

# DANIEL MANDRAGONA

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## EDUCATION

### Texas A&M

Masters in Mathematics *GPA: 3.93*

College Station, TX

August, 2022 - December, 2024

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

### University of Central Florida

BS Mathematics; Concentration in Computational Sciences

Orlando, FL

August 2013 - May 2018

- Honors in the Major; *GPA: 3.71*

### Quantum Information Science Summer School

Focus on topological quantum computation, and quantum software tools.

Oak Ridge National Laboratory, TN

July 2024

## WORK EXPERIENCE

### Google

*Software Engineer*

Mountain View, CA

Sep. 2024 - Present & 2018 - 2022

- Developed Certificate Authority infrastructure.
  - Server migrations off of bespoke deployment environments onto shared compute spaces without dropping security posture. New services running with latest server frameworks and health monitoring.
  - Performance optimizations and productionization of third party DNS library in C.
  - On-call experience: Tended to rollouts, triaged outages, and responded to customer requests. Carried out the CA WebTrust audit at Oklahoma datacenter.
  - 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 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](#)).
- Quantum Computing 20% project in device modeling & optimization.
  - Unsupervised learning for TLS prediction.
  - TLS thresholding and metric construction.
  - Dashboard improvements for TLS visualization.
- 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

*Research Collaborator*

College Station, TX

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

*Teaching Assistant*

College Station, TX

August 2022 - August 2024

### UCF's Department of Computer Science

*Teaching Assistant for CS1*

Orlando, FL

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.

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## 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)