Alvin Heng

PhD Candidate, National University of Singapore
alvin.heng@u.nus.edu | ajrheng.github.io

EDUCATION

National University of Singapore 2021 - Present
PhD Candidate in Computer Science

University of Toronto 2020 - 2021
M.Sc in Physics

Nanyang Technological University, Singapore 2016 - 2020
B.Sc in Physics

EXPERIENCE

Graduate Researcher, *National University of Singapore* Aug 2021 - Present

- Conducting research in machine learning, with a focus on improving the safety, robustness and efficiency of deep generative models.
- Non-exhaustive list of areas explored include diffusion models, variational inference, anomaly detection and neural ODEs/SDEs.
- Research published in NeurIPS, ICML, ECML PKDD.

Graduate Researcher, *University of Toronto* Sep 2020 - Aug 2021

- Worked remotely to investigate how deep learning techniques can be used to improve particle resamplers for Sequential Monte Carlo, with applications to quantum algorithms.

Software Development Intern, *SpeQtral* Jun 2020 - Aug 2020

- Developed an open-source API that distributes quantum keys according to the ETSI standard, and ensured compatibility with commercial encryptors from a partner cybersecurity firm.

Undergraduate Researcher, *Nanyang Technological University* Jun 2017 - May 2020

- Ran Quantum Monte Carlo simulations to study the physics of quantum materials.
- Research published in Physical Review B.

Visiting Researcher, *Kavli Institute for Theoretical Physics, UCSB* Jun 2019 - Dec 2019

- Collaborated with experimental physicists to run numerical simulations on a quantum material with exotic spin excitations.
- Research published in Physical Review Letters.

Research Intern, *Institute of High Performance Computing, A*STAR* May 2018 - Aug 2018

- Analyzed the statistical properties of the Bitcoin and Lightning cryptocurrency networks and ran simulated transactions to investigate the problem of Lightning channel imbalances.
- Research published in ICPADS 2018.

SCHOLARSHIPS & AWARDS

NUS SoC Graduate Tutorship-PhD Scheme 2021 - Present
NUS SoC Research Achievement Award 2023
Singapore National Academy of Science Award 2020
CNYSP Research Award (Gold) 2020
CN Yang Scholars Program 2016-2020
Nanyang Scholarship 2016-2020
NTU SPMS Dean's List 2016/17, 2017/18, 2019/20

PUBLICATIONS

Out-of-Distribution Detection with a Single Unconditional Diffusion Model
A. Heng, A. H. Thiery, H. Soh
Advances in Neural Information Processing Systems 37 (NeurIPS), 2024.

Generative Modeling with Flow-Guided Density Ratio Learning
A. Heng, A. F. Ansari, H. Soh
Joint European Conference on Machine Learning and Knowledge Discovery in Databases (ECML PKDD), 2024.

Selective Amnesia: A Continual Learning Approach to Forgetting in Deep Generative Models
A. Heng, H. Soh
Advances in Neural Information Processing Systems 36 (NeurIPS), 2023, **Spotlight** (Top 3.06% of submitted papers).

Neural Continuous-Discrete State Space Models for Irregularly-Sampled Time Series
A. F. Ansari, **A. Heng**, A. Lim, H. Soh
International Conference on Machine Learning (ICML), 2023, **Oral** (Top 2.37% of submitted papers).

Three-Magnon Bound State in the Quasi-One-Dimensional Antiferromagnet α-$NaMnO_2$
R. L. Dally*, **A. Heng***, A. Keselman, M. M. Bordelon, M. B. Stone, L. Balents, S. D. Wilson
Physical Review Letters, 2020, *Equal contribution.

Pair Hopping in Systems of Strongly Interacting Hard-Core Bosons
A. Heng, W. Guo, A. W. Sandvik, P. Sengupta
Physical Review B, 2019.

Optimal Fee Structure for Efficient Lightning Networks
A. Heng, L. Feng, S. Cheong, R. Goh
IEEE 24th International Conference on Parallel and Distributed Systems (ICPADS), 2018.

SKILLS & SERVICE

Programming Languages: *proficient in* Python; *have worked with* C/C++, Fortran, Java
Deep Learning Frameworks: PyTorch
Typesetting: LaTeX
Academic Service: Invited Reviewer for ICML 2024, NeurIPS 2024, ICLR 2025

TEACHING

CS3264: Foundations of Machine Learning, *National University of Singapore* — Fall 2023, 2024
CS3244: Machine Learning, *National University of Singapore* — Spring 2024
CS1010: Programming Methodology, *National University of Singapore* — Fall 2021, 2022
CS2030S: Programming Methodology II, *National University of Singapore* — Spring 2022