Haoan Feng

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ABOUT ME

I am a researcher focused on the intersection of computer vision, geometry processing, and geospatial data analysis. My research centers on neural representations of geospatial data, combining implicit neural modeling, topology-aware analysis, and generative frameworks to enable interpretable, continuous, and scalable representations of the physical world. I am motivated by interdisciplinary collaboration that bridges machine learning, graphics, and scientific computing.

WORK EXPERIENCE

PhD Research Intern at Dolby ATG Laboratories Summer 2025
Sunnyvale, CA Manager: Guan-Ming Su

- Developed a geometry-guided framework to augment Video Large Language Models (VideoLLMs) with cinematographic camera motion understanding, resulting in a first-author publication accepted at the CVPR 2026 Workshop (PVUW).
- Created a synthetic video benchmark using Unreal Engine 5 and designed probing experiments to evaluate spatial retention in vision encoders via Q-former.
- Proposed a plug-and-play strategy that injects camera motion, framing, and spatial descriptors into VideoLLMs, improving reasoning for video captioning, VQA, and stylistic plagiarism detection.

EDUCATION

Doctor of Philosophy in Computer Science 2021 - *anticipated graduation* 05/27
University of Maryland, College Park, United States

- *Thesis: Topology-Aware Modeling of Terrain and Volumetric Data: From Discrete to Neural Implicit Representations GPA*: 4.0/4.0

Master of Philosophy in Computer Science and Engineering 2018 - 2020
Hong Kong University of Science and Technology, Hong Kong, China

- *Thesis: Linear structure vectorization in large-scale landscape point cloud. GPA*: 3.9/4.3

BEng. 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

PUBLICATIONS

[1] **Feng, H.**, Aldana, D., Novello, T., & De Floriani, L. (2026). **SASNet: Spatially-Adaptive Sinusoidal Networks for INRs.** In *CVPR 2026*. (🔗).

[2] **Feng, H.**, Song, Y., & De Floriani, L. (2026). **A Parallel Scale-Space Method for Critical Features Tracking on Triangulated Irregular Networks.** In *ACM Transactions on Spatial Algorithms and Systems (TSAS)*. (🔗).

[3] **Feng, H.**, Song, Y., & De Floriani, L. (2024). **Critical Features Tracking on Triangulated Irregular Networks by a Scale-Space Method.** In *SIGSPATIAL '24)*. **(Best paper runner-up, 🔗).**

[4] **Feng, H.**, Musunuri, S. H., & Su, G.-M. (2026). **Geometry-Guided Camera Motion Understanding in VideoLLMs.** In *CVPR 2026 Workshop PVUW*. (🔗).

[5] **Feng, H.**, Xu, X., & De Floriani, L. (2026). **ImplicitTerrainV2: Wavelet-Guided Spatially Adaptive Neural Terrain Representation.** *arXiv preprint*. (🔗).

[6] **Feng, H.**, Xu, X., & De Floriani, L. (2026). **Rethinking Amortized Neural Representations for High-Resolution Terrain Elevation Data.** *arXiv preprint*. (🔗).

[7] **Feng, H.**, Xu, X., & De Floriani, L. (2024). **ImplicitTerrain: a Continuous Surface Model for Terrain Data Analysis.** In *CVPR 2024 Workshop INRV*. **(🔗).**

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[8] Aldana, D., Lima, J. P., Csillag, D., Perazzo, D., **Feng, H.**, Velho, L., & Novello, T. (2025). **Adaptive Training of INRs via Pruning and Densification.** *arXiv preprint*. (🔗).

[9] 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 *ECCV 2020*.

[10] **Feng, H.**(2020). **Linear Structure Vectorization in Large-Scale Landscape Point Cloud** *(MPhil)*.

RESEARCH PROJECTS

Analytical Neural Representations of Geospatial Data 2021 - Present
University of Maryland, College Park *Advisor: Prof. Leila De Floriani*

- **Survey on Neural Representations of Geospatial Data**: 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 terrain surface reconstruction with 25% storage and 4 times training speed with a progressive training strategy. Conducted accurate topological analysis and topographical feature extraction on the implicit surface function. Evaluated and visualized experimental results using OpenCV and Matplotlib and collaborated with teammates on the W&B platform.
- **Topological Feature Tracking on Triangulated Irregular Networks (TINs) in Scale Space**: Designed and implemented an adaptive scale-space algorithm to track topological features on 2D manifolds discretized as TINs. Adapted the previous regular grid-based scale-space algorithm to work with TINs for more accurate results and less overall memory cost. Accelerated the triangular mesh smoothing process by approximately 100 times using C++ data structures, extracting adjacency graph, and custom GPU kernels via PyTorch. Implemented a local geometry adaptive sampling method to construct efficient TINs from point clouds for topological analysis.

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.
- **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.

SKILLS

- Programming languages: Python, C++, and C.
- Machine learning frameworks: PyTorch, SciPy, Tensorflow, and JAX.
- Research toolkits: CUDA, OpenMP, OpenCV, Matplotlib, MATLAB, MeshLab, Paraview, QGIS, W&B.
- Development environment: Unix (CentOS) with SLURM, Window WSL, and MacOS.
- Miscellaneous: MySQL, MongoDB, NodeJS, PHP, ReactJS, D3.js, Tableau.

CERTIFICATIONS & AWARDS

- Chair's Graduate Fellowship 2021 - 2023
- Postgraduate Studentship 2018 - 2020
- University's Scholarship Scheme for Continuing Undergraduate Students 2015 - 2018

REFERENCES

References available upon request.

June 7, 2026