YuQing Xie

+1 (302) 345 0433
Cambridge, MA
xyuqing@mit.edu
github.com/xyuqing

Education

Massachusetts Institute of Technology *PhD in EECS* **Cambridge, MA** *2022-present*
Theoretical Limits of Equivariant Networks (Advisor: Tess Smidt)
- GPA 5.0/5.0

Massachusetts Institute of Technology *MS in EECS* **Cambridge, MA** *2022-2024*
Equivariant Symmetry breaking Sets (Advisor: Tess Smidt)
- GPA 5.0/5.0

Massachusetts Institute of Technology *BS in Physics and Math* **Cambridge, MA** *2018-2022*
- GPA 4.8/5.0

Selected coursework.....

- **Physics:** Quantum Field Theory I, II, and III (8.323, 8.324, 8.325), General Relativity (8.962), Statistical Physics I and II (8.333, 8.334), Theory of Solids I and II (8.511, 8.512), Statistical Physics in Biology (8.592)
- **Math:** Introduction to Lie Algebras (18.745), Algebraic Topology I (18.905), Topology (18.901), Real Analysis (18.100B), Functions of a Complex Variable (18.112), Algebra I (18.701)
- **EECS:** Algorithms for Inference (6.7810), Foundations of Cryptography (6.5620), Advanced Complexity Theory (6.5410/18.405), Shape Analysis (6.8410), Design and Analysis of Algorithms (6.046) A, Introduction to Machine learning (6.036), Theory of Computation (6.840/18.404)

Publications

- Daigavane, A., **Xie, Y.**, Vani, B. P., Saremi, S., Kleinhenz, J., Smidt, T., (2025). "Matching the Optimal Denoiser in Point Cloud Diffusion with (Improved) Rotational Alignment". In: *arXiv preprint arXiv:2510.03335*. URL: https://doi.org/10.48550/arXiv.2510.03335.
- Zhang, X. (2025). "Artificial intelligence for science in quantum, atomistic, and continuum systems". In: *Foundations and Trends® in Machine Learning* 18.4, pp. 385–912. URL: http://dx.doi.org/10.1561/2200000115.
- **Xie, Y.**, Smidt, T., (2025). "A Tale of Two Symmetries: Exploring the Loss Landscape of Equivariant Models". In: *The Thirty-ninth Annual Conference on Neural Information Processing Systems*. URL: https://openreview.net/forum?id=rH4aGTL4jY.
- **Xie, Y.**, Daigavane, A., Kotak, M., Smidt, T., (2025). "The Price of Freedom: Exploring Expressivity and Runtime Tradeoffs in Equivariant Tensor Products". In: *Forty-second International Conference on Machine Learning*. URL: https://openreview.net/forum?id=EvIwwGYTLc.
- **Xie, Y.**, Smidt, T., (2024). "Equivariant Symmetry Breaking Sets". In: *Transactions on Machine Learning Research*. **J2C certified and presented at ICLR 2025**. URL: https://openreview.net/forum?id=tHKH4DNSR5.
- Hintz, P., **Xie, Y.,** (2022). "Quasinormal modes of small Schwarzschild–de Sitter black holes". In: *Journal of Mathematical Physics* 63.1. URL: https://doi.org/10.1063/5.0062985.
- Hintz, P., **Xie, Y.,** (2021). "Quasinormal modes and dual resonant states on de Sitter space". In: *Physical Review D* 104.6, p. 064037. URL: https://doi.org/10.1103/PhysRevD.104.064037.

Research Experience

Theoretical Limits of Equivariant Neural Networks *Atomic Architects (Prof. Tess Smidt)* *07/2022 - present*
- Completely characterized adaption of equivariance for spontaneous symmetry breaking systems
- Provided first fair framework for comparing tensor products, a fundamental operation in many equivariant architectures
- Discovered novel mechanism for loss barriers in linearly constrained neural networks
- Provided first asymptotic expansion of the matrix Fisher distribution, helping explain rotation alignment in diffusion models

Experimental Tools for Condensed Matter Physics *Ju Group (Prof. Long Ju)* *06/2021 - 06/2022*

- Worked on building the world's third cryogenic atomic force microscope
- Independently built, optimized, and tested a microscope setup for viewing samples such as graphene in a cryogenic dewar

Mathematical Physics of Black Holes *Prof. Peter Hintz* *02/2020 - 05/2021*

- Demonstrated convergence of QNMs in SdS spacetime numerically for the first time in the limit of small black holes
- Performed first known numerical computation of dual resonant states for massless fields in SdS spacetime
- Resolved the disagreement over existence of QNMs in dS spacetime by computing exact dual resonance modes of massless scalar fields in de Sitter spacetime

Performance Impacts of Novel Hardware *Quantum Photonics Group (Prof. Dirk Englund)* *06/2019 - 09/2019*

- Characterized performance limits of novel energy efficient hardware for general matrix multiplication (GeMM)
- Simulated impact of hardware errors on machine learning performance

Awards

- Journal 2 Conference (J2C) certification for "Equivariant Symmetry Breaking Sets" (2024)
- National Science Foundation Graduate Fellowship (2022)
- MIT Schwarzman College of Computing Fellowship (2022)
- International Theoretical Physics Olympiad - 1st Place Team (2021)
- International Theoretical Physics Olympiad - 1st Place Team (2020)
- William Lowell Putnam Competition - Top 200 (2019)
- William Lowell Putnam Competition - Top 200 (2018)
- International Physics Olympiad (Team USA) - Gold Medal (2018)

Service

- Reviewer for ICML GRaM workshop, TAG-DS conference
- Volunteer at Cambridge Science Festival - explained basic AI concepts to families
- Teacher at MIT Splash - explained group theory concepts to high schoolers
- TA for Introduction to Special Relativity (8.20)
- Physics Mentorship Program - provided guidance for undergrad students
- Physics Instructor for HSSP
- Secretary for House 5 of New House
- Treasurer for House 5 of New House

Languages

- **English** [Native]
- **Chinese** [Proficient]

Hobbies

Soccer, Bouldering, Running, A Capella, Guitar, Chess