Deval Deliwala

Berkeley, CA — devaldeliwala@berkeley.edu — (480) 734-9235 — LinkedIn — Github — Website

Education

B.S. Astrophysics with Mathematics Minor *Aug 2022–May 2026*
University of California, Berkeley. GPA: 3.670.

Employment

Undergraduate Researcher *Fall 2022–Present*
Under Professor Jessica Lu, Head of Astronomy *Galactic Center Group*
Moving Universe Lab (muLab), UC Berkeley

- Developed extensive code and statistical models for analyzing Red Clump stars in the Galactic Center.
- Derived my own extinction law for the Galactic Center via Red Clump analysis.
- Developed and implemented code used in research for coordinate transformations on JWST catalogs of various infrared and near-infrared wavelengths.
- Utilized data science skills with Astropy, SciPy, NumPy, Pandas, Matplotlib, Mathematica, and SAODS9.
- Worked closely alongside researchers from UCLA and UCSD's Starclusters Group.
- Authored and presented research findings. Wrote extensive documentation using LaTeX.
- **Research paper pending publication.**

Personal Projects

Hypersphere-based Quantum Image Encryption *Current, Summer 2024*
On Github – Github

- **Developed a novel image encryption algorithm** that *vastly* reduces the qubit-requirement relative to other modern methods
- **Reversibly Represents 2^n pixels via an $n-1$ dimensional wave function** via storing the (r,g,b) information on a 2^n dimensional hypersphere of radius 1.
- **Scrambles** the wave functions via an algorithm to generate large-depth quantum circuits
  - Afterwards generates mixed-states by weighting together the outputted pure states using their probabilities generated via spectral/eigendecomposition
  - Further sorts/scrambles the outputted mixed state density matrices via their **von neumann entropy**
  - Stores the pure states of least probability for measuring each mixed state, and converts them back into 2^n dimensional wave functions
- Reconstructs 2^n dimensional vectors from the outputted scrambled 2^n dimensional wave functions
- Using a 2^n dimensional hypersphere that was generated via radial basis function interpolation to store a smoothed-out gaussian mesh of all possible pixel values and finally generates the encrypted image based on which pixel values on the hypersphere the scrambled 2^n dimensional vectors point to.

Creating Elegant Math & Physics Videos *Fall 2023*
On my YouTube Channel – YouTube

- Developing Python scripts using *Manim* (3blue1brown's Mathematical Animation Engine).
- Animating videos to facilitate learning in Quantum Computing.
- I hope to continue this work and reach a broader audience soon.

Avid Tesla Coiler *Fall 2020–Present*
Since Highschool – Video

- Built a 400kV Tesla coil in my backyard, demonstrating a deep understanding of high voltage E&M.
- Constructed a demo fusor using the principles of inertial electrostatic confinement.
- Passionate about hands-on experimentation and advancing practical skills in electromagnetic systems.

IBM Qiskit Tutorials *Summer 2024*
On my website – Qiskit Tutorials

- Authored extensive and detailed tutorials on IBM Qiskit.
- Tutorials are hosted on my personal website and have been used by over 100 individuals.
- Focus on making quantum computing concepts and software accessible and understandable through clear, comprehensive guides with exercises every lesson.
- Dedicated to advancing education and knowledge in the fields of quantum mechanics and computing.
- Also currently writing a textbook on Quantum Mechanics, alongside university coursework & classes.

Quantum Mechanics Textbook *Summer 2024*
Compiling Quantum Mechanics Notes into a Textbook –

Languages & Relevant Coursework

Languages: Python (Advanced), Qiskit (Pending Certification), Java, Mathematica, LaTeX(Advanced)
Relevant Coursework: Physics 137A – Quantum Mech. Math 53/89/121A (Mathematical Methods). Physics 5A/5B/5C (Mechanics, E&M, Thermodynamics), 5BL/5CL (Labs). Physics 189 – ML (Coming Fall).

Certifications

- IBM Basics of Quantum Information
- IBM Practical Introduction to Quantum-Safe Cryptography
- IBM Quantum Challenge 2024 Achievement