

Tam Minh Nguyen

CONTACT INFORMATION

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EDUCATION

Rice University, Houston, Texas, USA 2023–present

Ph.D. student in Electrical and Computer Engineering

- Advisor: Professor Richard G. Baraniuk

University of Business and Economics - VNU, Ha Noi, Vietnam 2013–2018

B.S. in International Business and Economics

RESEARCH INTERESTS

My research aims at understanding and advancing self-attention mechanisms in transformers. Adopting a mathematical approach, I prove that self-attention has connections with various established and well-developed techniques, from probabilistic clustering and non-parametric regression to primal-dual optimization and image denoising. These connections reveal the inherent properties and limitations of self-attention while providing principled frameworks to further develop transformers for real-world applications.

CONFERENCE PUBLICATIONS

Tam Nguyen, Tan M. Nguyen, Richard G. Baraniuk. “Mitigating Over-smoothing in Transformers via Regularized Nonlocal Functionals”. *Conference on Neural Information Processing Systems (NeurIPS)*, 2023.

Tan M. Nguyen*, **Tam Nguyen***, Nhat Ho, Andrea Bertozzi, Richard G. Baraniuk, Stanley J. Osher. “A Primal-Dual Framework for Transformers and Neural Networks”. *International Conference on Learning Representations (ICLR)*, 2023 (notable-top-25%).

Tan M. Nguyen*, **Tam Nguyen***, Long Bui*, Hai Do, Dung Le, Hung Tran-The, Khuong Nguyen, Richard G. Baraniuk, Nhat Ho, Stanley J. Osher. “A Probabilistic Framework for Pruning Transformers via a Finite Admixture of Keys”. *International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, notable-top-3%, 2023.

Tan M. Nguyen*, Minh Pham*, **Tam Nguyen**, Khai Nguyen, Stanley J. Osher, Nhat Ho. “FourierFormer: Transformer Meets Generalized Fourier Integral Theorem”. *Conference on Neural Information Processing Systems (NeurIPS)*, 2022..

Tan M. Nguyen*, **Tam Nguyen***, Hai Do, Khai Nguyen, Vishwanath Saragadam, Minh Pham, Khuong Nguyen, Nhat Ho, Stanley J. Osher. “Improving Transformer with an Admixture of Attention Heads”. *Conference on Neural Information Processing Systems (NeurIPS)*, 2022..

Tam Nguyen*, Tan M. Nguyen*, Dung Le, Khuong Nguyen, Anh Tran, Richard G. Baraniuk, Nhat Ho, Stanley J. Osher. “Improving Transformers with Probabilistic Attention Keys”. *International Conference on Machine Learning (ICML)*, 2022..

WORKSHOP PAPERS

Tam Minh Nguyen, Quang Huu Pham, Linh Bao Doan, Hoang Viet Trinh, Viet-Anh Nguyen, Viet-Hoang Phan. “Contrastive Learning for Natural Language-Based Vehicle Retrieval”. *IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR) Workshops*, 2021.

*: co-first author

Viet Anh Nguyen*, **Tam Nguyen***, Huy Quang Dao*, and Quang Huu Pham*. “S-NLP at SemEval-2021 Task 5: An Analysis of Dual Networks for Sequence Tagging”. *International Workshop on Semantic Evaluation (SemEval)*, 2021.

INVITED SEMINAR PRESENTATIONS A Primal-Dual Framework for Transformers and Neural Networks. *MURI meeting, Office of Naval Research, 2023.*

INDUSTRIAL EXPERIENCE **FPT Software**, Ha Noi, Vietnam 2021–2023
AI Resident. My research in transformers started here, where we adopted probabilistic perspectives to explain and improve transformer models.

Sun Asterisk Inc., Ha Noi, Vietnam 2020–2021
AI Engineer. I gained experience working with machine learning models on various topics, including self-supervised learning for toxic span detection, multi-task learning for relation extraction, and multimodal learning for vehicle retrieval. I also participated in several AI competitions:

- CVPR AI city challenge track 5: Natural Language-Based Vehicle Retrieval. Ranked 2nd on the public test dataset and 4th on the private test dataset.
- SemEval 2021 Task 5: Toxic Span Detection. Ranked 2nd.
- VLSP 2020 Relation Extraction. Ranked 3rd.

REFERENCES **Professor Richard G. Baraniuk**
C. Sidney Burris Professor of Electrical and Computer Engineering
Founder & Director, OpenStax
Rice University, Houston, Texas
Email: richb@rice.edu

Professor Tan Minh Nguyen
Professor of Mathematics
National University of Singapore
Email: tanmn@nus.edu.sg

Professor Nhat Ho
Professor of Statistics and Data Sciences
The University of Texas at Austin, Texas
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