Mason Haberle

Curriculum Vitae

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Education

2021 – 2026 **New York University, Courant Institute**, *PhD in Mathematics Candidate*.
Expected Graduation: May 2026

2017 – 2020 **The University of California, Berkeley**, *Bachelor of Arts, Mathematics with Honors*, *GPA – 4.00*.
Graduated December 2020

Research Papers

Chen, A., Demmel, J., Dinh, G., Haberle, M., Holtz, O., (2021). *Communication Bounds for Convolutional Neural Networks*. Manuscript submitted to PASC22.

Haberle, M., Wang, J. (2020). *A Full Study of the Dynamics on Dilation Tori*. Manuscript submitted to Israel Journal of Mathematics. arXiv:2012.04159 [math.DS]

Chowdhary, A., Haberle, M., Wu, Q. (2019). *Nonlinear Stability at the Zigzag Boundary*. Manuscript in preparation. arXiv:2012.04154 [math.AP]

Research Talks

Aug 2020 **Dynamics on Dilation Tori**, 2020 Indiana REU Conference.
Presented background of translation and dilation surfaces. Presented new results on dynamics of flows on dilation tori. Slides at ocf.io/masonhaberle.

Aug 2020 **Avoiding Communication in Convolutional Neural Networks**,
2020 Berkeley SURF Conference.
Presented with the SURF Math Team on new lower bounds and upper bounds for data movement in convolutional neural networks. Slides at ocf.io/masonhaberle.

Workshops

Aug 2021 **Mathematical Fluid Dynamics Advanced Summer School**, Institut d'Etudes Scientifiques de Cargése.
Typed lecture notes for Laure Saint-Raymond's and Colm Connaughton's courses on mathematical foundations of wave turbulence theory.

Spring 2021 **Mathematical Problems in Fluid Dynamics**, MSRI.
Participated in Thomas Alazard's course in free surface flows, among attending a breadth of research talks.

Research Experience

Summer 2020 - Fall 2021 **Berkeley Summer Undergraduate Research Fellowship Math Team**,
Advisors: James Demmel, Olga Holtz. Team: Anthony Chen, Rahul Jain, Jon Hillery.

- Team funded to solve communication efficiency problems in numerical linear algebra.
- Proved data-movement lower bounds and developed communication-efficient algorithms for convolutional neural networks with mixed precisions using functional analysis, numerical analysis, and group theory.
- Presented results in the SURF 2020 Conference and to the Berkeley Benchmarking and Optimization Group.
- Paper submitted to Platform for Advanced Scientific Computing 2022 Conference (PASC22).
- Developed ongoing connections to the numerical linear algebra research community.

Summer 2020 **Indiana University Mathematics REU**, Advisor: Jane Wang.

- Researched dynamics of flows on dilation surfaces utilizing tools from geometry, analysis, topology, and group theory.
- Improved understanding of accumulation sets of geodesic flows on dilation tori. Proved the generic behaviors of flows and fascinating fractal-like behaviors of specific flows.
- Presented results at the 2020 Indiana University REU Conference.
- Paper submitted to Israel Journal of Mathematics.

Summer 2019 **Ohio University Pattern Forming REU**,
Advisor: Qiliang Wu. Partner: Abhijit Chowdhary.

- Collaborated with a team to research a pattern forming partial differential equation which models convection, animal skin patterns, and climatological process.
- Proved stability results for periodic roll solutions to the nonlinear 2-dimensional Swift Hohenberg Equation in a difficult marginal case, the boundary of the "zigzag" instability.
- Employed techniques from functional analysis, dynamics, and Fourier analysis.
- Paper in preparations for publication.

Selected Coursework

Fall 2021 **Enhanced Dissipation**, Scott Armstrong, Vlad Vicol.

Fall 2021 **Advanced PDEs**, Sylvia Serfaty.

Spring 2021 **Partial Differential Equations**, Maciej Zworski.

Spring 2021 **Free Surface Flows**, Thomas Alazard.

Spring 2020 **Noncommutative Euler Equations**, Dan Voiculescu.

Relevant Work Experience

2016 – 2020 **Math and Logic Tutor**.

- Tutored students at all levels (6th grade - Undergraduate) in a variety of math classes.
- Tutored middle school Algebra and Geometry, AP Calculus, AP Statistics, and undergraduate courses Discrete Mathematics, Intro to Logic, Differential Equations.
- Self-employed and self-marketed.

Fall 2020 **Mathematics Grader**, UC Berkeley Math Department.

- Read and graded homeworks for students taking courses Math 123 - Ordinary Differential Equations, Math 104 - Intro to Analysis.

2018 – 2020 **UC Berkeley Residential Assistant**, Supervisor: Erica Plasencia.

- Residential Assistant for continuing students in UC Berkeley Residence Halls.
- Planned programs and events for group of up to 200 residents with a team.
- Responded to crises and emergencies, both long-term and during nighttime duty, including fires, conflicts, and bias incidents.
- Trained to provide resources to residents with a focus on social justice, inclusion, and uplifting marginalized experiences.

Campus Involvement

2017 – 2020 **Mathematics Undergraduate Student Association Officer/Member**.

- Outreach Chair for UC Berkeley MUSA. Participated in info sessions for math majors, outreach programs for incoming students, and volunteer work around the Bay Area.
- Collaborated with graduate students and professors in non-classroom settings.
- Facilitated social spaces for math majors, online during COVID-19.

2017 – 2018 **Pioneers in Engineering Education Team**.

- Hosted engineering workshops and provided educational resources for underserved Bay Area high school students in the annual Pioneers in Engineering robotics competition.
- Instructed a class at UC Berkeley to prepare and support undergraduate mentors.

Awards and Scholarships

2021 NYU GSAS MacCracken Fellowship

2021 Dorothea Klumpke Roberts Prize

2020 Berkeley Science Network Leadership Program Award

2018 – 2020 SAG-AFTRA John Dales Scholarship Award (Three-time recipient)

2018 Kraft Award for Scholastic Achievement

2017 Cal Alumni Association Leadership Award

2017 Jill Ann Newman Scholarship for Education

Other Skills/Interests

- Strong interest in many fields of analysis: Harmonic/Functional Analysis, Dynamical Systems, Partial Differential Equations, Operator Algebras.
- Computer Science and Coding - proficient in Python, Java, C, and Matlab. Produced a number of personal projects on numerical modeling of physical systems.
- Annual participant in the Putnam Mathematics Competition.