# Ryan Anselm

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## EDUCATION

**Columbia University**                                         2021 - 2024
*B.S. in Computer Science (Foundations Track), Magna Cum Laude*        *GPA:* 4.05/4.33

- Minors in Applied Math and Applied Physics
- Selected coursework: Quantum Computing, Computational Learning Theory, Unconditional Lower Bounds & Derandomization, Advanced Algorithms, Functional Analysis, Quantum Optics

## RESEARCH EXPERIENCE

**Summer Research Assistant, Flatiron Institute**            May 2024 - Aug. 2024
*New York, NY*

- Investigated quantum-inspired classical methods to compress and transform continuous-variable multivariate functions using tensor networks at the Flatiron's Center for Computational Quantum Physics.
- Designed and implemented algorithms for tensor network construction, optimization, and function approximation in Julia.

**Columbia Quantum Computing Theory Group**                Aug. 2023 - May 2024
*New York, NY*

- Studied complexity-theoretic lower bounds for hybrid digital-analog quantum computation under the supervision of Prof. Henry Yuen.
- Investigated architecture-aware quantum circuit compilation for reconfigurable neutral atom quantum computers.

**Summer REU Student, Learning the Earth with AI and Physics**      June 2022 - Aug. 2022
*New York, NY*

- Developed neural network-based ML models to emulate cloud microphysics in atmospheric models, achieving comparable accuracy to traditional bulk/bin numerical simulation techniques, as measured by MSE.
- Leveraged Python ecosystem (NumPy, PyTorch, Scikit-learn, SciPy, Xarray) to implement and evaluate ML models, culminating in a presentation at the 2022 American Geophysical Union Fall Meeting.

**Freshman Research Initiative Fellow, Henkelman Group**      Jan. 2021 - Aug. 2021
*Austin, TX*

- Developed algorithms to efficiently locate charge density saddle points corresponding to chemical bonds in molecular datasets as part of <u>Bader</u>, a computational charge analysis code written in Fortran.

## PROFESSIONAL EXPERIENCE

**Teaching Assistant, Columbia Department of Computer Science**      Sept. 2022 - May 2024
*New York, NY*

Led office hours, graded assignments, and contributed to course content for:
- COMS 4232: Advanced Algorithms (Spring 2024)
- COMS 4281: Intro to Quantum Computing (Fall 2023)

· COMS 3261: Computer Science Theory (Spring 2023)
· CSOR 4231: Analysis of Algorithms I (Fall 2022)

### Software Engineer Intern, Salesforce
May 2023 - Aug. 2023
*San Francisco, CA*

· Engineered cross-platform marketing integrations for Salesforce Data Cloud, connecting major social media platforms like Snapchat and LinkedIn to streamline multi-channel campaign management for customers.
· Leveraged Java, Spring Boot, SQL, and Docker to execute and optimize key technical changes across the Salesforce Data Cloud infrastructure.

## ACTIVITIES & SERVICE

### Seminar Co-Organizer, Columbia Undergraduate Learning Seminar in Theoretical CS

· Led and organized a Spring 2024 undergraduate reading group on quantum complexity theory with 8 weekly talks, covering topics such as hardness results for shallow quantum circuits, stabilizer circuit simulation, and the quantum PCP conjecture.
· Gave presentations in other semesters on spectral graph theory, randomized complexity classes, and semidefinite programming for MAX-CUT approximation.

### Mentee, Columbia Mathematics Directed Reading Program

· Explored percolation theory and its connections with statistical physics with a graduate student mentor.

### Co-President, Columbia University Science Olympiad

· Founded and led a team of 12 to organize a day-long Science Olympiad tournament for 400+ high school students, managing a $2000+ budget, coordinating 75 volunteers, and liaising with 29 teams.
· Wrote 12 Science Olympiad tournament tests as an event supervisor for Columbia, MIT, UT Austin, UPenn, and UPitt invitationals, as well as the 2021 national tournament.

## PUBLICATIONS & PRESENTATIONS

**R. Anselm**, R. Levy, and J. Tindall. *Quantum-inspired tree tensor network methods for compression and transformation of multivariate functions.* American Physical Society March Meeting, Oral Presentation. Expected March 2025. In Submission.

**R. Anselm**, K. Lamb, H. Morrison, S.P. Santos, and M. van Lier-Walqui. *Machine learning optimal prognostic moments for single-category cloud microphysics parameterizations.* American Geophysical Union Fall Meeting, Oral Presentation. December 2022.

P. Chowdhury, R. Dasgupta, P.R. Phelps, C-T.A. Lee, and **R. Anselm**. *Partitioning of chalcophile and highly siderophile elements (HSEs) between sulfide and carbonated melts – Implications for HSE systematics of kimberlites, carbonatites, and melt metasomatized mantle domains.* Geochimica et Cosmochimica Acta 305:130-147. 2021.

## AWARDS

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| 1st Place, 2024 MIT iQuHack Quantum Hackathon | 2024 |
| Tau Beta Pi Junior Inductee | 2023 |
| Top 500 scorer, William Lowell Putnam Mathematical Competition | 2022 |
| USA Physics Olympiad Semifinalist | 2020 |
| United States National Chemistry Olympiad High Honors | 2019, 2020 |
| USA Computing Olympiad Gold Division | 2019 |