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Charlie Ruppe

Education

2022-2026

Carleton College Bachelor of Mathematics Cumulative GPA: 3.75/4.0 Major GPA: 4.0/4.0

Relevant Coursework: **(Conducted in English)**

- Intro to Computational Algebraic Geometry (Gröbner Bases, Elimination Theory, Mathematica) A
- Abstract Algebra (Groups, Rings, Fields, with final paper on Exact Sequences) A
- Topology (Classification of Covering Spaces, Seifert-van Kampen, Homology Groups) A
- Advanced Linear Algebra (SVD, QR, PCA, MATLAB, Conditioning, Numerical Stability) A
- Computational Mathematics (Linear Programming, Simplex Algorithm, Julia, JuMP) A
- Atomic and Nuclear Physics (Quantum Mechanics, Radiative Decay, Material Properties of Solids, Lab) A-
- Electricity and Magnetism (Maxwell's Laws, DC and AC Circuits, Lab) A
- Programming Languages (Scheme, C, parsing, memory allocation algorithms) A
- Real Analysis (In-progress)

September 2024-December 2025

Budapest Semesters in Mathematics Graduated with Honors

Relevant Coursework: **(Conducted in English)**

- Quantum Logic and Quantum Probability (Spectral Calculus, Dense-coding, Shor's Algorithm) A
- Functional Analysis (Hahn-Banach, Uniform Boundedness, Resolvent and Spectrum) A
- Commutative Algebra and Algebraic Geometry (Modules, Categories, Projective Varieties) A+
- Conjecture and Proof (Axiom of Choice, Banach-Tarski Paradox, Hamel Bases, All Student Presentations) A

Research Experience

June 2024-August 2024 (to be resumed)

Geometry of Numbers Research with Dr. Corey Brooke cbrooke@carleton.edu

In-progress research on organizing integer solutions of quadratic forms as trees parameterized by matrix representations of free groups. Paper in-progress written by me and fellow student Alex Lattal, overseen by Dr. Corey Brooke. To be resumed on returning to Carleton College.

June 2023-June 2024

Mesoscale Magnetic Research with Dr. Barry Costanzi bcostanzi@carleton.edu

- Modeled energy landscapes of 250nm permalloy dots in Golang/Python to solve inverse problem
- Implemented system for managing simulations using Github
- Assembled and operated our sputtering system, for depositing metal features used in experiments
- Processed samples, wrote LabVIEW code for measurement taking
- Used a scanning electron microscope to image our samples for computer simulations

Results given in a poster session: "Magnetic Configurations in Mesoscale Magnetic Dots" Student Research and Internship Symposium. Carleton College, Northfield, MN, October 2023.

Activities

September 2023-current:

Algebra Club

- Student-led club for giving talks and doing readings.
- I have given talks on topics such as Polynomial Factorization in Cyclic Redundancy Checks, Combinatorial Game Theory, and Clifford Algebra.

September 2023-current

President of Carleton College Problem Solving Club

- Competition Math preparation (eg. for Putnam and regional competitions)
- Compile problems, guide, and organize meetings
- President since September 2023, member since 2022.

September 2023-June 2024

Math Teaching Assistant/Grader at Carleton College

Lead collaborative study sessions for Calculus II and graded for Computational Mathematics (in Julia).

Relevant Skills

- Python, Julia, MATLAB, Mathematica, LabVIEW, C, C++, and Java.
- SEM (electron microscope).
- Native Fluency in English
- Intermediate German
- Extracurriculars: I swim and dive for my college's varsity team, and live in the Culinary Interest House on campus.