Bradley Dirks

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Positions

Institute for Advanced Study 2024-2025
Member, School of Mathematics *Princeton, NJ*

Stony Brook University 2023-2027
Simons Instructor *Stony Brook, NY*

NSF Mathematical Sciences Postdoctoral Research Fellow 2023-2027
Stony Brook University *Stony Brook, NY*

Education

University of Michigan 2018-2023
PhD in Mathematics. Advisor: Mircea Mustaţă *Ann Arbor, MI*

- Thesis: Using Mixed Hodge Modules to Study Singularities

University of California 2014-2018
BA and MA in Mathematics *Los Angeles, CA*

Teaching Experience

Instructor Spring 2024
Stony Brook University *Stony Brook, NY*

- MAT310: Linear Algebra

Graduate Student Instructor October 2018-Winter 2022
University of Michigan *Ann Arbor, MI*

- Math 105 (Precalculus), Math 115 (Calculus I), Math 116 (Calculus II)

Docent 2016 - 2018
LA Math Circle (now ORMC) *Los Angeles, CA*

Research Interests

Algebraic Geometry, Singularities, $\mathcal{D}$-modules, Hodge Theory

Preprints

- **Hirzebruch-Milnor classes of local complete intersections, minimal exponent, and applications to higher singularities**
  with Laurenţiu Maxim and Sebastián Olano. Submitted
- **A Hodge theoretic generalization of Q-homology manifolds**
  with Sebastián Olano and Debaditya Raychaudhury. Submitted
- **Restrictions of Hodge modules using generalized V-filtrations**
  with Qianyu Chen and Sebastián Olano. Submitted
- **Fourier transform and Radon transform for mixed Hodge modules**
  Submitted
- **Some applications of Microlocalization for LCI subvarieties**
  Accepted
- **Verdier specialization and restrictions of Hodge modules**
  w/ Qianyu Chen and Morihiko Saito. Math. Z. **310** (2025)

Publications

- **The minimal exponent of cones over smooth complete intersection projective varieties**
  w/ Qianyu Chen and Mircea Mustaţă. Rev. Roumaine Math. Pures Appl. **70** (2025)
- **The minimal exponent and k-rationality for locally complete intersections**
  w/ Qianyu Chen and Mircea Mustaţă. J. Ec. polytech. Math. **11** (2024)
- **Minimal exponents and V-filtrations of locally complete intersection singularities**
  w/ Qianyu Chen, Mircea Mustaţă and Sebastián Olano. J. Reine Angew. Math. **811** (2024)
- **An introduction to V-filtrations**
  with Qianyu Chen and Mircea Mustaţă. Handbook of Geometry and Topology of Singularities, Volume VII
- **On V-filtration, Hodge filtration and Fourier Transform**
  with Qianyu Chen. Selecta Math. (N.S.) **29** (2023)
- **Minimal exponents of hyperplane sections: a conjecture of Teissier**
  with Mircea Mustaţă. J. Eur. Math. Soc. **25** (2023)
- **The Hilbert series of Hodge ideals of hyperplane arrangements**
  with Mircea Mustaţă. J. Singul. **20** (2020)
- **Upper bounds for roots of B-functions, following Kashiwara and Lichtin**
  with Mircea Mustaţă. Publ. Res. Inst. Math. Sci. **58** (2022)

Organizing

AIM Workshop "Higher Du Bois and higher rational singularities" October 28 - November 1, 2024
American Institute of Mathematics. See website *w/ Radu Laza*

Winter School on New Applications of Mixed Hodge Modules January 2024
Simons Center for Geometry and Physics. See website *w/ Christian Schnell*

Student Algebraic Geometry seminar Winter 2021-2023
University of Michigan *w/ Devlin Mallory in Winter 2021, w/ Saket Shah 2022-2023*

$\mathcal{D}$-modules and Representation Theory Minicourse Summer 2022
University of Michigan

Mixed Hodge Theory Minicourse Summer 2020
University of Michigan *w/ James Hotchkiss*

Variations of Hodge Structure Reading Group Winter 2020
University of Michigan *w/ James Hotchkiss*

Invited Talks

Singularities in the Midwest, IX April 2025
Hodge theoretic properties of LCI singularities *University of Wisconsin, Madison*

AMS 2025 Spring Sectional Meeting March 2025
Singularities of Local Complete Intersections via Hodge Theory *University of Kansas*

JHU Algebraic Geometry Seminar October 2024
Minimal Exponent for LCI Subvarieties *Johns Hopkins University*

Princeton University Algebraic Geometry Seminar September 2024
Minimal Exponent for LCI Subvarieties *Princeton University*

Birational Geometry Seminar 2024 May 2024
Recent Results on Minimal Exponent for LCI Subvarieties *Online*

CUNY Commutative Algebra and Algebraic Geometry Seminar March 2024
The minimal exponent for LCI subvarieties *Graduate Center of CUNY*

University of Utah Algebraic Geometry Seminar February 2024
The minimal exponent for LCI subvarieties *University of Utah*

Columbia University Algebraic Geometry Seminar January 2024
The minimal exponent for LCI subvarieties *Columbia University*

Winter School on New Applications of Mixed Hodge Modules January 2024
V-filtration and Hodge filtration in higher codimension *Simons Center for Geometry and Physics*

University of Toronto Algebraic Geometry Seminar November 2023
The minimal exponent for LCI subvarieties *University of Toronto*
Harvard/MIT Algebraic Geometry Seminar October 2023
The minimal exponent for LCI Subvarieties *Harvard University*
Birational Geometry Seminar 2023 May 2023
Higher du Bois and higher rational singularities for LCI varieties *Online*

MAGGC August 2022
V-filtrations of $\mathcal{D}$-modules *UIC*
Algebraic Geometry and Singularities Learning Workshop & Conference June 2022
Comparing V-filtration of an ideal with that of a general linear combination *UW Seattle*
Algebraic Geometry Seminar February 2022
The Structure of Monodromic Mixed Hodge modules *Stony Brook University*
DOCAS Seminar August 2021
Understanding the roots of b-functions *Online*
UConn Algebra Seminar April 2021
Minimal Exponents and a Conjecture of Teissier *Online*

Topology and Singularities Seminar in Madison March 2021
Minimal Exponents and a Conjecture of Teissier *Online*

AWARDS

NSF Mathematical Sciences Postdoctoral Research Fellowship — National Science Foundation, 2023
Wirt and Mary Cornwell Prize — University of Michigan Mathematics Department, 2023
Rackham Predoctoral Fellowship — University of Michigan, Summer 2022-Winter 2023
Paul Daus Memorial Award — UCLA, 2018
Departmental Honors — UCLA Math Department, 2018
Summa Cum Laude — UCLA, 2018