VAN HAI NGUYEN

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EDUCATION

PhD in Aerospace Engineering, GPA: 3.9/4.0 Dec 2025 (Expected)
The University of Texas at Austin

Master of Science in Civil Engineering Jun 2017
Ho Chi Minh City University of Technology

Bachelor of Engineering in Civil Engineering Jun 2015
Ho Chi Minh City University of Technology

SKILLS

Programing Language: Advanced Python (Machine Learning: JAX, Pytorch, Tensorflow), MATLAB, Julia, MPI computing
Software & Tools: Docker, Git, bash, Paraview, Firedrake, LaTeX, Microsoft Office, MAPLE, ABAQUS, AutoCAD, Revit

WORK EXPERIENCE

Subsurface Intern Houston, TX, USA
Subsurface Innovation Lab, Chevron USA Inc. May 2024 - Aug 2024
Project: Implicit neural representation for geomodelling and geophysics inversion

- Invented a unified machine-learning approach for efficiently solving problems in geomodeling and geophysics.
- Performed data parallelism training on multiple GPUs with JAX and enabled high-resolution complex geology objects.
- Achieved $40\times$ acceleration in computation time while saving memory by $60\times$ compared to legacy grid-based code

Earth Science Intern Houston, TX, USA
Computation Reservoir Geophysics R&D, Chevron USA Inc. May 2023 - Aug 2023
Project: Implicit Machine Learning for Elastic Full Waveform Inversion (FWI)

- Inverted successfully the subsurface earth models for field data without initial models, for the first time, in academic and industry
- Reduced drastically the cycle time (saving months or more) for imaging inversion than the conventional FWI approach
- Accelerated $57\times$ faster for solving wave equations, $23\times$ faster for training, and saved 35% GPU memory with JAX
- Parallelized training models on 8 of A100-GPUs, thus scaling for large-scale 2D&3D synthetic and field data problems

RESEARCH EXPERIENCE

Graduate Research Assistant Austin, TX, USA
The University of Texas at Austin Jan 2021 - Present
Project: Model-constrained machine learning frameworks for simulating time-dependent PDEs with discontinuities

- Trained Convolutional Network and Graph Neural Network for $10\times$ faster time-dependent PDEs simulations with discontinuities
- Generalized learned neural networks for unseen scenarios including discretization, boundary conditions, geometry, and parameters
- Parallelized the training models and differentiable numerical PDEs simulations on a GPU cluster of 128 GPUs with JAX.

Project: Model-constrained machine learning frameworks for solving PDE-constrained inverse problems

- Learned inverse solver surrogate models with only one arbitrary training sample, generalized models to unseen samples.
- Accelerated $25,000\times$ faster than the classical Tikhonov framework while achieving the same accuracy level

Project: Redesigning Transformer architecture for simulating time-dependent PDEs and forecasting time-series data

- Redesigned the transformer architecture via the perspective numerical methods
- Achieved a higher-order convergence rate than the vanilla transformer in PDEs numerical simulations

Project: TorchFire - A combination of PyTorch and Firedrake for differentiable machine learning framework

- Embedded the Firedrake PDE simulations within PyTorch to form an end-to-end differentiable training framework.
- Distributed Firedrake PDE simulations on multiple CPUs for faster training.

PUBLICATIONS

1. **H.V. Nguyen**, et. al. *"TAEN: A Model-Constrained Tikhonov Autoencoder Network for Forward and Inverse Problems."* **Under Review** at Computer Methods in Applied Mechanics and Engineering (2025)
2. **H.V. Nguyen**, et. al. *"A model-constrained Discontinuous Galerkin Network (DGNet) for Compressible Euler Equations with Out-of-Distribution Generalization."* **Under Review** at Computer Methods in Applied Mechanics and Engineering (2024)
3. **H.V. Nguyen**, et. al. *"JAX acceleration of Implicit FWI and field data application."* Applied Geoscience & Energy (2024)
4. **H.V. Nguyen**, et. al. *"TNet: A Model-Constrained Deep Learning Approaches for Inverse Problems."* SIAM Journal of Scientific Computing (2024)
5. R.S. Philley, **H.V. Nguyen**, T. Bui-Thanh. *"Model-Constrained Empirical Bayesian Neural Networks for Inverse Problems."* XLIV Ibero-Latin American Congress on Computational Methods in Engineering (2023)
6. J. Wittmer, **H.V. Nguyen**, et. al. *"On Unifying Randomized Methods for Inverse Problems."* Inverse Problems (2023)
7. **H.V. Nguyen**, et. al. *"A Model-Constrained Tangent Slope Learning Approach for Dynamical Systems."* International Journal of Computational Fluid Dynamics (2022)
8. **H.V. Nguyen**, et. al. *"A Data-Informed Active Subspace Regularization Framework for Inverse Problems."* Computation (2022)
9. **H.V. Nguyen**, et. al. *"Large Displacement Elastic Analysis of Planar Steel Frames with Flexible Beam-to-Column Connections under Static Loads by Corotational Beam-Column Element."* Journal of Science and Technology in Civil Engineering (2019)
10. **H.V. Nguyen**, et. al. *"Large Displacement Elastic Static Analysis of Semi-rigid Planar Steel Frames by Corotational Euler–Bernoulli Finite Element."* Journal of Science and Technology in Civil Engineering (2019)

CONFERENCES

1. **Invited talk + Poster presentation + Symposium organizer** SIAM Conference on Mathematics of Data Science, USA, 2024
2. **Invited talk + Poster presentation** SciML Workshop on Scientific Machine Learning, USA, 2024
3. **Invited talk + Symposium organizer** 17th U. S. National Congress on Computational Mechanics, USA, 2023
4. **Invited talk** Seminar at Department of Mathematics - Kansas State University, USA, 2023
5. **Invited talks + Poster presentation + Symposium organizer** SIAM Texas-Louisiana Section, USA, 2022
6. **Invited talk** SIAM Conference on Mathematics of Data Science, USA, 2022
7. **Invited talk** Thematic Conference on Uncertainty Quantification for Machine Learning Integrated Physics Modeling, USA, 2022
8. **Invited talk** SIAM Conference on Uncertainty Quantification, USA, 2022

TEACHING EXPERIENCE

Teaching assistant Austin, TX, USA
The University of Texas at Austin Aug 2021 - Present
Courses: Engineering Computation (COE311K), Software Design and Engineering (COE332), Software Design For Responsible Intelligent Systems (COE379L), Analytical Methods I & II (ASE380P1, ASE380P2), Introduction to Machine Learning (EM397)

- Hosted office hours to address students' questions about course-related materials including lecture notes, homework, and projects
- Assisted in developing homework problems, exam problems, and project topics

Teaching assistant Vietnam
Ho Chi Minh City University of Technology Jun 2017 - Nov 2020
Course: Steel Structures Theory and Design

MENTORING EXPERIENCE

1. **William Cole Nockolds**, The University of Texas at Austin, Spring Semester 2023, *A Model-Constrained Tangent Learning Approach for Dynamics Systems on Latent Manifold*, pursued PhD in the same group from Sep 2024
2. **Wesley Lao**, The University of Texas at Austin, Fall Semester 2022, *Graph Neural Network Model-Constrained Tangent Learning Approach for Discontinuous Wave Propagation PDEs Using JAX Fluids Package*, pursued PhD in the same group from Sep 2023.
3. **Hieu Tran**, DePauw University, Summer and Fall Semesters 2022, *A Convolution Neural Network Model-Constrained Tangent Learning Approach for Dynamics Systems*

HONORS

Nominated for great research performance M. J. Thompson Endowed Presidential Graduate Scholarship 2022-2023.