VU-ANH LE

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[Google Scholar](#) • [Personal Website](#) • [LinkedIn](#)

RESEARCH INTERESTS

Research Interests: Geometric Machine Learning, Graph Machine Learning, Applied Geometric Modeling

EDUCATION

The Abdus Salam International Centre for Theoretical Physics   Trieste, Italy
School on Quantum Topology and Hyperbolic Geometry, Awarded a Certificate   *June 2025*
Introduced foundational geometric and topological methods relevant to physics-informed data modeling.

Beloit College   Beloit, Wisconsin
Bachelor of Science, Mathematics, GPA: 3.74/4.00   *Aug 2021 - May 2025*
Relevant Coursework: Mathematical Statistics, Differential Equations, Complex Analysis, Topology, Algorithm Design and Analysis, Data Mining

RESEARCH EXPERIENCE

Massachusetts Institute of Technology   Remote
Research Associate   *June 2025 – Present*
- Lead development of geometry-informed learning methods for multimodal generative AI.

Vietnam Academy of Science and Technology   Hanoi, Vietnam
Researcher   *June 2023 - Present*
- Lead development of geometric and topological frameworks for data analysis, including methods to detect and correct corrupted training data in large language models.
- Collaborate with cross-disciplinary teams to apply geometric-informed modeling to real-world datasets i.e. image reconstruction for land subsidence mapping.

Google Research   Chicago, Illinois
Student Researcher, B.S.   *Aug 2024 - May 2025*
- Designed a mathematical framework to analyze the structure and convergence of physics-informed neural networks.
- Extended classical approximation theorems and explored long-term model behavior through geometric and dynamic lenses.
- Developed a differential equation solver that trains **15% faster** than baseline methods e.g. DeepONet.

Massachusetts Institute of Technology   Cambridge, Massachusetts
Summer Research Intern, MSRP General   *June 2024 - Aug 2024*
- Designed a regression framework to model the transport behavior of hazardous analytes.
- Achieved **97.7% accuracy** in safety risk forecasting, outperforming conventional models by 5–10%.

University of Tokyo   Kashiwa, Chiba, Japan
Summer Intern, Graduate School of Frontier Sciences   *Apr 2022 - Aug 2022*
- Designed a segmentation algorithm to detect orthognathous genomic regions via structural pattern learning.
- Implemented probabilistic models to reveal latent geometric structures linked to disease phenotypes.

PREPRINTS

1. Le, Vu Anh, Dik, Mehmet, Nguyen, Viet Anh, and Le, Hai Khoi, "Lipschitz Bounds for Persistent Laplacian Eigenvalues under One-Simplex Insertions," in *Preprint, June 2025 (Currently submitted to Journal of Applied and Computational Geometry)*
We prove that adding a single simplex to a filtration shifts each persistent Laplacian eigenvalue by at most a fixed amount based solely on the simplex's boundary norm. This result ensures robust, predictable spectral geometry updates for dynamic data.
2. Le, Vu Anh, Dik, Mehmet, and Nguyen, Viet Anh, "Spectral Contraction of Boundary-Weighted Filters on delta-Hyperbolic Graphs," in *Preprint, June 2025 (Currently submitted to Transactions on Machine Learning Research)*
We introduce a boundary-weighted graph filter that systematically reduces signal energy by a curvature-governed factor on delta-hyperbolic graphs. This yields a lightweight, geometry-backed tool for stable analysis of hierarchical networks.

PUBLICATIONS

1. Le, Vu Anh, Nguyen, Dinh Duc Nha, Nguyen, Phi Long, and Sood, Keshav, "RN-F: A Novel Approach for Mitigating Contaminated Data in Large Language Models," in *Data in Generative Models Workshop: The Bad, the Ugly, and the Greats (DIG-BUGS), International Conference on Machine Learning, June 2025 (Accepted)*
We propose a method to detect and remove corrupted data in LLM training by modeling contamination as a geometric distortion in the embedding space.
2. Le, Vu Anh and Dik, Mehmet, "Topology-Preserving Scaling in Data Augmentation," in *Maltepe Journal of Mathematics, April 2025 (Published)*
We design a scaling-based augmentation technique that maintains the global topological structure of data. The paper uses tools from persistent homology to ensure stability.
3. Le, Vu Anh and Dik, Mehmet, "How Analysis Can Teach Us the Optimal Way to Design Neural Operators," in *Proceedings of International Mathematical Sciences, December 2024 (Published)*
This paper uses ideas from functional analysis to guide the design of neural operators. We ensure that architectures align with the geometry of input function spaces in PDE problems.
4. Le, Vu Anh and Dik, Mehmet, "The Stability of Persistence Diagrams Under Non-Uniform Scaling," in *Boletim da Sociedade Paranaense de Matemática, Nov 2024 (Accepted)*
We extend classical results in topological data analysis by proving that persistence diagrams remain stable under non-uniform (anisotropic) scaling of the data.
5. Le, Vu Anh and Dik, Mehmet, "A Mathematical Analysis of Neural Operator Behaviors," in *Advances in Quantum Calculus and Functional Analysis, CRC Press, Oct 2024 (Accepted)*
We analyze the spectral behavior of neural operator layers and show how their structural choices affect approximation accuracy and robustness in high-dimensional learning tasks.
6. Vu, Thi Phuong Thao, Dan Truong Giang, and **Le, Vu Anh**, "Reliability assessment of land subsidence monitoring results using PSI technique in Ho Chi Minh City, Vietnam," in *International Journal of Environmental Studies, March 2024 (Published)*
We model land subsidence in Ho Chi Minh City (2014-2021) as a spatial deformation field and employ geometric filtering, derived from multi-temporal optical and SAR data, to isolate and quantify reliable deformation patterns. We achieve millimeter-level precision in subsidence mapping while accounting for both natural and anthropogenic influences.

