Botong Wang

Professor of Mathematics, University of Wisconsin–Madison

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Academic Appointments

Professor 2025–present
Department of Mathematics, University of Wisconsin–Madison

Associate Professor 2021–2025
Department of Mathematics, University of Wisconsin–Madison

Assistant Professor 2017–2021
Department of Mathematics, University of Wisconsin–Madison

Visiting Assistant Professor 2016–2017
Department of Mathematics, University of Wisconsin–Madison

Postdoctoral Researcher Fall 2015
Department of Mathematics, KU Leuven

Visiting Assistant Professor 2012–2015
Department of Mathematics, University of Notre Dame

Education

Ph.D. in Mathematics 2006–2012
Purdue University; advisor: Donu Arapura

B.A. in Mathematics 2002–2006
Peking University

Honors and Fellowships

Von Neumann Fellowship 2024–2025
Institute for Advanced Study

Simons Fellowship 2023–2024

Early Career Distinguished Alumni Award 2022
Purdue University College of Science

Sloan Research Fellowship 2019–2023
Alfred P. Sloan Foundation

International Mathematical Olympiad Gold Medal 2002

Research Grants

Simons Travel Support for Mathematicians 2026–2031

NSF Research Grant 2017–2020

Simons Travel Grant 2015–2017

Publications

Preprints and Forthcoming Work

1. **The parity module of a matroid** [arXiv:2610.20234]
   With Tom Braden, June Huh, Jacob P. Matherne, and Nicholas Proudfoot.
2. **The topology of Kähler manifolds and 1-forms without zeros** [arXiv:2610.04314]
   With Maurício Corrêa, János Kollár, and Stefan Schreieder.
3. **Invisible singularities in complex algebraic geometry** [arXiv:2608.10973]
   With Mauricio Correa, János Kollár, and Stefan Schreieder.

4. **Matroid correspondence** [arXiv:2607.13783]
   With Colin Crowley, Changxin Ding, Haoxi Hu, Arvind Kumar, Jonathan Montaño, Thai Thanh Nguyen, Anna Shapiro, Noah Solomon, and Juliet Whidden.
5. **Topology and Euler characteristics of tropical varieties** [arXiv:2606.10817]
   With Scott Hiatt, Connor Simpson, and Chenxi Wu.
6. **Euclidean distance degree defect of singular projective varieties** [arXiv:2605.13726]
   With Laurentiu Maxim and José Rodríguez.
7. **Vertex posets, monotone path polytopes, and Chow polynomials** [arXiv:2604.27515]
   With Mateusz Michałek and Leonid Monin.
8. **Tree metrics and log-concavity for matroids** [arXiv:2601.02547]
   With Federico Ardila-Mantilla, Sergio Cristancho, Graham Denham, Christopher Eur, and June Huh.
   To appear in Proceedings of the London Mathematical Society.
9. **Spectral sequences, Massey products and homology of covering spaces** [arXiv:2511.11893]
   With Yongqiang Liu and Laurentiu Maxim.
   To appear in European Journal of Mathematics.
10. **Bounded ratios for Lorentzian matrices** [arXiv:2510.25030]
    With Daoji Huang, June Huh, and Daniel Soskin.
11. **Linear operators preserving volume polynomials** [arXiv:2506.22415]
    With Lukas Grund, June Huh, Mateusz Michałek, and Hendrik Süß.
12. **Realizations of homology classes and projection areas** [arXiv:2505.08881]
    With Daoji Huang, June Huh, Mateusz Michałek, and Shouda Wang.
13. **Deformation openness of big fundamental groups and applications** [arXiv:2412.08636]
    With Ya Deng and Chikako Mese.
14. **L^2-vanishing theorem and a conjecture of Kollár** [arXiv:2409.11399]
    With Ya Deng.
15. **Linear Chern–Hopf–Thurston conjecture** [arXiv:2405.12012]
    With Ya Deng.
16. **Singular Hodge theory for combinatorial geometries** [arXiv:2010.06088]
    With Tom Braden, June Huh, Jacob Matherne, and Nick Proudfoot.
    To appear in Journal of the American Mathematical Society.
17. **Numerical computation of braid groups** [arXiv:1711.07947]
    With José Rodríguez.

