Hoang Anh (Benjamin) NGUYEN

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Research Interests

Scientific Computing:

- Full waveform inversion (FWI)
- Physics-guided/informed neural networks (PINNs)
- Partial differential equations (PDEs) & optimization with quantum computing
- Hybrid quantum neural networks

Education

Ph.D. of Geophysics | ***Major: Geophysics - Minor: Computer Science*** — Aug 2023 – 2027 (Expt.)
Colorado School of Mines (CSM) — Golden, CO, USA
Thesis: Geophysical Inversion and Optimization of FWI via Quantum Computing

Diploma of Earth Sciences | ***Major: Earth System Physics*** — Sept 2022 – Aug 2023
International Centre for Theoretical Physics (ICTP) - UNESCO — Trieste, Italy
Thesis: Ambient noise Tomography beneath the Banda Arc

Master of Engineering Physics | ***Major: Computational Physics*** — May 2021 – Sept 2023
Hanoi University of Science and Technology (HUST) — Hanoi, Vietnam
Thesis: Structural Simulation of MgSiO3 under Compression

Engineer of Engineering Physics | ***Major: Computational Physics*** — Sept 2016 – April 2021
Talent Honours Program – HUST — Hanoi, Vietnam
Thesis: Computational Modelling of Microstructure of Magnesium Silicate

Research Experience

Research Assistant — Aug 2023 – Present
Department of Geophysics - CSM — Advisor: Prof. A. Tura

- FWI with quantum computing, PINNs & hybrid quantum PINNs
- PDEs solver with quantum computing
- Optimization using quantum annealing
- Multicomponent elastic FWI - Devito & SPECFEM

Research Assistant — May 2023 – Aug 2023
Earth System Physics - ICTP — Advisors: Prof. A. Aoudia & Dr. D. Manu-Marfo

- Ambient noise tomography
- Nonlinear inversion

Research Assistant — Aug 2018 – July 2023
Department of Computational Physics - HUST — Advisor: Prof. V. H. Nguyen

- Molecular dynamics simulation

Work Experience

Geophysics R&D Research Intern — May 2026 – Aug 2026
Shell: global integrated energy company — Houston, TX

- FWI

Geophysics R&D Research Intern — May 2025 – Aug 2025
TGS: energy data and analytics company — Houston, TX

- Developed GPU-accelerated seismic wave solvers for high-performance computing environments
- Q-attenuation and compensation modeling in isotropic and anisotropic (VTI/TTI) media using Devito Pro

- Formulated anisotropic attenuation model on fully staggered grids for implementation
- Implemented Q-elastic gradient computation for RTM and FWI

Geophysics R&D Intern Sept 2021 – Feb 2022
VPI: national petroleum and energy research institute Hanoi, Vietnam

- 3D ray-tracing
- Tomography

Academic Activities

Peer-review service
Geophysical Journals International (Oxford), IMAGE25 (SEG)

PhD Application Mentoring
Mentored 3 students attending PhD programs in the US

IMAGE25 post-convention workshop presentation Aug 2025
H. Nguyen, Optimization with quantum annealing method Houston, TX

IASPE-IAGA25 poster presentation Sep 2025
D. Manu-Marfo, **H. Nguyen**, A. Aoudia, Ambient noise tomography beneath the Banda basin reveals new insights into the arc-continent collision zone Lisbon, Portugal

IMAGE25 oral presentation Aug 2025
H. Nguyen, A. Tura, Crosswell traveltime inversion using a quantum computing method Houston, TX

RCP Sponsor Meeting 2025 presentation Apr 2025
H. Nguyen, A. Tura, Seismic wave propagation with gate-based quantum computing Golden, CO

RCP Sponsor Meeting 2024 presentation Apr 2024
H. Nguyenn, A. Tura, Seismic inversion with quantum computing Golden, CO

Erasmus master exchange 2022 Feb 2022 – Jul 2022
Physics of complex systems - Polytechnic University of Turin (POLITO) Torino, Italy

HUST scientific research conference presentation May 2020
H. Nguyen, H.S. Nguyen, V.H. Nguyen, Study on structure of magnesium silicate material under densification Hanoi, Vietnam

