Tan Minh Nguyen

CONTACT INFORMATION

Department of Mathematics
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ACADEMIC APPOINTMENTS

University of California, Los Angeles, CA, USA   2020–present

- Post-doctoral Scholar in Mathematics
- Mentor: Professor Stanley J. Osher

EDUCATION

Rice University, Houston, Texas, USA

Ph.D. in Electrical and Computer Engineering, 2014–2020

- Advisor: Professor Richard G. Baraniuk
- Thesis: Momentum-based Methods for Training and Designing Deep Neural Networks

M.S. in Electrical and Computer Engineering, 2014–2016

- Advisor: Professor Richard G. Baraniuk
- Thesis: Bridging Theory and Practice in Deep Learning with the Deep Rendering Model

B.S. in Electrical and Computer Engineering, 2011–2014

RESEARCH INTERESTS

My research focuses on developing models for scientific machine learning with applications in computational fluid dynamics (e.g. turbulence modeling) and numerical analysis (e.g. efficient numerical solvers) via three principled approaches:

- Optimization (momentum-based neural networks)
- Differential equations (graph neural diffusion, neural ordinary differential equations)
- Statistical modeling (deep generative models, mixture framework for transformers)

JOURNAL SUBMISSIONS

Tan M. Nguyen*, Nhat Ho*, Ankit B. Patel, Anima Anandkumar, Michael I. Jordan, Richard G. Baraniuk. "A Bayesian Perspective of Convolutional Neural Networks through a Deconvolutional Generative Model". *Under review, Journal of Machine Learning Research.*

Bao Wang, Hedi Xia, **Tan M. Nguyen**, Stanley J. Osher. "How Does Momentum Benefit Deep Neural Networks Architecture Design? A Few Case Studies". *Under review, invited paper, Research in the Mathematical Sciences.*

CONFERENCE SUBMISSIONS

Tan M. Nguyen*, Tam Nguyen*, Hai Do, Khai Nguyen, Vishwanath Saragadam, Minh Pham, Khuong Nguyen, Nhat Ho, Stanley J. Osher. "FiSHFormer: Transformer with a Finite Admixture of Shared Heads". *Under review, International Conference on Machine Learning (ICML), 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". *Under review, International Conference on Machine Learning (ICML), 2022.*

Nghia Nguyen*, **Tan M. Nguyen***, Huyen Vo, Stanley J. Osher, Thieu Vo. "Nesterov Neural Ordinary Differential Equations". *Under review, International Conference on Machine Learning*

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*: co-first author

(ICML), 2022.

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". *Under review, European Conference on Computer Vision (ECCV), 2022.*

Tan M. Nguyen, Richard G. Baraniuk, Mike Kirby, Stanley J. Osher, Bao Wang. "Momentum Transformer: Closing the Performance Gap Between Self-attention and Its Linearization". *Under review, Mathematical and Scientific Machine Learning (MSML), 2022.*

JOURNAL PUBLICATIONS	Bao Wang*, **Tan M. Nguyen***, Andrea L. Bertozzi, Richard G. Baraniuk, Stanley J. Osher. "Scheduled Restart Momentum for Accelerated Stochastic Gradient Descent". *SIAM Journal on Imaging Sciences, 2022.*

Yue Wang, Jianghao Shen, Ting-Kuei Hu, Pengfei Xu, **Tan M. Nguyen**, Richard Baraniuk, Zhangyang Wang, Yingyan Lin. "Dual Dynamic Inference: Enabling More Efficient, Adaptive, and Controllable Deep Inference". *IEEE Journal of Selected Topics in Signal Processing, 2020.*

CONFERENCE PUBLICATIONS

Matthew Thorpe*, **Tan M. Nguyen***, Hedi Xia*, Thomas Strohmer, Andrea Bertozzi, Stanley J. Osher, Bao Wang. "GRAND++: Graph Neural Diffusion with a Source Term". *International Conference on Learning Representations (ICLR), 2022.*

Tan M. Nguyen, Vai Suliafu, Stanley J. Osher, Long Chen, Bao Wang. "FMMformer: Efficient and Flexible Transformer via Decomposed Near-field and Far-field Attention". *Conference on Neural Information Processing Systems (NeurIPS), 2021.*

