HO **NAM** NGUYEN

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PhD student with a strong research background in Quantum Computing and applied Machine Learning, seeking roles where I can leverage my expertise towards impactful projects.

EDUCATION

Ph.D. in Physics **Aug 2019 - Present**
University of California, Berkeley GPA: 3.80
Research Focus: ML algorithms for quantum error correction, measurement, and control. *Advisor: K. Birgitta Whaley*

M.S. in Theoretical Physics **Aug 2018 - Jun 2019**
Perimeter Institute/University of Waterloo (Perimeter International Scholar)
Thesis: "Machine (Un)Learning in Phases Classification of Lattice Models" *Advisor: Adam Lewis*

B.S. in Physics and Astronomy **Aug 2014 - May 2018**
Stony Brook University (Honors College) GPA: 3.98, Summa Cum Laude
Physics Thesis: "Local Measurement of the Material Budget in the CMS Tracker" *Advisor: Klaus Dehmelt*
Astronomy Thesis: "Measuring Small-Scale Dark Matter with High-Resolution CMB Lensing" *Advisor: Neelima Sehgal*

EXPERIENCE @ BERKELEY

INDUSTRY

Quantum Device Theorist Intern **Jun - Aug 2024**
Rigetti Computing *Mentor: Eyob Sete*
- Explored error suppression techniques for tunable-coupler 2Q gates via **fast simulation in Julia**.
- Demonstrated **in experiments** successful calibration of high-fidelity short 1Q gates on Rigetti's QPUs.

RESEARCH

Machine Learning for Real-Time Quantum State Discrimination (preprint) **Jan - Jun 2024**
- Implemented matched filtering on noisy measurement signals and a small deep learning model on accumulated data to achieve **97-98% accuracy** in qubit state classification task while **reducing measurement time by 25%**.
- Collaborated with experimentalists at LBNL to deploy the lightweight model on an FPGA for real-time classification with only **54 ns latency**, enabling mid-circuit measurements.

Reinforcement Learning for Quantum Gate Design (journal paper) **Jan 2021 - Nov 2023**
- Led and executed all aspects of the project, including constructing a physics simulator for two superconducting transmon qubits, implementing the DDPG algorithm for continuous controls, and reporting the findings.
- Demonstrated novel entangling gates that are **30% shorter**, while maintaining **fidelity above 99.9%**.
- Engineered a pre-trained context-aware agent, delivering 99.9% fidelity solutions to hardware **drifts up to 4%**, while offering up to **8x faster fine-tuning** for larger drifts.

Summer Research Assistant: AI for Quantum Control. **Jun - Aug 2021**
Lawrence Berkeley National Lab *Advisor: Mekena Metcalf*
- Developed an OpenAI-compatible gym for simulating the quantum dynamics of one superconducting transmon qubit under external control pulses.
- Implemented two Q-learning algorithms (DQN and DDPG) to learn both discrete and continuous pulses.
- Achieved a **3x reduction in gate duration** for single-qubit operations, while sustaining a **fidelity above 99.9%**.

TEACHING

CHEM 277B: Machine Learning Algorithms **Jan - May 2024**
- Facilitated weekly tutorials and homework tailored to chemistry and molecular science for 20 Master students
- Implemented 10+ core optimization methods such as SGD simulated annealing, followed by various deep learning models, including CNNs for image classification, RNNs for time-series, generative models like VAEs, and GNNs.
- Spotlighted more recent advancements such as sequence-to-sequence learning, transformers, and AlphaFold2.

PHYS C21: Physics and Music **Jan - May 2021**
PHYS/CS C191: Quantum Information Science and Technology **Aug - Dec 2020**
PHYS 8A/8B: Introductory Physics **Aug 2019 - May 2020**

OTHER EXPERIENCE

Summer Student Researcher: Model-fitting with λ-statistics for pulsar search **Jun - Aug 2018**
Perimeter Institute, Canada *Advisor: Kendrick Smith*

- Validated a λ-statistics-based model-fitting algorithm on time-series data on a simplified toy model featuring 2D timestreams, providing the groundwork for the full pulsar search problem with 3D timestreams.

