

Emily Cairncross

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Proactive and curious PhD candidate in graph theory with extensive data analytics and machine learning experience, ability to learn new techniques quickly and deeply, and track record of delivering high quality results in multiple fields. Excels at both quantitative analysis of complicated information and consolidation of big-picture narrative to drive business decisions and stay on the cutting-edge. Passionate about communicating technical ideas to audiences of all levels and working with teams to set clear objectives and solve complex problems effectively and efficiently.

SKILLS

Coding skills: Python (including multi-package implementation), SQL, C++, Java, Mathematica, LaTeX, MS Office Suite

Technical skills: Machine Learning, Statistical Analysis, Data Modeling, Optimization, Forecasting, Algorithms, PCA

Soft skills: Collaboration, Leadership, Organization, Conflict Resolution, Time Management, Research, Communication

PROJECTS

Chicago CTA Ridership | Data Science Boot Camp | The Erdős Institute | May 2025 – August 2025

- Used Triple Exponential Smoothing and Rolling Averages to predict Chicago bus ridership recovery post-COVID
- Results inform how current Frequent Bus Network could expand to return ridership and other KPIs to historic levels

Sedimentary Basin Geothermal Power | Modeling & Analysis Intern | Carbon Solutions LLC | June – July 2023

- Analyzed sedimentary basin data from Sequestration of CO₂ Tool (SCO2T^{PRO}) and generalizable GEOthermal techno-economic simulator (genGEO) using Python packages matplotlib, pandas, seaborn, and more
- Highlighted **practical tradeoffs** between cost-efficiency and land-efficiency of CO₂ geothermal power options

Airplane Boarding Simulation | Data Science Trainee | INMAS | October 2022 – February 2023

- Built airplane boarding simulation in Python and presented results on efficiency and practicality of strategies

WORK EXPERIENCE

Teaching Assistant | UIC | Chicago, IL | August 2021 – Present

- Programming Tools and File Management (**Python**), Intro to Data Structures (C++), **Finite Math for Business**

Modeling & Analysis Intern | Carbon Solutions LLC | June – July 2023

- Presented findings of above project to entire company and published in *Frontiers in Energy Research* as first author

Extremal Combinatorics Research Assistant | UIC | Chicago, IL | May 2022 – July 2025

- Analyzed connections between local and global structure in networks
- Generalized results of previous paper to both colored and ordered analogs, corrected a significant error in a published paper, and published results in *SIAM Journal on Discrete Mathematics*

LEADERSHIP

Graduate Student Organization Treasurer | UIC | Chicago, IL | May 2024 – January 2025

- Planned budgets, advised leadership team on financial responsibility, delivered 100+ prompt reimbursements for approved organizational spending, managed Quickbooks, and tracked receipts for annual financial review
- Facilitated efficient, productive, and positive meetings as member of leadership

Mathematics Graduate Students Association Co-President | UIC | Chicago, IL | May 2022 – May 2023

- Acted as liaison between graduate students and department, organized weekly graduate student research seminar, and coordinated weekly Math Teas for graduate students, faculty, and staff to support department connection

EDUCATION

PhD in Mathematical Computer Science | University of Illinois at Chicago (UIC) | Chicago, IL | Expected May 2026

- Related coursework: Theory of AI, **Mathematical Foundations of Data Science**, Combinatorial Optimization

BA in Mathematics | Oberlin College | Oberlin, OH | May 2021

- GPA: 4.09/4.0, Minors: **Computer Science**, Linguistics, Hispanic Studies, Religious Studies