HAOMING YANG Ph.D.

(+01) 423-991-3369
haoming.yang@duke.edu
https://imkeithyang.github.io/

RESEARCH INTEREST:

There are mainly two sides to my research.

- Foundational Deep Learning: I apply the rich mathematical structure of **Stochastic and Partial Differential Equations** to model the dynamic processes inherent in neural network training, study the stochastic nature of optimization methods, and integrate physical principles directly into the learning process. These equations can be applied in deep learning to provide valuable insights to develop **robust learning, continual learning, and sequence modeling** architectures.

- Deep Learning in Neuroscience: I study insect neuroscience and neuromotor controls from a deep learning perspective. Our goal is to understand how insects, with limited resources, perceive a complex changing environment and make rapid decisions. On this front, I develop **(semi)-interpretable deep learning algorithms** and collaborate with neuroscientists to understand how complex environmental information is gathered and processed by insects to direct their highly efficient and agile movements.

EDUCATION

Duke University   Durham, NC
Ph.D. in Electrical and Computer Engineering   05/2026 *(expected)*
- Advisor: Prof. Vahid Tarokh
- Research area: Foundations of Deep Learning; ML in neuroscience

Duke University   Durham, NC
Master of Science in Statistical Science   12/2022
- Advisor: Prof. David Dunson
- Research area: Interpretable Machine Learning in neuroscience

University of Illinois at Urbana Champaign   Champaign, IL
Bachelor of Science in Statistics (Highest Distinction)
Bachelor of Science in Engineering Physics (Highest Honor)   05/2021
- Minor: Mathematics

PUBLICATIONS

1. Ali Hasan*, **Haoming Yang***, Yuting Ng, and Vahid Tarokh. Elliptic Loss Regularization. In: The Thirteenth International Conference on Learning Representation *ICLR*, 2025.

2. **Haoming Yang**, Ali Hasan, and Vahid Tarokh. Parabolic Continual Learning. In: The 28th International Conference on Artificial Intelligence and Statistics. PMLR, *AISTATS* 2025.

3. **Haoming Yang***, Ali Hasan*, Yuting Ng, and Vahid Tarokh. Neural McKean-Vlasov Processes: Distributional Dependence in Diffusion Processes. (**Oral**) In: The 27th International Conference on Artificial Intelligence and Statistics. PMLR, *AISTATS* 2024.

PREPRINTS

1. **Haoming Yang***, Pramod KC*, Panyu Chen, Hong Lei, Simon Sponberg, Vahid Tarokh, and Jeffrey Riffell. Neuron synchronization analyzed through spatial-temporal attention. *Under Review.*

2. Barredo, Elina*, **Haoming Yang***, et al. Body size and light environment modulate flight speed and saccadic behavior in free flying *Drosophila melanogaster. Under Review.*

3. **Haoming Yang***, Marko Angjelichinoski*, Suya Wu, Joy Putney, Simon Sponberg, and Vahid Tarokh. Cross-subject Mapping of Neural Activity with Restricted Boltzmann Machines. *Under Review.*

4. **Haoming Yang**, Steven Winter, Zhengwu Zhang, and David Dunson. Interpretable AI for relating brain structural and functional connectomes.

In Progress

Deep Multivariate Time Series Forecasting
Developed novel cross-attentional mixture of Mamba and Transformer to exploit cross-variate correlation and cross-time scales interplay of time series. Achieved SOTA result in multivariate time series forecasting.

Incontext Learning of Functionals
Researching transformer's in-context learning ability on distribution flows. Developing mathematical model and architecture to study in-context generative models.

Interpretable Models in Neuroscience
Architect deep learning model to model neural representation that leads to linear behavior in agile insects.

Interpretable Models for Neuromotor Control
Formulate neural network system to uncover neural to motor program connections. Identify neural signals crucial for insect to make spontaneous, agile movement under odor and visual stimuli.

Selected Experience

Morgan Stanley | Remote   Current
- Collaborating with scientists at Morgan Stanley researching application of SDE/PDE in various areas of machine learning. Published on top machine learning conferences.

IRisk Lab, NLP Risk Management Group | Champaign   2020.09 - 2021.07
- Developed Natural Language Processing Tools for Actuarial Science Applications including an unsupervised method to identify businesses' related industries.

Tencent | Shenzhen, China   2020.06 - 2020.09
- Led the design and implementation of internal data analysis tool to capture product demographic similarity. Conducted multiple A/B tests and market analysis on behavioral data. Improved user stickiness by 30%.

Awards and Honors

- **Oral Presentation (Top 5%) in AISTATS 2024**   2024.01
- **Duke Fellowship**   2023.01
- **Undergraduate Highest Honor & Highest Distinction**   2021.05

Professional Services

Reviewer for Conference: *ICLR 2025*
Teaching Assistant, *ECE 685D: Introduction to Deep Learning*   Duke University
(2022, 2024, 2025)

Skills

Languages: Chinese (Fluent), English (Fluent), French (Intermediate)
Programming Languages: Python, R, SQL.
Developer Tools: PyTorch, Jax, Scikit-learn, Pandas, NumPy, SciPy, Matplotlib, Seaborn

Mentoring

Zihao Wu: Previous master student at Duke, now Ph.D student at Duke.
Junyi Liao: Ph.D student at Duke.
Matthew LaRosa: Master student at Duke.
Panyu Chen: Master student at Duke.