Duc-Anh Nguyen

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Research Interests

My research focuses on uncovering the mathematical principles underlying foundation models, leveraging these insights to design efficient, interpretable, and scalable LLMs and VLMs, with an emphasis on non-convex optimization, sparse model architectures, and transfer learning.

Education

- **University of Virginia, Charlottesville (UVA)** *Aug 2026 - May 2031*
  Ph.D. in Computer Science Virginia, USA
  - Advisor: Prof. Hadi Daneshmand
- **Hanoi University of Science and Technology (HUST)** *Oct 2020 – Sep 2024*
  B.S. in Mathematics and Informatics (Talented Program) Hanoi, Vietnam
  - **Valedictorian** (Ranked 1st), Cumulative GPA: 3.92/4.00.
  - Scholarships for students with outstanding academic achievement every semester.
  - Thesis: Steepest Descent for Multi-Objective Optimization and Machine Learning Applications **(Best Presentation Award)**.

Research Experience

- **Research Intern** *Jul 2025 – Aug 2026*
  Web IR and NLP Group, NUS Singapore
  - Supervisor: Dr. Do Xuan Long and Prof. Min-Yen Kan.
  - Research Topic: Test-time methods for Agents.
  - Research Outcome: 1 first-author paper, currently under review.
- **AI Research Resident** *Mar 2024 – Aug 2026*
  VinAI Research (acquired by Qualcomm) Hanoi, Vietnam
  - Supervisor: Dr. Toan Tran and Dr. Tung Pham.
  - Research Topic: Efficiency, Interpretability, and Robustness of Foundation Models (Sparse Mixture of Experts, Transformers and State-Space Models).
  - Research Outcomes: 3 Vietnam patents and 3 first-author papers, including two papers accepted at ICML 2026 and NeurIPS 2026, together with 1 manuscript currently under review.
- **Research Student** *Aug 2022 - Aug 2024*
  Modeling, Simulation and Optimization in Data Science (HATLAB), HUST Hanoi, Vietnam
  - Supervisor: Dr. Thang Tran Ngoc.
  - Research Topic: Multi-objective Optimization in Machine Learning.

Publications & Patents (ORCID: 0009-0009-0528-8430)

(*) denotes equal contribution

1. **Mixture-of-Control: State-Aware Fine-Tuning for Transformer-based Models**
   Duc-Anh Nguyen*, Tien-Ngoc Luu*, Tung Pham, Toan Tran
   Advances in Neural Information Processing Systems (NeurIPS 2026); *Patent Filed*

2. **Artificial Intelligence in Metal Additive Manufacturing: Current Status, Challenges, and Future Developments**
   Duc-Anh Nguyen*, Bui Truong Giang Le*, Van Anh Nguyen, Minh Tuan Vu, Manh Ha Bui, Minh Thanh Le, Trong Duc Nguyen, Tien Dung Hoang, Xuan Hai Le
   Journal of Intelligent Manufacturing, Q1, Impact Factor: 7.4, 2025

3. **Selective Sinkhorn Routing for Improved Sparse Mixture of Experts**
   Duc-Anh Nguyen, Huu Binh Ta, Nhuan Le Duc, Tan Minh Nguyen, Toan Tran
   International Conference on Machine Learning (ICML 2026 AdaptFM workshop); *Patent Filed*, 2025

4. **Selected Beautiful Math Problems from International Competitions (Geometry)** *[Book]*
   Nguyen Duy Khuong, Phan Quang Tri, Tran Quoc Dung, Nguyen Duong Minh, Pham Nguyen Phuc Long, **Duc-Anh Nguyen**
   Vietnam National University Press, 2025

5. **Adaptive Conflict-Averse Multi-gradient Descent for Multi-objective Learning**
   Dinh Van Tuan, Tran Anh Tuan, **Duc-Anh Nguyen**, Bui Khuong Duy, Tran Ngoc Thang
   International Conference on Intelligence of Things (ICIT 2023)

6. **Exploration of Plane Geometry** *[Book]*
   Le Xuan Hoang, **Duc-Anh Nguyen**
   Vietnam National University Press, 2022

Preprints

1. **Rethinking State-Control Dynamics for Unified and Efficient Transformer Adaptation**
   Duc-Anh Nguyen, Minh Phuc Truong, Truong Nguyen, Dinh Phung, Toan Tran

2. **SWE-MISBEHAVIOR: Benchmarking and Mitigating Boundary Violations in Software Coding Agents**
   Do Xuan Trong*, **Duc-Anh Nguyen***, Do Xuan Long, Ngoc-Hai Nguyen, Tongyao Zhu, Duy Dinh, Cayden Chik, Dang Cao Cuong, Jiaying Wu, Xuan-Phi Nguyen, Vinh Van Nguyen, Kenji Kawaguchi, Shafiq Joty, Nancy F. Chen, Min-Yen Kan

3. **Artificial Intelligence for Metal Material Science: Challenges, Solutions, and Future Developments**
   Bui Truong Giang Le*, **Duc-Anh Nguyen***, Minh Tuan Vu, Phan Anh Tran, Trong Duc Nguyen, Minh Thanh Le, Khue Nguyen Vo Ngoc, Duy Hung Tran, Van Anh Nguyen

4. **A Steepest Gradient Method with Nonmonotone Adaptive Step-sizes for the Nonconvex Minimax and Multi-Objective Optimization Problems**
   Duc-Anh Nguyen, Tran Ngoc Thang

Talks

- Workshop on Scientific Computing and Applications (Talk in session with discussion): "*The Minimax Approach for solving non-convex multiobjective optimization and Applications*", 2024
- VIASM Summer school "Research Experience for Undergraduates" (Talk in session with discussion): "*The Steepest Descent Method for Solving Nonconvex Minimax Problem and Applications to Multi-Task Learning*", 2023

Honors & Awards

- **National Program for the Development of Mathematics Scholarship** *Nov 2023 – Apr 2024*
  Vietnam Institute for Advanced Study in Mathematics (VIASM)
  - Awarded twice for outstanding academic performance in 2023–2024.
- **Gold Medal - International Youth Math Challenge** *Nov 2023*
  - Final-round participant; ranked among top 2% of all participants.
- **Exness Scholarship** *Aug 2023*
  Hanoi University of Science and Technology & Exness Corporation
- **Third Prize - VIASM Summer School** "**Research Experiences for Undergraduates**" *Aug 2023*
  Vietnam Institute for Advanced Study in Mathematics (VIASM)
- **Gold Medal - Iranian Combinatorics Olympiad** *Jun 2022*
- **Silver Medal – Iranian Geometry Olympiad** *Nov 2019*
  - Ranked 4th nationally in Vietnam and 22nd globally.

Professional Services

Reviewer, ICML 2026 CoLorAI; NeurIPS 2026 InterpScience.

References

- **Dr. Toan Tran**
  Senior Staff Engineer, Qualcomm AI Research
  toatran@qti.qualcomm.com
- **Dr. Tung Pham**
  Research Scientist, Qualcomm AI Research
  tungp@qti.qualcomm.com
- **Dr. Thang Tran Ngoc**
  Lecturer, Faculty of Mathematics & Informatics
  Hanoi University of Science and Technology
  thang.tranngoc@hust.edu.vn
- **Prof. Van Anh Nguyen**
  Lecturer, University of Kentucky, USA
  vananh.nguyen@uky.edu