

Arun Debray

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Employment

Golomb Visiting Assistant Professor

PURDUE UNIVERSITY, DEPARTMENT OF MATHEMATICS

Fall 2021 – present

Education

The University of Texas at Austin

PH.D. IN MATHEMATICS

2021

Thesis: “Taking topological field theory at phase value,” advised by 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](https://arxiv.org/abs/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](https://arxiv.org/abs/1811.03583)).
3. Invertible phases for mixed spatial symmetries and the fermionic crystalline equivalence principle, 2021 ([arXiv:2102.02941](https://arxiv.org/abs/2102.02941)).
4. Stable diffeomorphism classification of some unorientable 4-manifolds, 2021 ([arXiv:2102.03965](https://arxiv.org/abs/2102.03965)).
5. (with Markus Dierigl, Jonathan J. Heckman, and Miguel Montero) The anomaly that was not meant IIB. Accepted for publication, *Fortschritte der Physik*. 2021 ([arXiv:2107.14227](https://arxiv.org/abs/2107.14227)).
6. (with Yu Leon Liu and Christoph Weis) Constructing the Virasoro groups using differential cohomology, 2021 ([arXiv:2112.10837](https://arxiv.org/abs/2112.10837)).

OTHER WORKS

- (with Søren Galatius and Martin Palmer) Appendix to “Lectures on Invertible Field Theories” by Søren Galatius. ([arXiv:1912.08706](https://arxiv.org/abs/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](https://arxiv.org/abs/1911.11780)).

Books

1. (edited jointly with Araminta Amabel and Peter Haine) *Differential Cohomology: Categories, Characteristic Classes, and Connections*, 2021 ([arXiv:2109.12250](https://arxiv.org/abs/2109.12250)).

Talks

November 2021	The anomaly of the duality symmetry in type IIB string theory , Perimeter Institute Math Physics Seminar
July 2021	Invertible phases for mixed spatial symmetries , Higher Structures in QFT and String Theory Gong Show
July 2021	Modeling invertible topological phases of matter using homotopy theory , Harvard Center of Mathematical Sciences and Applications Interdisciplinary Science Seminar
June 2021	From bordism groups to crystalline SPT phases , TopFlavours
June 2021	Stable diffeomorphism classification of some unorientable 4-manifolds , (Online) Workshop in Geometric Topology
March 2021	Stable diffeomorphism classification of some unorientable 4-manifolds , MIT Topology Seminar
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

2020, 2021

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, 2021

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, Spring 2021

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

Spring 2021	Frank Gerth III Dissertation Award , UT Austin Department of Mathematics
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)
June 2021	Viva Talbot! (online)
June 2021	Workshop in Geometric Topology (online)
June 2021	TopFlavours (online)
July 2021	Higher Structures in QFT and String Theory (online)
October 2021	Generalized Cohomology and Physics (online)
November 2021	MSRI: Chern-Simons and other topological field theories

Teaching experience

Linear algebra

PURDUE UNIVERSITY

Fall 2021

Teaching Assistant

THE UNIVERSITY OF TEXAS AT AUSTIN

Fall 2020, Spring 2021

TAed UT's grad algebraic topology and differential topology courses, 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 – Spring 2021

- 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