds discretized as TINs. Adapted previous regular grid-based approaches to work with triangulated irregular networks and accelerated the process using custom GPU kernels.

Researcher and Developer at Vision and Graphics Laboratory 2017 - 2020

Hong Kong University of Science and Technology

Advisor: Prof. Long Quan

- ◇ **Large-Scale Point Cloud Processing, Information Extraction, Semantic Segmentation:** Developed a comprehensive pipeline for processing large-scale noisy point clouds, enhancing PointNet's ability to segment thin and neglected structures. Created algorithms and a GUI tool for feature extraction, clustering, and recovering lost linear structures.

September 16, 2024

- ◇ **3D Web Application for Large-scale Landscape Reconstruction:** Implemented a 3D web application, which loads 3D reconstructions of large-scale landscapes efficiently, and provides simulation of the Earth for user interaction and engineering measurement.

PUBLICATIONS

- [1] **Feng, H.,** Song, Y., & De Floriani, L. (2024). **Critical Features Tracking on Triangulated Irregular Networks by a Scale-Space Method.** In *The 32nd ACM International Conference on Advances in Geographic Information Systems (SIGSPATIAL '24)*, October 29–November 1, 2024, Atlanta, GA, USA. ACM, New York, NY, USA, 13 pages. <https://doi.org/10.1145/3678717.3691218>. **(Oral)**
- [2] **Feng, H.,** Xu, X., & De Floriani, L. (2024). **ImplicitTerrain: a Continuous Surface Model for Terrain Data Analysis.** In *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition* (pp. 899–909).
- [3] Zhen, M., Li, S., Zhou, L., Shang, J., **Feng, H.,** Fang, T., & Quan, L. (2020). **Learning discriminative feature with crf for unsupervised video object segmentation.** In *Computer Vision–ECCV 2020: 16th European Conference, Glasgow, UK, August 23–28, 2020, Proceedings, Part XXVII 16* (pp. 445–462). Springer International Publishing.
- [4] **Feng, H.** (2020). **Linear structure vectorization in large-scale landscape point cloud** (MPhil dissertation).

SKILLS

Fluent Python and C/C++

- ◇ Developed machine learning algorithms for published research using the PyTorch framework in a Unix (CentOS) environment, with computational tasks managed by SLURM.
- ◇ Implemented GPU-accelerated algorithms using Python bindings and CUDA kernel programming, and enhanced algorithm inference speed through parallel computation over tree structure leaf nodes with the OpenMP library.
- ◇ Conducted evaluation and visualization of experimental results and intermediate stages using Python packages (e.g., OpenCV, Matplotlib) and collaborated with teams through the W&B platform for efficient tracking and experimentation.

Miscellaneous

- ◇ Practical experience in database management (SQL: MySQL, NoSQL: MongoDB), web development (PHP), and professional engineering software (QGIS, MATLAB, MeshLab).

Languages

- ◇ Mandarin (native), English (fluent), Cantonese & Japanese (amateur)

EXPERIENCE

Moodle Software Developer and Technical Support 2020

Hong Kong University of Science and Technology, Hong Kong, China

- ◇ Implemented LaTeX file compilation, encoding, and distribution features in the Moodle course management system as part of a copyright protection scheme.
- ◇ Developed web app user interfaces and plugins for various contexts using PHP and MySQL.

CERTIFICATIONS & AWARDS

- ◇ Chair's Graduate Fellowship 2021 - 2023
- ◇ Simatelex Charitable Foundation Scholarship 2015 - 2018
- ◇ University's Scholarship Scheme for Continuing Undergraduate Students 2015 - 2018

REFERENCES

References available upon request.