Daniel Halmrast

Lafayette College
Department of Mathematical Sciences
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Academic Interests

Algebraic & Complex Geometry, Topological String Theory, and Generalized Complex Geometry

Education

University of California, Santa Barbara

Ph.D., Mathematics 2024
Thesis: *Supersymmetric Topological Sigma Models and Doubling Spaces*
Advisor: David Morrison.

M.A., Mathematics 2019

Hillsdale College

B.S., Mathematics and Physics, *cum laude* 2017

Senior thesis, Mathematics: *Spectral Decomposition of Quantum-Mechanical Operators*
Advisor: David Gaebler (available here as pdf [1])

Senior thesis, Physics: *Detecting High-Frequency Gravitational Waves With the Pulsar Timing Array*
Advisor: Timothy Dolch (available here as pdf [2])

Professional Experience

Teaching Assistant, Mathematics, University of California, Santa Barbara 2018-2024

Instructor, Mathematics, University of California, Santa Barbara 2019-2024

Visiting Assistant Professor, Mathematics, Lafayette College 2024-present

Publications and Preprints

1. **The NANOGrav 11-year Data Set: High-precision timing of 45 Millisecond Pulsars** (joint with Z. Arzoumanian et. al.). ApJS **235** 37. arXiv:1801.01837
2. **The NANOGrav 12.5 yr Data Set: Observations and Narrowband Timing of 47 Millisecond Pulsars** (joint with Md F. Alam et al.). 2021 ApJS **252** 4. arXiv:2005.06490
3. **The NANOGrav 12.5-year Data Set: Wideband Timing of 47 Millisecond Pulsars** (joint with Md F. Alam et al.). 2021 ApJS 252 5. arXiv:2005.06495
4. **Supersymmetric Topological Sigma Models and Doubling Spaces**. (In Preparation).

[0] Updated June 5, 2025
[1] https://danielhalmrast.github.io/resources/halmrast-math-thesis.pdf
[2] https://danielhalmrast.github.io/resources/halmrast-physics-thesis.pdf

Talks and Presentations Given

1. *Upper Limits on High-Frequency Single-Source Gravitational Waves.* International Pulsar Timing Array Annual Science Meeting, Stellenbosch, South Africa, June 20-July 1 2016. (poster available here as pdf [3])
2. *Upper Limits on High-Frequency Single-Source Gravitational Waves.* American Astronomical Society Annual Meeting, Grapevine, TX, January 3-7, 2017. (poster available here as pdf [4])
3. *Spectral Decomposition of Quantum-Mechanical Operators.* Rose-Hulman Undergraduate Mathematics Conference, Rose-Hulman Institute of Technology, April 22, 2017. (slides available here as pdf [5])
4. *Schwarzschild Geometry and Black Holes.* Graduate Differential Geometry Seminar, UCSB, November 8, 2018.
5. *Model Categories: Topology for the Algebraist.* Graduate Algebra Seminar, UCSB, February 20, 2020.
6. *Stability Conditions on Topological String Theories.* Ph.D. Advancement to Candidacy, UCSB, August 13, 2020.
7. *D-branes and Derived Categories.* Graduate Mathematical Physics Seminar, UCSB, October 17, 2022.
8. *Multimatrix Algebras.* Graduate Quantum Algebra and Topology Seminar, UCSB, October 12 and 17, 2022.
9. *A Refined Approach to Stability in the Hyperkähler Setting.* Derived Categories, Moduli Spaces, and Counting Invariants, Imperial College, London, July 4, 2023. (available here as pdf [6])
10. *String Theory and Mathematics: an Ongoing Dialogue.* , Lafayette College, April 16, 2024. (slides available here as pdf [7])

Seminars Organized

UCSB Graduate Mathematical Physics Seminar, *with Chris Dare and Danning Lu* 2022

Conferences Attended

Midwest Relativity Meeting, Northwestern University	October 2015
NANOGrav Spring Meeting, Caltech	March 2016
Michigan MAA Annual Meeting, Hillsdale College	April 2016
Green Bank Telescope Student Workshop, Green Bank, WV	May 2016
International Pulsar Timing Array Annual Science Meeting, Stellenbosch University	June 2016
American Astronomical Society Annual Meeting, Grapevine, TX	January 2017
Rose-Hulman Institute of Technology Undergraduate Mathematics Conference, Rose-Hulman institute of Technology	April 2017
Donaldson-Thomas Invariants and Resurgence (Virtual Meeting),	January 2021
Redbud Topology Conference, University of Oklahoma	March 2023
Workshop and School on Complex Lagrangians, Integrable Systems, and Quantization, University of Oxford	June 2023
Derived Categories, Moduli Spaces, and Counting Invariants, Imperial College London	July 2023
Hyperkähler Varieties, Derived Categories, and Moduli Spaces, Columbia University	February 2025
Enumerative geometry, representation theory, and physics, Kavli IPMU	March 2025
Derived Categories and Mirror Symmetry, University of Wisconsin, Madison	June 2025

