

# Kyle Roke

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## EDUCATION

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### MASSACHUSETTS INSTITUTE OF TECHNOLOGY

2022-Present

Class of 2026

**B.S. Mathematics** (anticipated 2026)

5.0 GPA

#### *Notable Coursework*

Geometry of Manifolds

Algebra I/II, Commutative Algebra

Representation Theory

Algebraic Topology I/II

Kan Seminar on Algebraic Topology

Algebraic Geometry I/II

### COMMONWEALTH HIGH SCHOOL

2018-2022

Graduated 2022

5.05 GPA

## RESEARCH

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### Research in category theory under Peter May at the UChicago Math REU

2025-Present

Read literature on operads, pseudoalgebras, and Segal infinite loop space machines

Worked on new research into proving conjectures about permutative categories and Segal  $\Gamma$ -categories

Worked toward producing a better infinite loop space machine to construct highly structured spectra

Co-authored a paper on our results

Ongoing work on further research

### Directed reading project in algebraic topology at MIT with Natalia Pacheco-Tallaj

2025

Directed reading and problem solving focused on generalized cohomology theories, vector bundles, spectral sequences, and more to understand Atiyah & Rees' "Vector Bundles on Projective 3-Space"

### UROP+ at MIT in chromatic homotopy theory at MIT under Jeremy Hahn

2024

Read existing literature on chromatic homotopy theory and ring spectra

Performed computations of power operations of MU using Maple

Conjectured and proved statements about E-infinity ring spectra using power operations

Authored a paper on our results and suggested a counterexample to chromatic blueshift conjecture

### Reading project in systolic geometry at MIT with Jonathan Zung

2024

Directed reading and problem solving across varied topics in topology and geometry

## TEACHING EXPERIENCE

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### Undergraduate Assistant for 18.701: Algebra I

Fall 2025

MIT Math Department; taught by Henry Cohn  
Graded problem sets and exams  
Hosted office hours and exam review sessions

**Undergraduate Assistant for 18.702: Algebra II****Spring 2025**

MIT Math Department; taught by Ju-Lee Kim  
Graded problem sets and exams  
Hosted office hours and exam review sessions

**Grader for 18.701: Algebra I****Fall 2023**

MIT Math Department; taught by Zhiwei Yun  
Graded problem sets and exams

**EXPOSITORY TALKS****Symmetric monoidal categories, operadic categories, and Segal categories****August 7, 2025**

UChicago Math REU  
With Jiasen Liu, Hongyi Zhang, and Keming Zhou

**Selick on Odd-Primary Torsion in  $\pi_*(S^3)$** **May 9, 2025**

MIT Kan Seminar

**Quillen on Model Categories and Homotopical Algebra****Apr 7, 2025**

MIT Kan Seminar

**Adams on the Construction of the Stable Homotopy Category****Feb 28, 2025**

MIT Kan Seminar

**Vector bundles on complex projective 3-space****Jan 31, 2025**

MIT Directed Reading Program Symposium

**SKILLS**

Software: Maple, Python, Java, Latex

**LEADERSHIP EXPERIENCE**

MIT Men's Ultimate Frisbee Team Captain

**2023-Present**

Vice President of Mass. Theta Chapter of Pi Lambda Phi Fraternity

**2024**

Commonwealth School Junior Varsity Ultimate Frisbee Coach

**2023**