Hedi Xia, Vai Suliafu, Hangjie Ji, **Tan M. Nguyen**, Andrea Bertozzi, Stanley J. Osher, Bao Wang. "Heavy Ball Neural Ordinary Differential Equations". *Conference on Neural Information Processing Systems (NeurIPS), 2021.*

Tan M. Nguyen, Richard G. Baraniuk, Andrea Bertozzi, Stanley J. Osher, Bao Wang. "MomentumRNN: Integrating Momentum into Recurrent Neural Networks". *Conference on Neural Information Processing Systems (NeurIPS), 2020.*

Yujia Huang, James Gornet, Sihui Dai, Zhiding Yu, **Tan M. Nguyen**, Doris Tsao, Anima Anandkumar. "Neural Networks with Recurrent Generative Feedback". *Conference on Neural Information Processing Systems (NeurIPS), 2020.*

Tan M. Nguyen*, Nhat Ho*, Ankit B. Patel, Anima Anandkumar, Michael I. Jordan, Richard G. Baraniuk. "Neural Rendering Model: Joint Generation and Prediction for Semi-Supervised Learning". *Deep Math Conference (DeepMath), 2019.* (Oral presentation)

Tan M. Nguyen, Wanjia Liu, Fabian Sinz, Richard G. Baraniuk, Andreas S. Tolias, Xaq Pitkow, Ankit B. Patel. "Towards a Cortically Inspired Deep Learning Model: Semi-Supervised Learning, Divisive Normalization, and Synaptic Pruning". *Conference on Cognitive Computational Neuroscience (CCN), 2017.*

Ankit B Patel, **Tan M. Nguyen**, Richard Baraniuk. "A Probabilistic Framework for Deep Learning". *Conference on Neural Information Processing Systems (NeurIPS), 2016.*

PAPERS ON APPLICATION

Tan M. Nguyen, Animesh Garg, Richard G Baraniuk, Anima Anandkumar. "InfoCNF: An Efficient Conditional Continuous Normalizing Flow with Adaptive Solvers". *ICML Workshop on In-*

vertible Neural Nets and Normalizing Flows, 2019. (Spotlight talk)

Gavin D. Portwood, Peetak P. Mitra, Mateus Dias Ribeiro, **Tan M. Nguyen**, Balasubramanya T. Nadiga, Juan A. Saenz, Michael Chertkov, Animesh Garg, Anima Anandkumar, Andreas Dengel, Richard G. Baraniuk, David P. Schmidt. "Turbulence Forecasting via Neural ODE". *NeurIPS Workshop on Machine Learning and the Physical Sciences, 2019.*

TEACHING	Summer 2022, Math 164 Optimization, UCLA.
	Fall 2021, Probability & Statistics Course, FPT Software AI Residency, Vietnam.
WORKSHOP ORGANIZATION	*Integration of Deep Neural Models and Differential Equations* at the International Conference on Learning Representations (ICLR), 2020.
	Integration of Deep Learning Theories at the Conference on Neural Information Processing Systems (NeurIPS), 2018.
HONORS AND AWARDS	*J. Tinsley Oden Visiting Fellowship*, 2022
	Computing Innovation Postdoctoral Fellowship (CIFellows), 2020–2022.
	AWS Cloud Credits for Research, $50,000, September, 2018.
	NSF Graduate Research Fellowship, 2016–2020.
	Ford Foundation Fellowship Honorable Mention, 2016.
	Neuroengineering IGERT: From Cells to Systems Fellowship, 2015 – 2017.
	Texas Instruments Fellowship, 2014–2016. (Awarded to top incoming graduate students in the ECE department at Rice University)
	Louis J. Walsh Scholarship in Engineering, 2013–2014. (Awarded to top undergraduate students in the ECE department at Rice University)
	Gold Scholar on Coca-Cola's Community College Academic Team, 2011.
INVITED SEMINAR PRESENTATIONS	Momentum-based Methods for Training and Designing Deep Neural Networks. *VinAI Research, Vietnam, 2020.* (Invited talk)
	Scheduled Restart Momentum for Accelerated Stochastic Gradient Descent. *Machine Learning Seminar, Rice University, USA, 2020.* (Invited talk)
	Deep Generative Models for Geophysical Signal Disentanglement. *Geo-Mathematical Imaging Group (GMIG) Project Review Meeting, Rice University, USA, 2018.* (Invited talk)
CONFERENCE, WORKSHOP PRESENTATIONS	Transformer with a Mixture of Gaussian Keys. *Geometry of Machine Learning, the 4th Annual Meeting of the SIAM Texas-Louisiana Section, 2021.* (Invited talk)
	Momentum-Based and Fast Multipole Methods for Designing Deep Learning Models. *Mathematical Foundation of Deep Learning with the Applications to PDE, the 4th Annual Meeting of the SIAM Texas-Louisiana Section, 2021.* (Invited talk)

