Alec Helm

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Education

(Current)	Ph.D Student in Mathematics
	University of South Carolina, Columbia SC
(Aug 2019)	B.A. in Mathematics and Philosophy *magna cum laude*
	University of Pennsylvania, Philadelphia PA

Career Objective

My current research under advisement of László Székely and Éva Czabarka is focused on topics in extremal combinatorics. At present we are working on a project of categorizing k-crossing critical tanglegrams with extensions to other extremal questions on these structures. I am more generally interested in problems related to graph drawings and crossing number problems, as well as problems in computation and information theory.

Preprints

Helm, Alec, Ann S. Blevins, and Danielle S. Bassett. "The growing topology of the C. elegans connectome." arXiv preprint arXiv:2101.00065 (2020).

Teaching Experience

(2022-2024) **Instructor of Record**
- MATH 115 Precalculus (Spring 2024)
- MATH 122 Business Calculus (Spring 2023)
- MATH 170 Finite Mathematics (Fall 2022)

(2021-2024) **Graduate Teaching Assistant**
- MATH 141 Calculus I (Spring 2022)
- MATH 142 Calculus II (Fall 2021, Fall 2024)

(2017-2024) **Other Teaching Experiences**
- Mathematics Tutor for Calculus I-III at University of Pennsylvania
- Taught Python to students at REU
- Worked in University of South Carolina's Tutoring Center

Other Work Experience

(Summer 2024) **Mathematics Placement Exam Graduate Director**- University of South Carolina
- Designed the online placement test for incoming students
- Proctored in-person sessions of the placement test
- Directed troubleshooting and test-reviewing team
- Handled critical issues as they arose with students

(Fall 2023-2024) **Calculus Gateways Coordinator**- University of South Carolina
- Trained TAs in administering of our Gateway exams
- Redesigned and implemented the online test
- Provided detailed documentation of the test questions
- Coordinated with instructors to provide grade information for their students

(Summer 2023) **Mathematics Placement Exam - Technical Support**- University of South Carolina
- Processed daily requests for technical support by email and phone
- Worked with students and guardians to amend grading errors
- Submitted routine reports of my documented work

(Summer 2022) **REU Graduate Assistant**- University of South Carolina
- Designed lesson plans to quickly familiarize students with Python, PyTorch, and TensorFlow
- Aided undergraduates throughout the REU with software and coding issues

(2019-2022) **Assistant Researcher**- University of Pennsylvania
- Aided with research work on the C. Elegans connectome
- Produced efficient code to handle the large data analysis needed for dynamic connectome computations

Talks/Presentations

(*Upcoming* - Nov 2024) **Discrete Math and Combinatorics Seminar**
Bounding the Size of 2-Crossing Critical Tanglegrams - (50 min)

(*Upcoming* - Nov 2024) **Graduate Colloquium**
A Quantitative Kuratowski Theorem - (50 min)

(Oct 2024) **AMS Fall Southeastern Sectional Meeting, Georgia Southern University**
Bounding the Crossing Number of Tanglegrams - (20 min)

(Oct 2023) **Graduate Colloquium**
Tanglegram Kuratowski and k-Crossing Critical Tanglegrams - (50 min)

Supported Participation (Conference/Workshop/Summer School)

(Apr. 2024) **Shanks Workshop on Combinatorics & Graph Theory**, Vanderbilt University

(Sep. 2023) **Summer School in Discrete and Convex Geometry**, Rényi Institute

(Jul. 2023) **GRWC - Graduate Research Workshop in Combinatorics**, University of Wyoming

Service

(2023-2024) **Annual High School Math Contest**, University of South Carolina
- Coded problems into computer testing software
- Processed and scored submitted exams
- Aided with math scavenger hunt activity

(Feb 2024) **Future STEM Heroes**, University of South Carolina
- Ran station to teach participating children about circuits
- Aided with event breakdown/setup

Professional Training

(Mar. 2024) **Certificate of Completion in Mental Health and Well-being Competency**, Center for Teaching Excellence, University of South Carolina
> - Completed a series of sessions to become trained in identifying, communicating with, and aiding students with potential mental health and/or substance abuse issues

Computer Proficiencies

Programming Languages
> **Python:** Frequent use for personal, research, and teaching projects. I have used Python as the programming language for doing work with *PyTorch* and *TensorFlow* for machine learning exercises.
> **SageMath:** Created and taught undergraduate SageMath coding projects
> **Lean:** One-semester of coursework. Proved several lemmas about chromatic number and chromatic index of graphs.
> **Java:** Two years of high-school coursework
> **Julia:** One year of practical work experience
> **MatLab:** Occasional use over undergraduate career
> **R:** Minor use in research projects
> **C#:** Minor use in personal game-development projects

Operating Systems
> **Windows:** Primary system for personal use
> **Linux:** Completed a semester of online coursework as well as the Bandit wargame

Software
> **Microsoft Excel:** Frequent use for work as Gateway Coordinator to manage and manipulate large sheets of data
> **LaTeX:** Primary software for writing all papers used in my work and research