Aaron Trowbridge

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Education

Syracuse University

- B.S. in Physics, with distinction (3.6 GPA); B.S. in Mathematics (3.8 GPA) Sep 2015 – Dec 2020

Experience

Research Associate (Robotic Exploration Lab at Carnegie Mellon University) Aug 2022 – Present

- Researching quantum optimal control under Prof. Zac Manchester and Prof. David Schuster.
- Developed and tested a novel pulse optimization method on hardware systems.
- Developed the open source Julia software package, Piccolo.jl, for solving quantum optimal control problems using the PICO method detailed in the paper listed below.

Data Engineering Intern (CatalystIQ) May 2022 – Aug 2022

- Developed backend components for an automated content tagging platform used in marketing analytics tasks.
- Implemented data ingestion pipelines for large continuously updating healthcare datasets utilizing AWS services combined with Snowflake databases.

Teaching Assistant (Syracuse University Physics Department)

- One semester as graduate TA: PHY 211 taught by Prof. Walter Freeman Jan 2021 – May 2021
- Four semesters as undergrad TA: astronomy, mechanics, E & M, computational physics Jan 2019 – Dec 2020

Talks & Publications

Quantum Collocation and Iterative Learning Control *Talk, SIAM CSE23*, March 2023

- Speaker: **Aaron Trowbridge**

Piccolo.jl: An integrated quantum optimal control stack *Talk, JuliaCon 2023, YouTube*, July 2023

- Speaker: **Aaron Trowbridge** and Aditya Bhardwaj

Direct Collocation for Quantum Optimal Control *Paper and Talk, IEEE QCE23 (2nd best paper award), ArXiv*, Sept. 2023

- Authors: **Aaron Trowbridge**, Aditya Bhardwaj, Kevin He, David I. Schuster, and Zachary Manchester

Projects

Superconducting Quantum Devices

- Extracted device parameters from spectroscopic data using Python and built simulations of Josephson Junction circuit dynamics in Julia advised by Prof. Britton Plourde.
- Simulation code can be found here.

Quantum Computation

- Implemented a custom quantum gate programming language and virtual quantum processor, in Julia.
- Code can be found here.

Monte Carlo Methods for Lattice Quantum Gravity

- Developed a novel rejection-free variant of the Metropolis algorithm specially designed for dynamical triangulation simulations of quantum gravity, advised by Prof. Jack Laiho and Prof. Walter Freeman.
- A recorded talk I gave can be found on youtube, a short blog post can be found here, and a GitHub repo here.

Deep Generative Models

- Implemented generative adversarial networks (GANs) for image generation from scratch in Julia using Flux.jl.
- Conducted additional research on conditional GANs and various types of variational autoencoders (VAEs).
- Code can be found here and a blog post here.

Additional Information

Programming: Julia, Python, SQL, AWS, Git, LaTeX
Hobbies: Reading, Chess, Snowboarding, Surfing, Skateboarding, Horseback Riding, Hiking