

JAEHOON HAHM

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RESEARCH INTEREST

- AI for Quantum Physics, Machine Learning Many-body Physics, Neural Quantum States
- Flow/Diffusion Models, Geometric Deep Learning

EDUCATION

University of Illinois, Urbana-Champaign (UIUC)

Aug 2024 - Present

Ph.D. student in Physics

- Advisor: Prof. Bryan Clark
- Machine Learning Many-body Physics, Neural Quantum States, Generative Modeling Quantum Distribution

Seoul National University, Graduate School of Data Science (GSDS)

Mar 2022 - Feb 2024

M.S. in Data Science

- Thesis: Isometric Representation Learning for Disentangled Latent Space of Diffusion Models
- Advisor: Prof. Joonseok Lee

Seoul National University

Mar 2016 - Feb 2022

B.S. in Physics, minor in Mathematics

- Thesis: Improvement in Variational Quantum Algorithms by Measurement Simplification
- Advisor: Prof. Young June Park
- Mandatory Military Service in Republic of Korea Army: July 2019 - Feb 2021

Seoul Science High School

Mar 2013 - Feb 2016

Graduated with Distinction

- Advanced Science and Mathematics Curriculum for Gifted Students

PUBLICATION

1. **Jaehoon Hahm**, Bryan Clark, "Shadow Flow Matching for Learning Quantum States", Under Review at NeurIPS, 2025.
2. Kwanseok Kim, **Jaehoon Hahm**, Jinhwan Sul, and Joonseok Lee, "SummDiff: Generative Modeling of Video Summarization with Diffusion", Under Review at ICCV, 2025.
3. **Jaehoon Hahm**, Tak Hur, Joonseok Lee, Daniel K. Park, "Generative Modeling of Quantum Distribution with Functional Flow Matching", Quantum Techniques in Machine Learning (QTML), 2024.
4. **Jaehoon Hahm**, Junho Lee, Sunghyun Kim, and Joonseok Lee, "Isometric Representation Learning for Disentangled Latent Space of Diffusion Models", International Conference on Machine Learning (ICML), 2024.
5. **Jaehoon Hahm**, Hayeon Kim, and Young June Park, "Improvement in Variational Quantum Algorithms by Measurement Simplification", *preprint* arXiv:2312.06176, 2022.

EXPERIENCE

Undergraduate Research Intern

June 2018 - April 2019, Feb 2021 - Dec 2021

Advisor: Prof. Young June Park

Seoul National University, Department of Electrical Engineering

- **Improvement in Variational Quantum Algorithms by Measurement Simplification:**
Conducted research project of improving Variational Quantum Algorithms by utilizing only partial information of the state vector. Reviewed simple rules in quantum circuits, and propose a simplification method, Measurement

Simplification, that simplifies the expression for the measurement of quantum circuit. The research was part of and supported by Samsung *Beyond Limit* project.

- **Gate Level Implementation of Quantum KNN:**

Leader of Quantum Algorithm and Quantum Machine Learning research team. Investigated about Quantum KNN algorithm and implemented it via IBM Qiskit that can be executed at IBMQ real qubit hardware. The research was part of and supported by Samsung *Beyond Limit* project.

Undergraduate Research Intern

Feb 2021 - Dec 2021

Advisor: Prof. Taehyun Kim

Seoul National University, Department of Computer Science & Engineering

- **Randomized Benchmarking of Trapped Ion Qubit:**

Conducted research project of measuring the performance of Trapped Ion Qubit in the lab via IBM Qiskit and Randomized Benchmarking.

Undergraduate Research Intern

July 2021 - Dec 2021

Advisor: Prof. Hyunyong Choi

Seoul National University, Department of Physics

- **Diamond NV center Control Experiment:**

Conducted diamond NV center control experiment, including sequences of Rabi oscillation, spin echo, dynamical decoupling.

IBM Qiskit Hackathon Korea 2021, 2022

2021, 2022

- **MNIST Handwritten Digit Image Dataset Classification with Quantum Convolutional Neural Network (QCNN), 2021 2nd place:**

We modeled a Quantum Convolutional Neural Network (QCNN) for MNIST image classification, showing comparable accuracy with classical CNNs.

- **Predicting Ground State with novel Quantum Descriptor of Molecules using QML, 2022 community award:**

With Quantum Descriptors, feature extraction from molecule information could be efficient. We modeled a ground state energy estimator with hybrid algorithm composed of quantum descriptors and neural network.

IBMQ Challenge 2021 Fall, Summer

2021

- Achieved Advanced badge for both events.
- Solved all problems illustrating the application fields of quantum computer: Quantum Chemistry, Quantum Optimization, Quantum Finance, and Quantum Machine Learning.

Mandatory Military Service for Republic of Korea Army

July 2019 - Feb 2021

Chemical, Biological, Radiological and Nuclear weapons Reconnaissance, 5th Infantry Division

- Served 19 months of mandatory military service for the nation, at the front border line of Republic of Korea.

HONORS AND AWARDS

- Development Fund Scholarship, Seoul National University - Feb, 2017
- Seoul City Honorable Student Award - Dec, 2015
- Grand Prize (1st, awarded with ₩40,000,000 KRW scholarship), 4th Hanwha Science Challenge - Sep, 2014
- Silver Award (2nd in Mathematics & Computation, awarded with ₩5,000,000 KRW scholarship), 20th Samsung Humantech - Feb, 2014

SKILLS

Programming Languages

Python, C, C++, JAVA, MATLAB, Mathematica

Frameworks

PyTorch, JAX, TensorFlow, Numpy, Pandas

Quantum Languages

Qiskit, Cirq, PennyLane, Tensorflow Quantum

Languages

English (Advanced), Korean (Native)