Haoan Feng

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ABOUT ME

I am a researcher working on neural representations of geospatial and volumetric data, combining implicit neural modeling, topology-aware analysis, and generative frameworks into continuous, differentiable models of the physical world. I am extending this work toward spatial intelligence, in particular world models built on explicit 3D representations (implicit neural fields, Gaussian splats, and triangulated meshes) whose structure can be queried, differentiated, and edited. I am motivated by interdisciplinary collaboration that bridges machine learning, graphics, and scientific computing.

WORK EXPERIENCE

PhD Research Intern at Dolby ATG Laboratories 05/2026 - 08/2026
Sunnyvale, CA Mentors: Peimeng Guan & Dae Yeol Lee, Manager: Guan-Ming Su

- Proposed and led a greenfield research project on authoring text and icon annotations as native TVGS Gaussian assets inside volumetric video, achieving correct mutual occlusion and physically based relighting in a single rendering pass, with a Viser-based interactive scene editor for keyframe and text-track authoring.
- Designed a feed-forward amortized authoring method where a shared encoder–decoder predicts renderable assets directly from canonical anchor point clouds, keeping normal map accuracy under 2 degrees while shrinking per-asset storage by roughly 28×.
- Built the multi-GPU training stack and scaled it to a library of 27K+ physically based assets that generalizes to fonts never seen in training.

PhD Research Intern at Dolby ATG Laboratories 05/2025 - 08/2025
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).
- Curated and labeled CameraMotionVQA, a 12K-segment camera-motion benchmark from UE5-rendered video, and probed vision encoders via Q-former for spatial retention.
- 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* 05/2027
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.** *CVPR 2026*. arXiv:2503.09750

[2] **Feng, H.**, Xu, X., & De Floriani, L. (2026). **ImplicitTerrainV2: Wavelet-Guided Spatially Adaptive Neural Terrain Representation.** *ACM SIGSPATIAL 2026*. doi:10.1145/3841645.3843428

[3] **Feng, H.**, Song, Y., & De Floriani, L. (2026). **A Parallel Scale-Space Method for Critical Features Tracking on Triangulated Irregular Networks.** *ACM TSAS*. doi:10.1145/3812549

[4] **Feng, H.**, Song, Y., & De Floriani, L. (2024). **Critical Features Tracking on Triangulated Irregular Networks by a Scale-Space Method.** *SIGSPATIAL 2024*. **Best paper runner-up.** doi:10.1145/3678717.3691218

[5] **Feng, H.**, Musunuri, S. H., & Su, G.-M. (2026). **Geometry-Guided Camera Motion Understanding in VideoLLMs.** *CVPR 2026 Workshop PVUW*. arXiv:2603.13119

[6] **Feng, H.**, Xu, X., & De Floriani, L. (2026). **Rethinking Amortized Neural Representations for High-Resolution Terrain Elevation Data.** *ACM SIGSPATIAL 2026, poster*. doi:10.1145/3841645.3844199

[7] **Feng, H.**, Xu, X., & De Floriani, L. (2024). **ImplicitTerrain: a Continuous Surface Model for Terrain Data Analysis.** *CVPR 2024 Workshop INRV*. arXiv:2406.00227

[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*. arXiv:2510.23943

[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.** *ECCV 2020*.

RESEARCH PROJECTS

Analytical Neural Representations of Geospatial Data 2021 - Present

University of Maryland, College Park *Advisor: Prof. Leila De Floriani*

- **Topological Feature Tracking on Triangulated Irregular Networks (TINs)**: Accelerated triangular mesh smoothing roughly 100× on GPU with custom kernels in PyTorch and optimized C++ adjacency structures, and designed an adaptive scale-space algorithm that tracks topological features on TINs at higher accuracy and lower memory cost than prior regular-grid methods. *Best paper runner-up at ACM SIGSPATIAL 2024; journal extension in ACM TSAS.*
- **Implicit Neural Representations for Terrain Surface Modeling**: Reduced terrain model storage to 25% of baseline and cut training time 4× through a progressive training strategy while preserving reconstruction accuracy, and performed topological analysis and topographical feature extraction directly on the learned implicit surface function. *Published at CVPR 2024 Workshop INRV; extended in two follow-up papers at ACM SIGSPATIAL 2026 (full paper and poster).*
- **Survey on Neural Representations of Geospatial Data**: Surveying implicit and explicit neural representations for geospatial storage, rendering, and analysis, assessing scalability, parallel computation, and support for physical simulation.

SKILLS

- **Languages:** Python, C++, C, CUDA, MATLAB, SQL, JavaScript.
- **ML & CV:** PyTorch, JAX, deep learning, implicit neural representations (INR), neural rendering, 3D Gaussian splatting, 3D reconstruction, geometry processing, point cloud processing, topological data analysis, vision-language models (VLM), multi-GPU distributed training.
- **Tools:** OpenCV, Matplotlib, MeshLab, ParaView, QGIS, W&B, UE5, Blender; Linux, SLURM, HPC.
- **Dev frameworks & scaffolds:** agentic development pipelines, MCP tool integration, custom skills/plugins, and multi-agent research orchestration.
- **Data & web:** SQL and NoSQL databases (MySQL, MongoDB), interactive data visualization (D3.js, Tableau), and full-stack web (React, Node.js).

AWARDS & HONORS

- Jacob K. Goldhaber Travel Grant and CS Department Travel Award, UMD 2026
- NSF Travel Grant, ACM SIGSPATIAL 2024
- Chair's Graduate Fellowship 2021 - 2023
- Postgraduate Studentship 2018 - 2020
- University's Scholarship Scheme for Continuing Undergraduate Students 2015 - 2018