Reid Andrew Vorbach

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Education

IBM: Qiskit Summer School   **August 3 2022**
Certificate, Qiskit-Quantum Simulations   Virtual

- Circuits programming, Complexity Theory & Optimization problems, Noisy simulations, Superconducting Qubit/hardware specific encoding

University of Wisconsin-Madison   **December 2021**
M.S., Physics-Quantum Computing   Madison, Wi

- **Intro & Advanced Quantum Computing Lectures**: fault tolerance/decoherence, quantum information theory, quantum error correction & error mitigation, quantum circuits & circuit optimization, physics behind the major platforms, algorithms, and mathematic foundations to quantum computing in 11 two-week long assignments; **Final research project:** LaTeX paper; **experimental simulation** qubit evolution coupled to external markovian/telegraph noise (theoretical **open quantum system models**)

- **Applied Optics, Electronics, Quantum Computing Lab:** **27 experiments**; Op-Amp configurations, SAR and Tracking ADC design, Sequential & Computational logic, **Altera/Quartus II FPGA board programming**, high power lasers, mirror & lens alignments, amplification in fabry-perot cavity scheme, optical fibers & coupling, SPCMs, michelson interferometry set ups, Pulsed NMR analysis for T1 & T2 values, Bell Inequality photon-photon entanglement, Stern-Gerlach sampling of spin up & down particles. **Final Qiskit research project:** LaTeX paper; programmed the **Quantum Teleportation Protocol** directly on IBM cloud, redesigned the protocol to run on real hardware as well as performed error data analyses in studying protocol performance

St. John's University   **May 2019**
B.S., Physics   Jamaica, Queens, NY

Experience

Graduate Researcher   **June 2020 – Present**
Madison, Wi

- **Fault tolerance/Error correction research (Open Quantum Systems)**; Principal Investigator: **Professor Robert Joynt**
- Analytically derived mathematical models of solid-state qubits in open quantum systems using a 'Transfer Matrix Method' (https://doi.org/10.1142/S0217979211100990)
- Developed the code for the method as well as formulated boundary conditions for Transfer Matrix input parameters, for studying short term decoherence behavior
- Discussed findings in one-on-one settings as well as submitted research reports
- Simulated theoretical test cases as well as predicted T1 Relaxation times from an experimental publication's set up (https://doi.org/10.1038/nature02693)
- Investigated Gerschgorin-Circle theorem's applicability in research through modifying our analytical solutions and developed software code
- Self-taught necessary advanced physics and math material under guidance of PI

Teaching Specialist (Physics 1&2)   **September 2021– May 2022**
Madison, Wi

- Led, organized and instructed 6 discussions, 3 labs classes weekly of 25 students each
- Routinely prepared, demoed, troubleshooted labs before scheduled classes in preparation for teaching
- Worked through listed problems/concepts, collectively as a class, in front on a chalkboard
- Reported section's progress weekly to professors as well as worked in tandem in preparation for future teaching strategies on upcoming material
- Regularly mediated **collaborative team environments** when teaching and troubleshooting labs
- Guest lectured on 'Heat and Calorimetry', 3 times, in front of 100-150 students

- Guided students individually, for homework and quiz assignments, during 4hr of weekly office hours
- Organized & prepared several 2hr review sessions for exams as well as ran and set up make up labs
- Required ability to communicate intro physics/math concepts and develop strong interpersonal skills
- Graded weekly lab reports and discussion sheet problems

Undergraduate Research Assistant   April 2017 – May 2019
Jamaica, Queens, NY
- Material science/optics research; Principal Investigator: **Professor Charles Fortmann**
- Assisted in the initial design of the 'optical refrigerating' medium through investigating candidate materials and their properties within several groups
- Worked in groups of 5 as well as communicated findings in weekly research meetings
- Author in **two publications** found in SPIE journals as well as helped edit 2019 publication
- **Lead Poster Designer/Presenter** for the 2019 SJU Research fair

"Mini Solar Panel Charger" Workshop leader   March 2018
Jamaica, Queens, NY
- Led 3 groups of 4 volunteers in assembling 30 mini solar panel chargers along with other 'Society of Physics Student' leaders
- Taught basic soldering and circuitry skills to undergraduate student volunteers
- Guided and Instructed groups in a fast-paced dynamic environment
- https://www.stjohns.edu/about/news/2018-06-05/stem-students-build-solar-cell-panels-puerto-rico

Student Tutor (self-employed)   June 2018 – May 2019
Jamaica, Queens, NY
- Tutored high school students and undergraduates in individual 1-hour sessions
- Subject areas: Introductory Physics & Biology, Pre-Calculus, American History, and SAT prep

Skills

- Laboratory Skills: Troubleshooting, Oscilloscope, Function Generator/RF generation, Breadboard, Laser beam alignments, fiber optics, optical bench, Focal Length & Plane measurements, **Altera/Verilog (FPGA-programming)**
- Software Skills: **Python**, Mathematica, **Qiskit**, LaTeX, Microsoft Office, Zemax, SPICE, Matlab
- Strong Experience in designing, assembling, aligning electronic, optical, and quantum systems
- Solid State physics, Thermal and Statistical mechanics, Quantum Mechanics, Atomic Physics
- **Data Analysis** & experienced in tracking trends from data sets in experimental settings
- Ability to learn new technical skills, in order to accomplish time restricted tasks
- Highly self-motivated with strong curiosity and desire to learn
- Well experienced in **c**ollaborative team settings from excelling in over 20 lab-group projects
- Highly organized and quick thinking from managing fast-paced undergraduate physics labs
- Proven capacity to be adaptive and innovative for employing problem solving skills
- History of effective communication skills from strong remarks across 2 semesters of teaching
- Ability to organize, prepare, and present technical documentation

References

- Robert Joynt (Graduate Advisor)   rjoynt@wisc.edu
- Charles Fortmann (Undergraduate Advisor)   fortmanc@stjohns.edu
- Daniel Thurs (worked under as a 'Teaching Specialist')   dpthurs@wisc.edu