

# Arun Debray

GRADUATE STUDENT, MATHEMATICS

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## Education

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### 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

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1. (with Sam Gunningham) The Arf-Brown TQFT of  $\text{Pin}^-$  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)).

### 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)).

## Talks

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

## Service

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### 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

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

Spring 2019

## Homotopy theory learning seminar

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

Fall 2018

## Saturday Morning Math Group

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

Fall 2018

## Gromov-Witten theory learning seminar

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

Spring 2018

## Quantum topology and categorification learning seminar

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

Spring 2017

## Student geometry seminar

Organizer.

Fall 2016, Fall 2017

## A-Star Math Tournament

Head proctor and co-organizer.

2015

## Berkeley Math Tournament

Proctor and grader.

2012, 2015

## Stanford Math Tournament

Head proctor, proctor, and problem writer.

2012, 2013, 2014

## American Regions Math League (ARML)

Coached the San Francisco-Bay Area A2 team.

2012

## Honors, awards, and fellowships

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

## Conferences attended

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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: $(\infty, n)$ -categories, factorization homology, and algebraic $K$ -theory (online)
April 2020	Graduate Online Anything Topology Seminar

## Teaching experience

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### 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

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### 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