Daniel Mandragona

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Education

Texas A&M — College Station, TX
Masters in Mathematics *GPA: 3.93* — August, 2022 - December, 2024

- **Qualifying Exams Passed**: Real Analysis and Topology/Differential Geometry.

University of Central Florida — Orlando, FL
BS Mathematics; Concentration in Computational Sciences — August 2013 - May 2018

- Honors in the Major; *GPA: 3.71*

Quantum Information Science Summer School — Oak Ridge National Laboratory, TN
Focus on topological quantum computation, and quantum software tools. — July 2024

Work Experience

Google — Mountain View, CA
Software Engineer — Aug. 2024 - Present & 2018 - 2022

- Developed Certificate Authority infrastructure.
  - Learned and implemented multiple RFC protocols including the ACME protocol (RFC8555), and several security best practices.
  - Analyzed and developed performance testing frameworks & integration tests in order to secure our infrastructure in preparation for its public release.
  - Found & reported a critical bug in Go/Crypto's DSA public key implementation that would allow for arbitrary DoS attacks against any of its users (Golang's official announcement).
- Developed an ML pipeline for Image Saliency Prediction, and implemented state of the art metric functions.
- Built infrastructure for Abuse Detection in the Google Play Store.

FermiLab — College Station, TX
Research Collaborator — May 2024 - October 2024

- Researched quantum error correcting spherical codes for qudits, simulating them in Python using QuTiP, and benchmarking their error performance across various noise models.

Texas A&M's Department of Mathematics — College Station, TX
Teaching Assistant — August 2022 - August 2024

UCF's Department of Computer Science — Orlando, FL
Teaching Assistant for CS1 — August 2017 - May 2018

Skills

Course Work:	Quantum Algorithms, Spectral Theory for Schrödinger Operators, Real Analysis sequence, Probability Theory, Physics for Mathematicians, Functional Analysis, Differential Geometry sequence, Algebra sequence
Programming Languages:	Python, C++, Golang, Qiskit, MATLAB, C, Java, Mathematica, SQL

Presentations

Berry Phase & Chern Numbers
Master's Presentation, TAMU. (November 2024). Mathematical foundations of Berry phase and Chern numbers, including their gauge invariance, discrete and continuous formulations, and applications in condensed matter physics. Implemented numerical methods to compute Chern numbers for topological systems, reproducing results from published research..

Quantum Markov Chains
Quantum Algorithms, CSCE 640 - TAMU. (November 2023). Presented basic theory of Markov chains, and how the proposed Quantization scheme outlined by Szegedy leads to a quadratic speedup in convergence to the stationary distribution over the classical version. This presentation was a portion of my term paper which also includes a description of the quantization of the Monte Carlo Metropolis-Hastings algorithm.

Weyl Quantization Lecture
Topics in Physics for Mathematicians, MATH 689 - TAMU. (December 2023). Presented the mathematical theory outlined by Brian Hall in Quantum Theory for Mathematicians for converting classical phase-space

$L^2(\mathbb{R}^{2n})$-observables to be self-adjoint operators on a quantum Hilbert space. My full write-up including some extra proofs not in Hall can be found here.

Visual Saliency Prediction
Perception Research Showcase, Google. (March 2019). Presented the topic of image saliency and its motivations, and the ML infrastructure my team used for prediction and evaluation. For more information on image saliency please see salicon.net/explore.

Functional Programming
Engineering Residency Program, Google. (October 2018). Taught my Engineering Residency cohort about functional programming fundamentals such as functors and monads in the context of the Haskell programming language.

Hopf Bifurcation Analysis in Chemical Reactor Model
Showcase of Undergraduate Research Excellence, University of Central Florida. (April 2018). Conducted Hopf bifurcation research in a system of ODEs arising from a chemical reactor model. Done under the guidance of a professor in the UCF Mathematics department, and using Mathematica software to perform the necessary symbolic computations for this analysis.

Publications

S. Roy Choudhury and Daniel Mandragona. "A Chaotic Chemical Reactor With and Without Delay: Bifurcations, Competitive Modes, and Amplitude Death." In: Int. J. Bifurc. Chaos (2019)