Research Intern: Validation of material budget in the CMS tracker **Jun - Aug 2017**
CERN, Switzerland *Advisor: Elisabetta Manca*

- Modified existing C++ code to extract azimuthal coordinates and added Python scripts for radiation length analysis in the Compact Muon Solenoid (CMS) tracker, towards improving the accuracy of the material budget estimation.

PUBLICATIONS

ML-FPGA-based Real-Time Q. State Discrimination for Mid-circuit Measurements. arXiv:2406.18807 (2024).
N. R. Vora, Y. Xu, A. Hashim, N. Fruitwala, H. N. Nguyen, et al.

Reinforcement Learning Pulses for Transmon Qubit Entangling Gates. Mach. Learn.: Sci. Technol. (2024).
H. N. Nguyen, F. Motzoi, M. Metcalf, K. B. Whaley, M. Bukov, M. Schmitt.

Machine learning for continuous quantum error correction on superconducting qubits. New J. Phys. (2022).
I. Convy, H. Liao, S. Zhang, S. Patel, W. P. Livingston, H. N. Nguyen, I. Siddiqi, K. B. Whaley.

Measuring the Small-Scale Matter Power Spectrum with High-Resolution CMB Lensing. Phys. Rev. D (2019).
H. N. Nguyen, N. Sehgal, M. S. Madhavacheril.

Results from a Prototype TPC Cherenkov Detector with GEM Readout. IEEE Trans. Nucl. Sci. (2019).
B. Azmoun, K. Dehmelt, T. K. Hemmick, R. Majka, H. N. Nguyen, et al.

Science from an Ultra-Deep, High-Resolution Millimeter-Wave Survey. arXiv:1903.03263 (2019).
N. Sehgal, H. N. Nguyen, et al.

The Simons Observatory: Science goals and forecasts. Journal of Cosmology and Astroparticle Physics (2019).
Simons Observatory Collaboration (including H. N. Nguyen).

SKILLS AND LEARNING

Programming Languages: Python, Julia, Mathematica, MATLAB, C/C++ (limited)
Frameworks and Libraries: Scikit-learn, PyTorch, Tensorflow (limited), RLlib, SciPy, Pandas
Quantum Softwares: QSimulator, Qiskit, Cirq, Qulacs, QuTiP, Stim
Languages: English (Proficient), Vietnamese (Native), Spanish (Intermediate)
Learning Certificates: Learning Julia (LinkedIn), Gen AI: Intro to LLMs (LinkedIn)

TALKS

05/2024: Reinforcement learning pulses for transmon qubit entangling gates. *Shenzhen International Quantum Academy*.
03/2023: Designing quantum gates using deep reinforcement learning. *APS March Meeting 2023*. Las Vegas, NV.

SERVICE AND LEADERSHIP

06/2024	**IOP Trusted Reviewer** for Engineering Research Express	IOPScience
01/2022 - 05/2023	**Instructor** for SwingCal course by UC Berkeley Swing Dancing Club	UC Berkeley
02/2021	**Teacher** for a course on Neural Networks at Splash! Berkeley	UC Berkeley
08/2016 - 05/2018	**Faculty Director Advisory Board** at College of Science and Society	Stony Brook University
08/2015 - 05/2018	**Resident Assistant** at Mount College, Campus Residences	Stony Brook University
08/2015 - 05/2016	**Undergraduate College Fellow** at College of Science and Society	Stony Brook University

AWARDS

2018 – 2019	**Perimeter Scholars International Award** (full support for 1-yr master)	University of Waterloo
2018	**John S. Toll Prize** (for 2 outstanding seniors in Physics and Astronomy)	Stony Brook University
2018	**Chancellor's Award for Student Excellence** (for 249 recipients in SUNY)	State University of NY
2016, 2017	**URECA Summer Research Award**	Stony Brook University
2015	**Honors College Scholarship** (1 of 3 highly selective honors programs)	Stony Brook University
2013	**Honorable Mention Award** (14th Asian Physics Olympiad - APhO)	Surya Institute, Indonesia