SELECTED PRESENTATIONS

1. "Mathematical Foundations of Neural Operators."
   - Infinite Possibilities Conference, *Institute for Mathematical and Statistical Innovation (University of Chicago)*, April 2025
   - National Conference on Undergraduate Research 2025, *Pittsburgh*, April 2025
   - 38th Annual Pi Mu Epsilon Undergraduate Regional Conference, *St. Norbert College*, Nov 2024

2. "Machine Learning Algorithms to Assess the Site Closure Time Frame for Toxic Analytes."
   - AGU Annual Meeting 2024 at Washington D.C., *American Geophysical Union*, Dec 2024
   - Midstates Physical Sciences, Mathematics and Computer Science Undergraduate Research Symposium, *Washington University in St. Louis*, Nov 2024
   - MIT Summer Research Program Conference, *Massachusetts Institute of Technology*, Aug 2024

SELECTED AWARDS AND HONORS

Magna Cum Laude, Beloit College	*May 2025*
Presidential Scholarship, Beloit College, Awards 48,000 USD annually	*Aug 2021 - May 2025*
Board of Trustees Grant, Beloit College, Awards 10,000 USD annually	*Aug 2021 - May 2025*
Dean's list, Beloit College	*Every semester*
MIT Summer Research Program, Massachusetts Institute of Technology, Fully funded	*June 2024*
Weissberg Human Rights Grant, Weissberg Foundation, Awards 1,000 USD	*March 2024*
Semifinalist, InSPiR2eS Global Pitching Research Competition 2023 (IGPRC 2023)	*Jan 2024*
Station1 Frontiers Fellowship, Station1, Awards 13,500 USD	*June 2023*
Friends of UTokyo Scholarship, University of Tokyo, Awards 4,000 USD	*April 2022*

OTHER EXPERIENCES

Antler   Ho Chi Minh City, Vietnam
Founder in Residence   *Apr 2025 – Present*
- Selected as one of 70 global early-stage founders from thousands of applications to participate in Antler's intensive incubation program, refining viable geometric-AI business concepts through expert mentorship and peer workshops.
- Led market validation and investor-ready pitch development for a 3D generative-AI platform, securing pre-seed feedback from venture partners and prospective co-founders.

Stealth Graph-Foundation-Model Startup   Ho Chi Minh City, Vietnam
Co-Founder & CEO   *Apr 2025 – Present*
- Defined the strategic vision and product roadmap for a stealth-stage venture dedicated to graph foundation models, designed to accelerate science, engineering, and decision-making.
- Built and led a cross-functional team (research, engineering, design) to prototype geometry-aware GNN backbones, benchmarks, and deployment pipelines, transforming state-of-the-art research into investor-ready proof-of-concepts.

[GEOHUB.ai (Remote Sensing Startup)](#)   Hanoi, Vietnam
AI Advisor & Member, Board of Trustees   *Dec 2024 – Present*
- Advised the Board on planning and growth strategies for a government-supported remote sensing spin-out under Vietnam's National Remote Sensing Department.
- Provided technical guidance on integrating geometric data-processing pipelines and physics-informed AI modules to automate environmental monitoring workflows.

Beloit Math and Computer Science Club   Beloit, Wisconsin
Co-founder and President   *Aug 2021 - May 2023*
- Updated students on field-related opportunities such as research projects, internships, and employment.
- Set preparatory sessions for academic competitions like the Mathematical Contest in Modeling and Putnam.

SKILLS

Programming Languages: Python, C++, Java, MATLAB
Formal Methods & Theorem Provers: Coq, Isabelle, Lean
Mathematical & Scientific Computing: NumPy, SciPy, SymPy, JAX, PyTorch, TensorFlow
Geometric & Topological Tools: Gudhi, Ripser, Dionysus, Giotto-TDA
Version Control & DevOps: Git, GitHub
Other Tools: LaTeX, Microsoft Office