Zackary Jorquera

Ph.D. Student at UCSC

Personal Information

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Education

09-2022 - Current **Doctor of Philosophy**, *University of California Santa Cruz*, Theoretical Computer Science
Advised by Prof. Alexandra Kolla

08-2018 - 05-2022 **Bachelor of Science in Computer Science**, *University of Colorado at Boulder*, Thesis Title: "Quantum Approximate Optimization Algorithm with Local Max-Cut", Graduated Summa Cum Laude
Minors: Double minors in Applied Mathematics and Pure Mathematics

Research

08-2020 - 05-2022 **Quantum Computing Thesis**, *Alexandra Kolla*, With Committee: Joshua Combes, Joshua Grochow, Steven Kordonowy
I helped researching quantum supremacy with the Quantum Approximate Optimization Algorithm (QAOA). We were looking at if a quantum computer can find locally optimal solutions to the NP-hard optimization problem, max-cut, better than classical computers.

05-2021 - 08-2021 **Software Research Assistant**, *Prof. Jed Brown*
Worked to make rust-lang bindings for the scientific computating library PETSc. This consisted of systems-level FFI Rust code. Much of which was done individually. However, future work was done after I left the project.

Teaching

Teaching Assistant, *University of California Santa Cruz*
- Computer Systems and C Programming - CSE 13S (Fall 2022)

Undergraduate Course Assistant, *University of Colorado at Boulder*
- Linear Algebra with Computer Science Applications - CSCI 2820 (Spring 2021)
- Linear Algebra with Computer Science Applications - CSCI 2820 (Fall 2020)
- Computer Systems - CSCI 2400 (Spring 2020)
- Computer Systems - CSCI 2400 (Fall 2019)

Work Experience

Summers 2019, 2020, 2022 **Software Engineer Intern**, *Boulder Imaging Inc.*, Computer Vision
Most recently, I worked on Computer Vision solutions assessing the quality of US bills to be used in the bill sorting machines in the US federal reserve. Previously, I worked to train neural networks to identify endangered bird in wind-farms.

Projects And Extracurricular

The complexity of solving an NxNxN Rubik's Cube

I wrote a paper on the complexity of solving an NxNxN Rubik's cube both optimally and approximately. This included showing that the optimal case in NP-Hard and conjecturing that the approximate case was APX-Complete.

PCA Handwritten Number Detection

In a group of four, we used principal component analysis to identify handwritten numbers from the MNIST dataset with a test error rate of 13.34%, do lossy compression on the handwritten numbers, and identify different audios from an audio dataset.

Fourier Series/PDE Project

In a group of three, we explored different ways to model the propagation of voltage in a neuron using the cable equation. My work focused on the traveling wave solution between the bistable, active and inactive states. This allowed us to convert to an ODE and solve analytically.

3rd Place Overall all for HackCU, *For HackCU VI and HackCU 007*

In a group of four, we won 3rd place for two on the HackCU events.

- **Vido (For HackCU VI)**, It's video but shorter. It takes a 20 (ish) minute video and produces a 2-minute, summarized version using a variation on the knapsack problem. We won 3rd place overall in Hack CU VI.
- **Legal-Ease (For HackCU 007)**, Summarizes and simplifies legal documents into a short and more easily readable documents using machine learning and other techniques. We won 3rd place overall in Hack CU 007.

section.io Article Writer, https://www.section.io/engineering-education/authors/zack-jorquera/

I wrote five articles on a variety of topics, such as low-level programming, parallel programming, and computer vision algorithms.

2021 Putnam

I took the 2021 Putnam and scored a 4, which tied for third place overall at CU Boulder.

For Fun

Whitewater Kayaking — I got into whitewater kayaking during my undergrad. Since then, I have done Colorado classics such as Gore Canyon and Bailey Canyon. Both are class 5 stretches of water. In California I ran the Tobin section on the NF Feather (class IV-V-).

Skiing — I've skied my whole life in ski resorts throughout Colorado. During college, I also started backcountry skiing. Last season I did a Colorado front range classic, Dragontail Couloir. And this year I did Silvers Couloir, one of the 50 Classic descents of North America.

Skills

Programming Languages — Rust, C/C++, Python, Assembly, MatLab

General — Leadership, Teamwork, Communication, Problem Solving

Zackary Jorquera, 10/17/2022, Santa Cruz