

# Alvin Heng

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## INTERESTS

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Deep generative models, unsupervised learning, self-supervised learning, gradient flows, representation learning.

## EDUCATION

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**National University of Singapore** 2021 - Present  
*Ph.D in Computer Science*

**University of Toronto** 2020 - 2021  
*M.Sc in Physics*

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

## EXPERIENCE

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**National University of Singapore** Aug 2021 - Present  
*Graduate Researcher* with Harold Soh

Conducting research in the field of deep generative modeling as a PhD thesis topic. Topics explored thus far are broadly in the areas of gradient flows, diffusion models, variational inference, neural ODEs and time-series prediction.

**University of Toronto** Sep 2020 - Aug 2021  
*Graduate Researcher* with Nathan Wiebe

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

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

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

**Nanyang Technological University, Singapore** Jun 2017 - May 2020  
*Undergraduate Researcher* with Pinaki Sengupta

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

**Kavli Institute for Theoretical Physics, UCSB** Jun 2019 - Dec 2019  
*Visiting Researcher* with Anna Keselman, Leon Balents

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

**Institute of High Performance Computing, A\*STAR** May 2018 - Aug 2018  
*Research Intern* with Ling Feng

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

## SCHOLARSHIPS & AWARDS

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NUS-SoC Graduate Tutorship-PhD Scheme	2021 - Present
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

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### Preprints

- [6] **Selective Amnesia: A Continual Learning Approach to Forgetting in Deep Generative Models**  
**A. Heng**, H. Soh  
*Preprint*, 2023.
- [5] **Generative Modeling with Flow-Guided Density Ratio Learning**  
**A. Heng**, A. F. Ansari, H. Soh  
*Preprint*, 2023.

### Journal Papers

- [4] **Three-Magnon Bound State in the Quasi-One-Dimensional Antiferromagnet  $\alpha$ -NaMnO<sub>2</sub>**  
R. L. Dally\*, **A. Heng**\*, A. Keselman, M. M. Bordelon, M. B. Stone, L. Balents, S. D. Wilson  
*Physical Review Letters*, 2020.
- [3] **Pair Hopping in Systems of Strongly Interacting Hard-Core Bosons**  
**A. Heng**, W. Guo, A. W. Sandvik, P. Sengupta  
*Physical Review B*, 2019.

### Conference Papers

- [2] **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*, 2023, *Oral*.
- [1] **Optimal Fee Structure for Efficient Lightning Networks**  
**A. Heng**, L. Feng, S. Cheong, R. Goh  
*International Conference on Parallel and Distributed Systems (ICPADS)*, 2018.

## TEACHING

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<b>CS1010: Programming Methodology</b> , National University of Singapore	Fall 2021, 2022
Teaching Assistant with Prof. Ooi Wei Tsang	
<b>CS2030S: Programming Methodology II</b> , National University of Singapore	Spring 2022
Teaching Assistant with Prof. Ooi Wei Tsang	

## SKILLS

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**Programming Languages:** Python, C, Java; *familiar with* C++, Fortran  
**Deep Learning Frameworks:** Pytorch  
**Typesetting:** L<sup>A</sup>T<sub>E</sub>X

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\*Equal contribution