Arun **Debray**

Graduate Student, Mathematics

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Education

The University of Texas at Austin

Ph.D. in Mathematics — *Expected 2021*

Advisor: Daniel Freed

Stanford University

B.S. in Mathematics with Honors — *2015*

Thesis: "Modular Representation Theory and the CDE Triangle," advised by Akshay Venkatesh.

Publications and Preprints

1. (with Sam Gunningham) The Arf-Brown TQFT of Pin$^-$ Surfaces. In *Topology and Quantum Theory in Interaction*, Contemp. Math. volume 718, pp. 49–87. 2018. (arXiv:1803.11183).
2. The low-energy TQFT of the generalized double semion model. Comm. Math. Phys. volume 375, issue 2, pp. 1079–1115. 2020 (arXiv:1811.03583).
3. Invertible phases for mixed spatial symmetries and the fermionic crystalline equivalence principle, 2021 (arXiv:2102.02941).
4. Stable diffeomorphism classification of some unorientable 4-manifolds, 2021 (arXiv:2102.03965).

Other works

- (with Søren Galatius and Martin Palmer) Appendix to "Lectures on Invertible Field Theories" by Søren Galatius. (arXiv:1912.08706).
- Appendix to "Topological Superconductors on Superstring Worldsheets" by Justin Kaidi, Julio Parra-Martinez, and Yuji Tachikawa. SciPost Phys. volume 9, issue 1. 2020 (arXiv:1911.11780).

Talks

November 2020	**Two Physics Applications of Invertible Field Theories**, Harvard Center of Mathematical Sciences and Applications Special Seminar (online)
August 2020	**From Crystalline Topological Phases of Matter to Bordism**, Graduates Reminisce Online On Topology Summer Seminar
April 2020	**What: Bordism groups. Why: Condensed-matter physics. How: The Adams spectral sequence.**, Graduate Online Anything Topology Series
April 2020	**Topological Phases and Topological Field Theories**, Mathematical Sciences Research Institute Grad Student Seminar (online)
March 2020	**Topological Phases and Topological Field Theories**, Johns Hopkins Topology Seminar
July 2019	**The low-energy TQFT of the generalized double semion model**, Park City Mathematics Institute Research Program 2019
August 2018	**The low-energy TQFT of the generalized double semion model**, Conference on Higher Algebra and Mathematical Physics, Perimeter Institute
November 2017	**The low-energy TQFT of the generalized double semion model**, Contributed talk, Texas Analysis and Mathematical Physics Symposium
January 2017	**Lattice models and TQFTs**, AT&T Foundry Palo Alto weekly seminar series

Service

Co-organizer: UT summer mini-courses — *Summer 2020*

Co-organized a program of several week-long online math mini-courses run by and for graduate students.

Teacher: UT summer mini-courses — *2017, 2018, 2019, 2020*

Taught week-long mini-courses on subjects including characteristic classes, topological field theory, and spectral sequences for grad students.

UT Math Club *Fall 2015, Spring 2016, Fall 2016, Fall 2019*

Spoke at UT Austin's undergraduate math club on SET and maximal caps; cohomology; and Frobenius algebras and TQFTs.

Teaching assistant: Park City Mathematics Institute *Summer 2019*

TA for Søren Galatius' course on invertible field theories for grad students.

10/8 theorem learning seminar *Spring 2019*

Co-organized a learning seminar on Furuta's proof of the 10/8 theorem.

Homotopy theory learning seminar *Fall 2018*

Co-organized a learning seminar on the Adams-Novikov spectral sequence.

Saturday Morning Math Group *Fall 2018*

Gave a talk to high schoolers about the mathematics of SET.

Gromov-Witten theory learning seminar *Spring 2018*

Co-organized a learning seminar on Gromov-Witten theory.

Quantum topology and categorification learning seminar *Spring 2017*

Co-organized a learning seminar on Chern-Simons theory, the Jones polynomial, and Khovanov homology.