[3] https://danielhalmrast.github.io/resources/IPTAPoster.pdf
[4] https://danielhalmrast.github.io/resources/IPTAPoster.pdf
[5] https://danielhalmrast.github.io/resources/SpectralDecompositionQMOperators.pdf
[6] https://danielhalmrast.github.io/resources/derivedFRGPosterHalmrast.pdf
[7] https://danielhalmrast.github.io/resources/mathStringsDialogue_nopause.pdf

Awards and Grants

Hillsdale College Half-Tuition Merit Scholarship	2013-2017
Hillsdale College LAUREATES Research Grant	2016
UCSB Central Fellowship	2017-2018
Department of Mathematics Outstanding TA Award	2022
UCSB Individualized Professional Skills Grant	2023
UCSB Doctoral Student Travel Grant	2023

Teaching Experience

Hillsdale College

Private Tutor, Mathematics and Physics	2014-2017
Mathematics Department Tutor	2014-2017
Arecibo Remote Command Center Student Team Leader	2015-2017
Teaching Assistant: Physics 101	Fall 2016

University of California, Santa Barbara

Instructor of Record

Math 34A: *Calculus for Social and Life Sciences*	Summer 2019
Math 6B: *Vector Calculus II*	Summer 2020
Math 6B: *Vector Calculus II*	Summer 2021
Math 6A: *Vector Calculus I*	Summer 2021
Math 4B: *Differential Equations*	Summer 2022
Math 4B: *Differential Equations*	Summer 2023

Teaching Assistant

Math 118A: *Introduction to Real Analysis (First Quarter)*	Fall 2018
Math 118B: *Introduction to Real Analysis (Second Quarter)*	Winter 2019
Math 4B: *Differential Equations*	Spring 2019
Math 4B: *Differential Equations*	Summer 2019
Math 111A: *Introduction to Abstract Algebra (First Quarter)*	Fall 2019
Math 6B: *Vector Calculus II*	Winter 2020
Math 6B: *Vector Calculus II*	Spring 2020
Math 4B: *Differential Equations*	Fall 2020
Math 108A: *Introduction to Linear Algebra*	Winter 2021
Math 118C: *Introduction to Real Analysis (Third Quarter)*	Spring 2021
Math 111A: *Introduction to Abstract Algebra (First Quarter)*	Fall 2021
Math 4B: *Differential Equations*	Spring 2022
Math 113: *Non-Euclidean Geometry*	Fall 2022
Math 108B: *Advanced Linear Algebra*	Winter 2023
Math 111C: *Introduction to Abstract Algebra (Third Quarter)*	Spring 2023
Math 4B: *Differential Equations*	Summer 2023
Math 4B: *Differential Equations*	Fall 2023

Course Grader

Math 202C: *Graduate Complex Analysis (Third Quarter)*	Spring 2021
Math 236A: *Graduate Homological Algebra (First Quarter)*	Winter 2023

Directed Reading [8]

"Functional Analysis" with Manish Kumar	2019
"Algebraic Geometry and Elliptic Curves" with Fidel Lopez	2020
"Cyclic Quotient Singularities of 2-Dimensional Affine Toric Varieties" with Jake Garcia	2020
"Quark Configurations and Lie Algebra Representations" with Yuxuan Wang	2021
"Algebraic Geometry and Moduli Spaces" with Michael Yan	2021
"Tangent Vectors as Derivations" with Christian Reynaldo	2022
"Introduction to Mirror Symmetry" with Justin Wu	2022

Lafayette College

Visiting Assistant Professor

Math 141: *Differential Calculus and Economic Modeling*	Fall 2024
Math 161: *Calculus I*	Fall 2024
Math 263: *Calculus III*	Spring 2025
Math 186: *Applied Statistics*	Spring 2025

[8] The Directed Reading Program at UCSB pairs graduate student mentors with undergraduate mathematics students to complete a two-quarter directed reading of a mathematical topic of interest. Details can be found at www.ucsbdrp.org