

PAUL KÖTTERING

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EDUCATION

University of California, Berkeley | Class of '21 | (Graduating December 2020) **Aug 17 – Present**

B.A. Major: Applied Mathematics, Minor: Physics | GPA: 3.67 / 4.00

- **Computational:** Computational Techniques in Physics, Bayesian Analysis and Machine Learning for Physical Sciences, Mathematical Methods for Optimization, Numerical Analysis, Advanced Matrix Computations (Graduate-Level).
- **Mathematical:** Real, Abstract and Complex Analysis, Linear Algebra.
- **Physics:** Analytical Mechanics, Introduction to Experimental Physics, Quantum Information Science and Technology, Quantum Mechanics, Quantum Field Theory.

EXPERIENCE

Lin Group at UC Berkeley Math Department | Berkeley, CA

<https://arxiv.org/abs/2012.06701>

Quantum Reinforcement Learning Assistant

August 20 – Present

- Applied an autoregressive policy gradient quantum control Quantum Approximate Optimization Algorithm (QAOA) method.
- Implemented a novel time-constraint resampling method in TensorFlow to improve method practicality.
- Studied how initialization of the protocol distribution affects the performance of the continuous-only Policy Gradient QAOA (PG-QAOA) and the full continuous-discrete algorithm (RL-QAOA).
- Analyzed the performance of the PG-QAOA using a Beta Distribution and a Sigmoid Gaussian Distribution.

German Aerospace Centre (DLR) | Munich, Germany

May 19 – Aug 19

Research Intern

- Algorithm research in Advanced Technology Group (MissionBetriebTechnologie) at German Space Operation Center.
- Extended Automated Telemetry Health Monitoring System (ATHMoS) for satellite anomaly detection.
- Applied Outlier Probability via Intrinsic Dimension (OPVID) algorithm for multiparameter data analysis.
- Constructed method to reduce anomaly false-positive rate through single and multiparameter comparison.

ATLAS Group at Berkeley Lab | Berkeley, CA

Aug 18 – May 19

Machine Learning Undergraduate Assistant

- Carried out research with Professor H. Wang for the ATLAS experiment at the CERN LHC.
- Applied boosted decision tree machine learning techniques to analyze top-top-Higgs (ttH) production from the detector.
- Used the C++ based CERN ROOT program for data analysis with TMVA toolkit.

Space Technologies at California | Berkeley, CA

May 19 – May 20

Co-President

- Student organization of 70+ active members, working on 5 projects including CubeSats, and Autonomous Lunar Rover.
- Maintained relationships with Silicon Valley advisors, Bay Area sponsors and campus academic researchers.
- Initiated new CubeSat project focused on developing a NV Diamond Quantum Gyroscope for use in spaceflight.
- Spearheaded UC Berkeley's first accepted application to NASA CubeSat Launch Initiative worth up to \$300,000.

PROJECTS

Simulating Molecules with VQE

May 20

- Modelled molecules using a Quantum Recurrent Neural Network and the Variational Quantum Eigensolver.
- Utilized TensorFlow Quantum and OpenFermion Cirq to investigate the electronic structure of Hydrogen and Ethene.

Applications of Random Matrices in Portfolio Optimization

Sept-Dec 20

- Investigated modern applications of Random Matrix Theory to cleaning correlation matrices for portfolio construction.
- Studied error bounds and computational costs of probabilistic matrix approximation techniques.

SKILLS

- **Programming Languages:** Strong: Python, MATLAB | Proficient: FORTRAN 90, C++
- **Libraries and Tools:** TensorFlow (+ Quantum), Scikit-Learn, Matplotlib, ROOT, Git, Cassandra (NoSQL).
- **Languages:** English (native), German (Limited Working Proficiency), French (Elementary Proficiency).
- **Interests:** Soccer (UC Berkeley Club Team), Skiing, Films.