Aryan M. Pour

Education

University of California, Los Angeles

Double major: Physics (BS) | Computer Science & Engineering (BS)
Cumulative GPA: 3.7/4.0
Expected graduation: June, 2026

Research Experience

Research Intern, Munich Center for Quantum Science and Technology
Munich, Germany
Summer 2024

- Conducted research on entanglement-breaking quantum channels with Professor Dr. Robert König's group, under the direct supervision of Dr. Zahra Khanian
- Utilized abstract algebra and semigroup theory to formulate and analyze rigorous mathematical proofs for key theorems in quantum information theory, contributing to a deeper understanding of quantum dynamical (Markovian) systems
- Collaborated with a multidisciplinary team to explore the implications of entanglement-breaking channels on quantum communication protocols.
- Presented findings at a poster symposium, effectively communicating complex concepts to an academic audience

Lab Experience

Muon Capture ($\mu^- + p^+ \rightarrow \nu_\mu + n^0$) Laboratory
UCLA, supervised by Professor Rene Ong
Winter 2025

- Plateaued muon counters consisting of organic scintillator and photomultiplier tube configurations
- Wrote theory section of report, underlining quantum-field-theoretical foundations for muon capture. Appealed to theorems and conventions native to quantum electrodynamics

Honors and Awards

Dean's Honour List, 2023, University of California, Los Angeles

British Columbia Excellence Scholarship, 2022 Province of British Columbia, Canada

District Authority Scholarship for Applied Design, Skills, and Technologies, 2022 Province of British Columbia, Canada

World Championship Contender, 2020, Vex Robotics Competition

Graduate Coursework

Quantum Information and Computation: Markovian systems and the Lindblad master equation, spin echo, GHZ states, interaction-picture Hamiltonians, rotating wave approximation, quantum algorithms, spin squeezing. Scored 90% for project on probing entanglement in quantum many-body systems.

Relevant Undergraduate Coursework

Quantum Mechanics: Dirac notation, Schrödinger's equation (1D, 3D), quantum harmonic oscillator, spinors and spin operators, total angular momentum, dipole transitions, parity, Noether's equation symmetric/antisymmetric spin spaces, quantum conservation laws

Atomic, Molecular, Optical Physics: Bloch sphere representation of two-level system, Rabi flopping, optical tweezers and lattices, Stark effect

Electrodynamics: local gauge invariance, special relativity (including pseudo-Riemannian manifolds and the hyperbolic metric of spacetime), rigorous treatment of Maxwell's equations, potential-based formulation of E&M, waves

Analytic Mechanics: Lagrangian and Hamiltonian mechanics, linear and nonlinear oscillations, calculus of variations, non-inertial reference frames, relativistic Lagrangian mechanics

Computer Systems: x86-64 assembly, MIPS assembly, parallel programming, computer architecture, elementary topics in operating systems, boolean algebra, Karnaugh maps, combinational and sequential logic, logic diagrams

Data Structures and Algorithms: overloading, inheritance, polymorphism, algorithm analysis, trees, graphs, stacks, queues, lists, searching and sorting

Systems and Signals: Laplace/Fourier transforms, system functions, linearity, time-invariance, frequency & impulse responses, superposition and convolution integrals

Software Construction: fundamentals of tools and environments for software construction, open-source platforms

Relevant Projects

Quantum MaxCut Simulation

- Conducted survey of current literature surrounding quantum approximate optimization algorithms, including papers by Edward Farhi (et al.), Leo Zhou (et al.)
- Programmed simulation of quantum maxcut (in C, with no external libraries), including code representations of qubit states and superpositions thereof. Simulation outputs match solutions computed on classical computers
- All test cases were solved in *O(n)* time, beating best-case classical approximations (which are at best polynomial in time)
- Supported code with rigorous hand-completed derivations based on theorems presented in aforementioned papers. Said derivations were included in my project writeup

Computer Processor Design

- Prototyped TTL logic circuits for design of original computer processor using *Logisim: Evolution* software
- Programmed and simulated said logic in *ModelSim*. All possible test cases were completed successfully prior to CAD
- Utilized CAD software (*KiCAD*) to design transistor configurations and accompanying logic on PCB board, which was sent to be manufactured

.ASP

- Designed and implemented custom assembly programming language
- Produced original lexical analysis and parsing algorithms. Used formal language theory to create custom instruction set architecture
- Emulated computer memory and register file, including *%rip* register capable of emulating instruction execution

hydrogenproject.ca

- Developed a dynamic website which computes the wave function for an electron in a hydrogen atom based on such user inputs as the *n*th excited state, order of the legendre polynomial, etc.
- Utilized Flask framework to implement automated calculations within a Python backend and dynamically update website with results in real-time
- Integrated Matplotlib library to graph probability density of the various wave functions directly from the Python backend

Relevant Teams/Programs

UCLA Formula Racing - Society of Automotive Engineers Competition
Role: Aerodynamics and Composites Team Member

- Demonstrated expertise in carbon-fiber manipulation techniques, including proficient carbon-fiber layups, which played a pivotal role in the manufacturing process of the car's rear wing
- Took an unofficial leadership role within the team by leveraging extensive knowledge in power tool usage, often spearheading tasks that required specialized power tools, ensuring precise and efficient fabrication processes

- Collaborated with the subteam lead in executing the aerodynamics experimental validation process, employing airflow visualization techniques to meticulously collect and analyze data on the car's aerodynamic efficiency
- Contributed to team's 10th place finish at year-end international competition with over 200 other teams

West Vancouver Premiere Mechatronics Robotics Academy
Role: Lead Programmer for Team 1010H

- Co-developed autonomous driving program (C++) that took controller inputs from human driver and replayed them autonomously in competition. Code was presented to panel of engineer judges who claimed the innovation contributed greatly to our team winning Amaze Award at the Provincial Championships
- Employed iterative design process to improve accuracy of in-match replaying portion of program, integrated LIDAR and photoelectric sensors, as well as PID controllers into the autonomization process
- Collaborated with 2 other team leads to prototype, 3D model, and physically construct VEX EDR robot. Team was awarded 2 Create Awards and 3 Build Awards across various region-wide tournaments for unique designs. Earned Excellence Award at local tournament for competition success rate
- Taught junior teams C++ programming, maintained GitHub page for public access to my code (https://github.com/aryanmp16)

Invited Presentations

On entanglement-breaking properties of quantum dynamical semigroups, 2024.
Delivered in the Max Planck Institute for Quantum Optics

On the Rapidly Growing Socioeconomic Divide Within Canada's Middle Class, 2020.
Delivered in the Canadian House of Commons (Parliament)

For cross-borders purposes:

- Citizenship: Canada
- Primary place of residence: Vancouver, British Columbia, Canada
- Place of study: Los Angeles, California, United States of America