Vietnam Robot National Contest 2019 May 2019
Team member of HUST Hanoi, Vietnam

Honors and Awards

[1] Fully funded scholarship for postgraduate program at ICTP 2023

[2] VEF 2.0 Program recommended candidate 2023: The VEF 2.0 Program is conducted by the Fellows and Scholars of the Vietnam Education Foundation (VEF) – an independent U.S. Federal Government agency created by the U.S. Congress

[3] Erasmus scholarship for master exchange students at POLITO 2022

[4] Fully funded scholarship for the master program at HUST 2021, 2022

[5] Certificate of Merit from School of Engineering Physics for undergraduates: Excellent Student in Fall Semester 2017, Spring Semester 2018, Fall Semester 2018, Spring Semester 2019

[6] The 20th Vietnam National Student Physics Olympiad 2018: Second Prize

[7] Lawrence S.Ting Scholarship 2017 for undergraduates

Other Certifications

[1] Deep Learning Specialization from DeepLearning.AI

- Neural Networks and Deep Learning (Certificate)
- Improving Deep Neural Networks: Hyperparameter Tuning, Regularization and Optimization (Certificate)
- Structuring Machine Learning Projects (Certificate)

Current Work & Publications

[1] **H. Nguyen** and A. Tura. Seismic Traveltime Inversion with Quantum Annealing. *Scientific Reports*, 2025. 10.1038/s41598-025-01188-8

[2] **H. Nguyen**, M. Daniel, A. Abdelkrim. Ambient Noise Tomography beneath the Banda Basin reveals new insights into the Arc-Continent Collision Zone. *Geophys. Res. Lett.*, 2025. Under review

[3] E. L. C. VI M. Plan, H.D Phan, **H. Nguyen**, N.V. Hong, P.H. Kien and N.V. Yen. Study of the density-phase and Micro-phase separation in the model GeO2 liquid under compression. *The European Physical Journal B*, 2025. Under review.

[4] V. D. Lai, H. S. Nguyen , **H. Nguyen**, V.T. Nguyen, L.C. Dinh, P.D. Doan, T. T. Pham, H. V. T. Phung, M. Tonezzer, D. D. La, H. D. Nguyen, T. T. Nguyen. Tailoring Hydrogen Storage Performance of Mg–Mg2Ni Alloys: Synergistic Effects of Composition and Phase Formation with First-Principles Insights. *RCS Advances*, 2025, doi: 10.1039/D5RA04356E.

[5] V.H. Nguyen, T.D. Pham, **H. Nguyen**, T.L. Mai. Molecular Dynamics-Based Analysis of Cavity Distribution in GeO2 Glass: A Novel Computational Method (Manuscript)

[6] V. H. Nguyen and **H. Nguyen**. Crystallization of Liquid SiO2 under Compression: A Molecular Dynamics Simulation. *Pramana - J. Phys.*, 2024, doi: 10.1007/s12043-024-02839-7

[7] **H. Nguyen** and V. H. Nguyen. Study the structure of MgSiO3 system under compression by using ring statistics and Voronoi analysis. *Physica Scripta*, 2023, doi: 10.1088/1402-4896/acc5b7

[8] V. H. Nguyen, **H. Nguyen**, T. Iitaka, T. L. Mai. Computer simulation of phosphate-silicate and calcium phosphate-silicate systems. *Physica Scripta*, 2023, doi: 10.1088/1402-4896/acd4fb

[9] **H. Nguyen**, H. S. Nguyen and V. H. Nguyen. Pressure-induced glassy networks of enstatite and forsterite, 2022. *VNU J. Sci. Math. - Phys.*, 2023, doi: 10.25073/2588-1124/vnumap.4767

[10] T. H. A. Pham, H. H Doan, Q. M. Ta, T. L. Mai, and **H. Nguyen**. Some results of seismic travel-time reflection tomography study. *Petrovietnam J.*, 10:4 –16, 2021, doi: 10.47800/PVJ.2021.10-01

[11] H. S. Nguyen, **H. Nguyen**, H. K. Pham, T. Iitaka, and V. H. Nguyen. Topology of SiOx -units and glassy network of magnesium silicate glass under densification: correlation between radial distribution function and bond angle distribution. *M. Simul. Mater. Sci. Eng.*, 2020, doi: 10.1088/1361-651X/ab9bb4

[12] H. S. Nguyen and **H. Nguyen**. Structural simulation of Mg2SiO4 under compression. *VNU J. Sci. Math - Phys*, 2020, doi: 10.2138/am-2000-1015