Student geometry seminar *Fall 2016, Fall 2017*

Organizer.

A-Star Math Tournament *2015*

Head proctor and co-organizer.

Berkeley Math Tournament *2012, 2015*

Proctor and grader.

Stanford Math Tournament *2012, 2013, 2014*

Head proctor, proctor, and problem writer.

American Regions Math League (ARML) *2012*

Coached the San Francisco-Bay Area A2 team.

Honors, awards, and fellowships

F19 – S20	**Continuing Fellowship**, UT Austin
S17, S18	**Geometry Research and Training Grant (RTG) Fellowship**, UT Austin Department of Mathematics
Fall 2017	**Honorable mention, Visualizing Science Competition**, UT Austin College of Natural Sciences
Spring 2017	**Honorable mention, National Science Foundation Graduate Research Fellowship Program**, National Science Foundation
Fall 2016	**Prelim Excellence Award**, UT Austin Department of Mathematics
F15 – S16	**Geometry Research and Training Grant (RTG) Fellowship**, UT Austin Department of Mathematics
Spring 2013	**Boothe Prize for Excellence in First-Year Writing**, Stanford University

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Conferences attended

April 2016	Graduate Student Topology and Geometry Conference, University of Indiana
April 2017	Conference on invertible objects and duality in derived algebraic geometry and homotopy theory, University of Regensburg
April 2017	Texas Algebraic Geometry Symposium, Rice University
June 2017	Strongly Correlated Topological Phases of Matter, Stony Brook
July 2017	Homotopy Theory: tools and applications, UIUC
August 2017	Topological and Geometric Methods in QFT, Montana State University
November 2017	Texas Analysis and Mathematical Physics Symposium, UT Austin
February 2018	Texas Geometry and Topology Conference, University of Houston
April 2018	Texas Algebraic Geometry Symposium, Texas A&M University
July 2018	The topology and geometry of low-dimensional manifolds: a celebration of the mathematics of Bob Gompf, UT Austin
August 2018	Conference on Higher Algebra and Mathematical Physics, Perimeter Institute
January 2019	Between Topology and Quantum Field Theory: A conference in celebration of Dan Freed's 60th birthday, UT Austin
June 2019	QFT for Mathematicians, Perimeter Institute
July 2019	Park City Mathematics Institute Graduate Summer School on quantum field theory and manifold invariants
January 2020	MSRI: Introductory Workshop: Quantum Symmetries
February 2020	MSRI: Introductory Workshop: Higher Categories and Categorification
March 2020	MSRI: Tensor categories and topological quantum field theories (online)
March 2020	MSRI: (∞, n)-categories, factorization homology, and algebraic K-theory (online)
April 2020	Graduate Online Anything Topology Seminar (online)

Teaching experience

Teaching Assistant

The University of Texas at Austin *Fall 2020*

TAed UT's grad algebraic topology course, including grading problem sets.

Supplemental Instruction (SI) Teaching Assistant

The University of Texas at Austin *Fall 2016, Fall 2017, Fall 2018*

- M408N: Differential Calculus for Science
- M408L: Integral Calculus
- Taught in a "flipped classroom," teaching sections, holding office hours, and participating in the Sanger Learning Center SI Program.

Directed Reading Program Mentor

The University of Texas at Austin *Spring 2016 – Present*

- Mentored undergraduates on projects including lattice-based cryptography, point-set topology, symplectic geometry, and cobordism.

Math 50 Series Tutor

Stanford University *Winter 2013 – Spring 2015*

- Tutored linear algebra, multivariable calculus, and differential equations.

Other experience

Member, Mathematical Sciences Research Institute, Program on Quantum Symmetries

Berkeley, CA *Spring 2020*

Software Engineering Internship, Dropbox

San Francisco, CA *Summer 2015*

Research Internship, AT&T Foundry

Palo Alto, CA *Summer 2014*

Computer Science Undergraduate Research Internship (CURIS), Stanford University

Palo Alto, CA *Summer 2013*