Howard Beck

hbeck@mit.edu   https://www.mit.edu/~hbeck   Cambridge, MA

EDUCATION

Massachusetts Institute of Technology, Cambridge, MA
B.S. in Pure Mathematics, expected May 2025
Humanities Concentration in Philosophy
GPA: 4.8/5.0
Relevant coursework: Graduate Topology Seminar (Kan Seminar), Algebraic
   Topology I and II, Motivic Homotopy Theory (at Harvard)

BASIS Tucson North, Tucson, AZ
High school diploma with High Honors
GPA: 3.99/4.0 (unweighted), 4.76/4.0 (weighted)

RESEARCH INTERESTS

Chromatic homotopy theory
Equivariant homotopy theory
Algebraic K-theory

TALKS

Adams on the J-homomorphism   March 31th, 2025
MIT Kan Seminar

Chromatic Blueshift and Redshift in Stable Homotopy Theory   March 5th, 2025
MIT/Harvard Zygotop Seminar

Borel on the mod 2 Cohomology of Homogeneous Spaces   February 7th, 2025
MIT Kan Seminar

The Quillen-Lichtenbaum Conjectures   January 31st, 2025
MIT Directed Reading Program Symposium, with Atticus Wang and Mohit Hulse

The Slice, Reduction, and Gap Theorems of HHR   December 3rd, 2024
MIT/Harvard Babytop Seminar

Curve Shortening Flow   February 3rd, 2023
MIT Directed Reading Program Symposium, with Jackson Flowers

PREPRINTS

(In prep) *Chromatic blueshift of certain $\mathbb{E}_\infty$-complex-oriented rings* with Kyle Roke

Howard Beck, Roberto Furfaro, and Brian Gaudet. "Deep Learning Imitation of Particle
Filter for Autonomous Vertical Optical Lunar Lander". Aug. 2021. URL: https://www.mit.
edu/~hbeck/papers/lunar_learning.pdf

RESEARCH EXPERIENCE

Chromatic Support of N_{I_∞}-algebras   Spring 2025

Undergraduate Researcher, Department of Mathematics, MIT   Cambridge, MA
Joint with Natalie Stewart and Eunice Sukarto
Faculty supervisor: Professor Haynes Miller
Direct supervisor: Keita Allen

Work in progress

RESEARCH EXPERIENCE (CONTINUED)	

Restrictions on Genera of Ring Spectra — Summer 2024

Undergraduate Researcher, Department of Mathematics, MIT — Cambridge, MA
Joint with Kyle Roke
Faculty supervisor: Professor Jeremy Hahn
Direct supervisor: Tristan Yang

- Investigated a recent conjecture of Burkland, Schlank, and Yuan concerning a shift in periodic behavior of $\mathbb{E}_\infty$-rings
- Found it was true for a small class of these spectra, but cast doubt on the general case
- Learned the basics of chromatic homotopy theory
- Used Maple to perform calculations of some power operations

Markov Chain Mixing on Lie Groups — Summer 2023, Fall 2023

Undergraduate Researcher, Department of Mathematics, MIT — Cambridge, MA
Faculty supervisor: Professor Alexei Borodin
Direct supervisor: Dr. Jimmy He

- Left-multiplication by a random element drawn from a conjugacy class gives a way to "mix" a group
- Showed that many standard compact Lie groups exhibit behavior similar to card shuffling in how some statistical properties converge through mixing
- Learned about representation theory and generalizations of Fourier analysis

Depth Estimation from RGB Images — Summer 2022

Undergraduate Researcher, Computer Science and Artificial Intelligence Lab, MIT
Cambridge, MA
Faculty supervisor: Professor Nicholas Roy
Direct supervisor: Laura Brandt
Lab: Robust Robotics Group (RRG)

- Worked full-time at the Robust Robotics Group, developing computer vision algorithms capable of depth estimation
- Increased performance by conditioning the model to expect an average distance profile based on data from the training set
- Used PyTorch to implement deep neural networks

Satellite Control Simulation — Spring 2022

Undergraduate Researcher, Department of Aeronautics and Astronautics, MIT
Cambridge, MA
Faculty supervisor: Professor Richard Linares
Direct supervisor: Miles Lifson
Lab: Astrodynamics, space Robotics, and Controls Lab (ARCLab)

- Developed a tool that can simulate control algorithms on satellites
- Used Orekit and Python to implement dynamics propagation

Probabilistic Space Debris Modelling — Fall 2021

Undergraduate Researcher, Department of Aeronautics and Astronautics, MIT
Cambridge, MA
Faculty supervisor: Professor Richard Linares
Direct supervisor: Miles Lifson
Lab: Astrodynamics, space Robotics, and Controls Lab (ARCLab)

- Implemented a statistical algorithm in Python for estimating how space debris gets distributed over time, particularly after a satellite collision event

TEACHING EXPERIENCE	Multivariable Calculus (18.02)	Spring 2024

Undergraduate Assistant, Department of Mathematics, MIT — Cambridge, MA
Taught by Professor David Jerison

- Hosted office hours, answered questions on the course site
- Helped with grading as needed
- Took lecture notes to post on Canvas for students

Real Analysis (18.100A) — Spring 2023

Mentor, Undergraduate Mathematics Association, MIT — Cambridge, MA
- Met weekly with a student to guide them through one of MIT's real analysis classes
- Helped with going through proofs, reviewing lecture material, and answering questions

Playing Games with Infinity — Spring 2022

Teacher, Educational Studies Program, MIT — Cambridge, MA
Through High School Studies Program

- Taught high schoolers about ordinals and cardinals with Isabel McGuigan and Katherine Taylor

SERVICE

Algebraic Topology II Reading Group — Fall 2024

Co-organizer, with Professor Haynes Miller — Cambridge, MA
- Advertised reading group and collected interest
- Created online space and communication listserv for the group

MITx Content Compression — Fall 2024

Volunteer — Cambridge, MA
- Worked as part of a team to translate online learning materials to PDF format, to enable access to communities with insufficient internet
- Wrote Python code that translated MITx source files from HTML, XML, and MathJax into LaTeX-generated PDFs ready for students and TAs

LEADERSHIP

Spinning Arts Executive Board — Summer 2022-present

MIT fire spinning and flow arts club
- Reserved spaces for performances and club practices
- Helped run fire safety trainings
- Staffed fire practices and ensured safety
- Interfaced with school administration to organize our events

Association of Student Activities Executive Board — Summer 2024-present

Student body government overseeing clubs at MIT
- Advocated for club needs
- Allocated extra storage space for clubs
- Helped clubs navigate event registration processes
- Ran biggest club recruitment event of the year, with over 230 clubs

LANGUAGES

Human: English (native), Spanish (also native), French
Computer: LaTeX, Python, MATLAB, Java, JavaScript, Lua, HTML

SKILLS AND HOBBIES

Rock climbing, running, fire spinning, figure skating, weight lifting