Brain-inspired Robust Vision Using Convolutional Neural Networks with Feedback. *NeurIPS NeuroAI Workshop, 2019.* (Poster)

Conditional Continuous Normalizing Flows for Physics-Inspired Learning. *NVIDIA Onsite Research Event, 2019.* (Lightning Talk)

Neural Rendering Model: Rethinking Neural Networks from the Joint Generation and Prediction Perspective. *NeurIPS Workshop on Integration of Deep Learning Theories, 2018.* (Contributed talk)

EnergyNet: Energy-Efficient Dynamic Inference. *NeurIPS Workshop on Compact Deep Neural Network Representation with Industrial Applications, 2018.* (Poster)

Tremor Generative Adversarial Network (TremorGAN): Deep Generative Model Approach for Geophysical Signal Generation. *NeurIPS Workshop on Machine Learning for Geophysical and Geochemical Signals, 2018.* (Poster)

The Latent-Dependent Deep Rendering Model. *ICML Workshop on Theoretical Foundations and Applications of Deep Generative Models, 2018.* (Poster)

Mixed Reality Generative Adversarial Networks: Closing the Visual Gap between Synthetic and Real Images. *Amazon Graduate Research Symposium, 2017.* (Poster)

A Probabilistic Framework for Deep Learning. *Computational and System Neuroscience Conference (COSYNE), 2016.* (Poster)

MENTORING

Hedi Xia, Ph.D. student in the Mathematics Department at UCLA

Tam Nguyen, Resident at FPT Software AI. (Next: Interviewing for a Ph.D. position at UT Austin)

Yujia Huang, Ph.D. student in the Computing + Mathematical Sciences Department at Caltech

Wanjia Liu, Master student in the Computer Science Department at Rice University. (Next: Google)

Si Hui Dai, Undergraduate student in the Computing + Mathematical Sciences Department at Caltech. (Next: Ph.D. at Princeton)

Ethan Perez, Undergraduate student in the Computer Science Department at Rice University. (Next: Ph.D. at NYU)

PROFESSIONAL SERVICES

Journal reviewing
- Journal of Machine Learning Research
- Information and Inference
- IEEE Journal on Selected Areas in Information Theory
- Statistical Applications in Genetics and Molecular Biology

Conference reviewing
- International Conference on Machine Learning (ICML)
- Conference on Neural Information Processing Systems (NeurIPS)
- International Conference on Learning Representations (ICLR)
- AAAI Conference on Artificial Intelligence (AAAI)
- Asilomar Conference on Signals, Systems, and Computers

Other service
- Summer Undergraduate Research Fellowship Program at Caltech, Pasadena, California, *Project Mentor*

- Machine Learning Lunch at Rice University, Houston, Texas, *Organizer*

- Deep Learning Meeting at Rice University, Houston, Texas, *Organizer*

MEMBERSHIP   Institute of Electrical and Electronics Engineers (IEEE)

REFERENCES   **Professor Stanley J. Osher**
Professor of Mathematics, Computer Science, Electrical Engineering, and Chemical and Biomolecular Engineering
Director of Special Projects, Institute for Pure and Applied Mathematics (IPAM)
University of California, Los Angeles
Email: sjo@math.ucla.edu

Professor Andrea L. Bertozzi
Distinguished Professor of Mathematics and Mechanical and Aerospace Engineering
Betsy Wood Knapp Chair for Innovation and Creativity
Director of Applied Mathematics
University of California, Los Angeles
Email: bertozzi@math.ucla.edu

Professor Richard G. Baraniuk
C. Sidney Burris Professor of Electrical and Computer Engineering
Founder & Director, OpenStax
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