Howard Beck

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EDUCATION

Massachusetts Institute of Technology, Cambridge, MA
B.S. in Pure Mathematics, expected May 2025
Humanities Concentration in Philosophy
GPA: 4.8/5.0

BASIS Tucson North, Tucson, AZ
High school diploma with High Honors

RESEARCH INTERESTS

Chromatic homotopy theory
Equivariant homotopy theory
Homological algebra

TALKS

(Upcoming) MIT/Harvard BabyTop Seminar   *December 3rd, 2024*

PREPRINTS

(In prep) *Chromatic blueshift conjecture: the simple case and an algebraic analogue* with Kyle Roke

RESEARCH EXPERIENCE

Restrictions on Ring Spectra Genera   *Summer 2024*

Joint with Kyle Roke
Faculty supervisor: Professor Jeremy Hahn, MIT
Direct supervisor: Tristan Yang

We investigated a recent conjecture of Burkland, Schlank, and Yuan concerning a shift in periodic behavior of well-behaved stable topological objects called $\mathbb{E}_\infty$ ring spectra. We found it to be true for a small class of these spectra, but cast doubt on the general case. This work was done through the MIT Mathematics department UROP+ program, and sponsored by the John Reed Fund.

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

Faculty supervisor: Professor Alexei Borodin, MIT
Direct supervisor: Dr. Jimmy He

Left-multiplication by a random element drawn from a conjugacy class gives a way to "mix" a group. I showed that many standard compact Lie groups exhibit behavior similar to card shuffling in how some statistical properties converge through mixing. This work was sponsored by the Paul E. Gray (1954) UROP Fund.

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RESEARCH EXPERIENCE (CONTINUED)	Directed Reading Program	*Winter 2022*

Joint with Jackson Flowers
Direct supervisor: Yiqi Huang

We read and presented a proof of the Gage–Hamilton–Grayson theorem concerning convergence of curve-shortening flow, and discussed the proof's applications to geometry. This was done through MIT Mathematics' winter Directed Reading Program.

Depth Estimation from RGB Images   *Summer 2022*

Faculty supervisor: Professor Nicholas Roy, MIT
Direct supervisor: Laura Brandt

I worked full-time at the Robust Robotics Group, developing computer vision algorithms capable of depth estimation. I was able to increase performance by conditioning the model to expect an average distance profile based on data from the training set.

Satellite Control Simulation   *Spring 2022*

Faculty supervisor: Professor Richard Linares, MIT
Direct supervisor: Miles Lifson

I developed a tool for the Astrodynamics, Space robotics, and Controls Lab (ARCLab) that can simulate control algorithms on satellites.

Probabilistic Space Debris Modelling   *Fall 2021*

Faculty supervisor: Professor Richard Linares, MIT
Direct supervisor: Miles Lifson

I implemented a statistical algorithm for estimating how space debris gets distributed over time, particularly after a satellite collision event. This project was also done under ARCLab.

Deep Learning for Lunar Landing   *Spring 2021*

Faculty supervisor: Professor Roberto Furfaro, University of Arizona
Accepted into AIAA SciTech 2022 Conference

This was a research internship during high school at the University of Arizona's Space Systems Engineering Laboratory. I worked on a deep learning model that could imitate a statistically robust but computationally expensive estimation algorithm for lunar descent, which uses camera data. The final paper can be found at `https://www.mit.edu/~hbeck/lunar_particle_filter_learning.pdf`

TEACHING EXPERIENCE	Undergrad. Assistant: Multivar. Calculus	*Spring 2024*

Taught by Professor David Jerison, MIT

I hosted office hours, answered questions on the course site, and helped with grading as needed for MIT's multivariable calculus class, 18.02.

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Teaching Experience (continued)	Real Analysis Mentor	*Spring 2023*

I met weekly with a student to guide them through 18.100A, one of MIT's real analysis classes. I helped with going through proofs, reviewing lecture material, and answering questions. This was done through the MIT Undergraduate Math Association.

HSSP: Playing Games with Infinity	*Spring 2022*

I taught high schoolers about ordinals and cardinals with Isabel McGuigan and Katherine Taylor, through HSSP at the MIT Educational Studies Program: `https://esp.mit.edu/learn/HSSP/index.html`

Languages

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

Miscellaneous Skills and Hobbies

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