David Freund

Curriculum Vitae

Department of Mathematics
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Education

Dartmouth College – Hanover, NH 2013-2018
Ph.D. in Mathematics (June 2018)
Adviser: Vladimir Chernov
Thesis: *Intersections of virtual multistrings*
A.M. in Mathematics (November 2014)

Budapest Semesters in Mathematics – Budapest, Hungary 2011-2012
Honors, Highest Honors

The College of Wooster – Wooster, OH 2009-2013
B.A. in Mathematics (May 2013)
Summa cum laude, Departmental Honors, Phi Beta Kappa

Lakeland Community College – Kirtland, OH 2006-2009

Employment

Yale University – New Haven, CT
– SUMRY Mentor Summer 2019

Harvard University – Cambridge, MA
– Preceptor 2019-present
– Lecturer 2018-2019

Academic Honors (selected)

Harvard Certificate of Teaching Excellence April 2020, August 2021
Office of Undergraduate Education, Harvard University

Extraordinary Teaching in Extraordinary Times July 2020
Office of Undergraduate Education, Harvard University

Kenneth P. Bogart Teaching Award May 2017
Department of Mathematics, Dartmouth College

Outstanding Graduate Teacher Award – Topology (Math 54) April 2017
Dartmouth Center for the Advancement of Learning, Dartmouth College

Dartmouth Graduate Fellowship 2013-2018

William H. Wilson Prize in Mathematics May 2013
The College of Wooster

Goldwater Scholarship March 2011
The Barry Goldwater Scholarship and Excellence in Education Program

Publications

(6) **Complexity of virtual multistrings**, *Comm. Contemp. Math.*, to appear.

(5) **Multistring based matrices**, *J. Knot Theory Ramificiations*, **29**(6) (2020), 2050038.

(4) **Minimizing intersection points of curves under virtual homotopy**, with V. Chernov and R. Sadykov, *J. Knot Theory Ramificiations*, **29**(3) (2020), 2050007.

(3) **Klein link multiplicity and recursion**, with S. Smith-Polderman, *Rose-Hulman Undergraduate Mathematics Journal*, **17**(2) (2016), 146–156.

(2) **Klein links and braids**, with S. Smith-Polderman, *Rose-Hulman Undergraduate Mathematics Journal*, **14** (2013), 71–84.

(1) A preliminary study of Klein knots, with L. Catalano, R. Ruzvidzo, J. Bowen, and J. Ramsay, *Proc. Midstates Conference for Undergraduate Research in Computer Science and Mathematics* (2010), 10–17.

Undergraduate Research

Summer Undergraduate Mathematics Research at Yale June-August 2019
Supervised project on the intersection of virtual multistrings with M. Dursun, J. Hinman, and L. Rumbaugh. Students presented their work at the UnKnot IV Conference (July 19-21, 2019) and the University of Massachusetts REU Conference (July 23, 2019).

Presentations

TALKS (*Invited)

**Boundary Surfaces for Virtual Links* January 2021
AMS Special Session on Invariants of Knots and Links, Joint Mathematics Meeting

**Intersections of Virtual Multistrings* October 2020
Mathematics Colloquium, University of Montana

**Some Algebraic Structures for Flat Virtual Links* July 2020
Classical Knots and Virtual Knots and Algebraic Structures Related to Knots Seminar

**Knot for Everyday Purposes* November 2019
Mathematics Colloquium, Southern New Hampshire University

**Knot for Everyday Purposes* October 2019
Amherst College Mathematics Colloquium, Amherst College

Knot Below the Surface July 2019
UnKnot IV, University of Washington Bothell

**Surfaces and Strings* July 2019
SUMRY Colloquium, Yale University

**Singular Based Matrices for Virtual 2-Strings* April 2019
AMS Special Session on Invariants of Knots, Links, and Low-dimensional Manifolds, University of Connecticut

**Singular Based Matrices for Virtual 2-Strings* January 2019
Knots in Washington XLVII, The George Washington University

Singular Based Matrices for Virtual 2-Strings January 2019
AMS Contributed Papers Session, Joint Mathematics Meetings

**Singular Based Matrices for Virtual 2-Strings* January 2019
Dartmouth Topology Seminar, Dartmouth College

**Complexity of Virtual Multistrings* June 2018
The 35th Annual Workshop in Geometric Topology, Calvin College

**Intersections of Virtual Multistrings* May 2018
Math Forum, Smith College

**Minimizing Intersection Points of Flat Virtual Links* May 2018
Knots in Washington XLVI, The George Washington University

**Intersections of Virtual Multistrings* March 2018
Math Monday, Kenyon College

**Multistring Based Matrices* (2 talks) February 2018
Dartmouth Topology Seminar, Dartmouth College

Complexity of Virtual Multistrings January 2018
AMS Contributed Papers Session, Joint Mathematics Meetings

**Complexity of Virtual Multistrings* December 2017
Knots in Washington XLV, The George Washington University

**Complexity of Virtual Multistrings* November 2017
Dartmouth Topology Seminar, Dartmouth College

**Minimizing Intersection Points of Flat Virtual Links* November 2017
AMS Special Session on Algebraic and Combinatorial Structures in Knot Theory, UC Riverside

