

KEITA ALLEN (HE/HIM)

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MATHEMATICAL INTERESTS

Homotopy theory, algebraic topology, algebraic geometry.

EDUCATION

Massachusetts Institute of Technology

Candidate for Ph.D. in mathematics.

Cambridge, MA
Expected 2023 – 2028

- National Defense Science and Engineering Graduate (NDSEG) Fellow.

Massachusetts Institute of Technology

B.S. in mathematics, GPA: 5.0/5.0.

Cambridge, MA
2019 – 2023

Southland College Prep Charter High School

High school diploma.

Richton Park, IL
2015 – 2019

UNDERGRADUATE PROJECTS

Computing the homology of the motivic lambda algebra.

Mentors: Mark Behrens, Peter May

The University of Chicago REU
Summer 2022

- Investigating generalizations of the Curtis algorithm (for computing the E_2 page of the Adams spectral sequence) to computing the E_2 page of the motivic Adams spectral sequences, over the base fields \mathbb{C} and \mathbb{R} .
- Writing computer program to facilitate generation of Curtis tables, which allow us to reconstruct the motivic Adams E_2 pages. Some code is available at <https://github.com/ktallen/PyLambdaCalc>.
- Preliminary draft available at <http://math.uchicago.edu/~may/REU2022/REUPapers/Allen.pdf>; paper presents a Curtis algorithm for computing the \mathbb{C} -motivic Adams E_2 page.

Complexity of computing the homotopy groups of spheres.

Mentors: Robert Burklund, Haynes Miller

MIT Math Dept.
Summer 2021

- Studied complexity of algorithm outlined by E.H. Brown in *Finite Computability of Postnikov Complexes*, which allows for the computation of the homotopy groups of any space obtained as the realization of a finite simplicial set.
- Gave explicit bounds on the runtime of this computation in the case of finite homotopy groups, and as particular examples of spaces with infinite homotopy groups, gave explicit bound on the computation of homotopy groups of odd-dimensional spheres.
- Preliminary draft available at <https://math.mit.edu/research/undergraduate/urop-plus/documents/2021/Allen.pdf>; polished preprint available soon.

TEACHING

18.02 (multivariable calculus)

Undergraduate TA

MIT Math Dept.
Spring 2022

- Taught twice-weekly recitation section, created problems for recitation, held office hours and review sessions, and graded. Please find some of the material I created [here](#).
- Student evaluations: *Stimulated interest: 6.8/7.0, Displayed thorough knowledge of subject material: 6.9/7.0, Helped me learn: 7.0/7.0.*

18.02A (accelerated multivariable calculus)*Undergraduate TA*

MIT Math Dept.

January 2022

- Taught two twice-weekly recitation sections, held office hours and graded.
- Student evaluations: *Stimulated interest: 6.7/7.0, Displayed thorough knowledge of subject material: 7.0/7.0, Helped me learn: 7.0/7.0.*

MIT Talented Scholars Resource Room*Tutoring Facilitator*

MIT Office of Minority Education

Spring 2021 – Fall 2022

- Tutoring MIT students in math subjects through one-on-one appointments, facilitated group study sessions, walk-in office hours, and exam reviews. Courses tutored include:

18.01/A	<i>single variable calculus</i>	18.02/A	<i>multivariable calculus</i>	18.03	<i>differential equations</i>
18.04	<i>complex variables</i>	18.06	<i>linear algebra</i>	18.600	<i>probability</i>
18.701	<i>abstract algebra I</i>				

- Overall rating: 5.0/5.0.

Interphase EDGE*Residential Calculus Facilitator*

MIT Office of Minority Education

Summer 2020, 2021

- TA for course in multivariable calculus, during residential program for rising MIT first-year students from underprivileged backgrounds.
- Responsible for crafting problem sets and recitation sheets, recitations twice weekly, holding office hours, and holding exam review sessions. Please find some of the material I helped create [here](#).
- Hosted events as peer mentor/consultant for program participants in order to facilitate successful transition into MIT.

TALKS**The lambda algebra in classical and motivic homotopy theory.***The University of Chicago REU*

August 2022

Chicago, IL

Computing the homology of the \mathbb{C} -motivic lambda algebra.*Leadership Alliance National Symposium*

July 2022

Virtual

Spectra and cohomology theories.*Chroma 2022 summer homotopy theory seminar*

June 2022

Virtual

OTHER ACTIVITIES**Associate Advisor – MIT Office of Minority Education**

Fall 2021 – Spring 2023

- Leading activities for advising group of first-year students and acting as peer mentor.

Chroma 2022*Harvard/MIT summer seminar in stable/chromatic homotopy theory.*

Summer 2022

Co-organizer

- Helped organize an undergraduate-focused seminar in stable/chromatic homotopy theory. Covered foundational topics in stable homotopy theory, building towards the chromatic point of view.

Grader – MIT Math

Spring 2020

- Graded problem sets for 18.03 (differential equations).

AWARDS AND FELLOWSHIPS

National Defense Science and Engineering Graduate (NDSEG) Fellowship	2023 – 2026
MIT Math Dept. Teaching and Learning Award <i>Presented by MIT Math Dept. for excellence in undergraduate teaching.</i>	May 2022
Questbridge National College Match Finalist	October 2018

SKILLS

Language	English (Native), Japanese (Native)
Programming & Markup	Comfortable with Python, TeX