**Complexity of Virtual Multistrings* October 2017
Seminar on Knots and Representation Theory, Moscow State University

**Minimal Intersection Number of Flat Virtual Links* April 2017
Knots in Washington XLIV, The George Washington University

**Minimal Intersection Number of Flat Virtual Links* April 2017
AMS Special Session on Combinatorial and Algebraic Structures in Knot Theory, Washington State University

**Based Matrices for Links* December 2016
Knots in Washington XLIII, The George Washington University

Graduate Student Seminar, Dartmouth College (7 talks) 2014-2017

POSTERS

Estimating Minimal Intersection Numbers April 2017
Graduate Poster Session, Dartmouth College

The Machete Number April 2013
Senior Research Symposium, The College of Wooster

Teaching

Harvard University – Course Head
Coordinated all sections of the course, taught multiple sections, and had full authority over course design.
– Linear Algebra and Differential Equations (Math 21b) Fall 2020 (remote)
– Multivariable Calculus (Math 21a) Spring 2022

Harvard University – Course Preceptor
Responsible for significant administrative tasks in addition to teaching one or more sections.
– Calculus, Series and Differential Equations (Math 1b) Fall 2019, Fall 2021
– Multivariable Calculus (Math 21a) Spring 2021 (remote)
– Linear Algebra and Differential Equations (Math 21b) Spring 2020

Harvard Summer School – Instructor
– Linear Algebra and Differential Equations (Math S-21b) Summer 2021 (remote)

Harvard University – Instructor
– Introduction to Functions and Calculus I (Math Ma) Fall 2018, 2019
– Introduction to Functions and Calculus II (Math Mb) Spring 2019, 2020
– Introduction to Calculus (Math 1a) Fall 2018
– Calculus, Series and Differential Equations (Math 1b) Spring 2019

Dartmouth College – Instructor
– Calculus with Algebra (**Math 1**) Fall 2015
– Calculus (Math 3) Fall 2017
– Shape of Space (**Math 32**) Winter 2018
– Topology (**Math 54**) Summer 2016

Educational Outreach

Math Meetups – Organizer Harvard University
Planned monthly events for calculus students with V. Collins. Spring 2020-Fall 2020

Sonia Kovalevsky Math Day – Organizer Dartmouth College
Planned events for middle- and high-school women with R. Orellana and M. Fraser. April 2018

Dartmouth Teaching Assistant Discussion Group – Facilitator Dartmouth College
Led biweekly discussion group with D. Wallace and A. Barnett to train first- and second-year mathematics graduate students in their duties as teaching assistants. Fall 2017

LaTeX Workshops – Organizer Dartmouth College
Designed series workshops to familiarize participants with various aspects of mathematical typesetting in LaTeX with D. DeFord, K. Harding, and others.
– Intermediate LaTeX Workshops (4 sessions, with K. Moore) Winter 2018
– Introductory LaTeX Workshops (3 sessions) Fall 2017
– Hands-On Introduction to LaTeX (2 sessions, with C. Darabos) Fall 2017
– Introduction to LaTeX Summer 2017
– Introductory and Intermediate LaTeX Workshops (11 sessions) Fall 2016-Spring 2017

Exploring Mathematics – Instructor Dartmouth College
Planned, organized, and conducted week-long camps for middle- and high-school students.
– Mathematics of Games August 2015
– Mathematics of Secrets July 2015

Johns Hopkins University: Center for Talented Youth – Workshop Leader Dartmouth College
– Binary, Bits, and Barcodes (with D. DeFord) May 2017
– Modern Cryptography (with D. DeFord) October 2014

Professional Activities & Service

Service to the Mathematics Department – Harvard University
– Calculus Advising Fall 2020-present
– Hiring and training of Upper-Level Course Assistants Spring 2019-Spring 2021
– Hiring and training of Calculus Course Assistants Fall 2021-present
– Mentor for Graduate Student Apprenticeship Program Fall 2021-present

Topology Postdocs Workshop – Participant July 2020

Course Planning for Remote Teaching – Participant July 2020
Week-long program offered at Harvard University for developing and teaching remote courses.

Project NExT – Fellow August 2019-August 2020
MAA program for new faculty to develop and explore innovative teaching techniques.

Dartmouth Center for the Advancement of Learning – Participant (Selected Workshops)
– Becoming Faculty: Mentoring February 2017
– Creating STEM Lesson Plans for High School Classrooms December 2016
– Using Grading for Learning and Assessment March 2016
– Using Student Groups in Your Teaching February 2016

Dartmouth Mathematics Teaching Seminar – Participant Summer 2015
Intensive 120-contact hour course focused on the discussion and implementation of educational philosophies and classroom techniques. Topics included assessing learning, planning lessons and courses, improving presentation quality, and collaborative assignments.

Dartmouth Graduate Open House – Organizer March 2015, 2016
Planned and coordinated activities for prospective mathematics graduate students with organizing team.

College of Wooster Commencement – Speaker May 2013
Gave commencement address to the College of Wooster class of 2013.