Published Articles and Chapters

1. **Maximal twisted Betti numbers of complex hyperplane arrangement complements**
   With Yongqiang Liu and Laurentiu Maxim.
   International Mathematics Research Notices, 2026, no. 6, Paper rnag050, 9 pp.
2. **The Bergman fan of a polymatroid**
   With Colin Crowley, June Huh, Matt Larson, and Connor Simpson.
   Transactions of the American Mathematical Society 379 (2026), no. 5, 3239–3256.
3. **Combinatorial flats and Schubert varieties of subspace arrangements**
   With Colin Crowley and Connor Simpson.
   Algebraic Combinatorics 8 (2025), no. 5, 1285–1312.
4. **A new generic vanishing theorem on homogeneous varieties and the positivity conjecture for triple intersections of Schubert cells**
   With Jörg Schürmann and Connor Simpson.
   Compositio Mathematica 161 (2025), no. 1, 1–12.
5. **Perverse sheaves on varieties with large fundamental groups**
   With Donu Arapura.
   Journal of Differential Geometry 129 (2025), no. 1, 1–15.
6. **Hodge-theoretic variants of the Hopf and Singer conjectures**
   With Donu Arapura and Laurentiu Maxim.
   In Geometry and Topology of Aspherical Manifolds, 93–103, Contemporary Mathematics 816.

7. **Brylinski–Radon transformation and generic projections**
With Yongqiang Liu and Laurentiu Maxim.
Proceedings of the American Mathematical Society 152 (2024), no. 12, 5279–5288.
8. **Applications of singularity theory in applied algebraic geometry and algebraic statistics**
With Laurentiu Maxim and José Rodríguez.
Handbook of Geometry and Topology of Singularities, vol. VII, 767–818.
9. **Cohomology of $\mathbb{Z}$-local systems on complex hyperplane arrangement complements**
With Yongqiang Liu and Laurentiu Maxim.
International Mathematics Research Notices 2024, no. 15, 11092–11103.
10. **Linear optimization on varieties and Chern–Mather classes**
With Laurentiu Maxim, José Rodríguez, and Lei Wu.
Advances in Mathematics 437 (2024), Paper 109443.
11. **Logarithmic cotangent bundles, Chern–Mather classes, and the Huh–Sturmfels involution conjecture**
With Laurentiu Maxim, José Rodríguez, and Lei Wu.
Communications on Pure and Applied Mathematics 77 (2024), no. 2, 1486–1508.
12. **Self-covering, finiteness, and fibering over a circle**
With Lizhen Qin and Yang Su.
Transactions of the American Mathematical Society 377 (2024), 1883–1914.
13. **Mixed Hodge structures on Alexander modules**
With Eva Elduque, Christian Geske, Moisés Herradón Cueto, and Laurentiu Maxim.
Memoirs of the American Mathematical Society 296 (2024).
14. **Non-abelian Mellin transformations and applications**
With Yongqiang Liu and Laurentiu Maxim.
Forum of Mathematics, Sigma 10 (2022), Paper e100, 17 pp.
15. **Alexander modules, Mellin transformation and variations of mixed Hodge structures**
With Eva Elduque, Moisés Herradón Cueto, and Laurentiu Maxim.
Advances in Mathematics 411 (2022), Paper 108798, 27 pp.
16. **Hodge theory on Alexander invariants — a survey**
With Eva Elduque, Christian Geske, Moisés Herradón Cueto, and Laurentiu Maxim.
Topology and its Applications 313 (2022), Paper 107981, 16 pp.
17. **A semi-small decomposition of the Chow ring of a matroid**
With Tom Braden, June Huh, Jacob Matherne, and Nick Proudfoot.
Advances in Mathematics 409 (2022), Paper 108646, 49 pp.
18. **A Morse theoretic approach to non-isolated singularities and applications to optimization**
With Laurentiu Maxim and José Rodríguez.
Journal of Pure and Applied Algebra 226 (2022), no. 3, Paper 106865, 23 pp.
19. **Correlation bounds for fields and matroids**
With June Huh and Benjamin Schröter.
Journal of the European Mathematical Society 24 (2022), no. 4, 1335–1351.
20. **Aspherical manifolds, Mellin transformation and a question of Bobadilla–Kollár**
With Yongqiang Liu and Laurentiu Maxim.
Journal für die reine und angewandte Mathematik 781 (2021), 1–18.
21. **Euclidean distance degree of projective varieties**
With Laurentiu Maxim and José Rodríguez.
International Mathematics Research Notices 2021, no. 20, 15788–15802.
22. **Topology of subvarieties of complex semi-abelian varieties**
With Yongqiang Liu and Laurentiu Maxim.
International Mathematics Research Notices 2021, no. 14, 11169–11208.
23. **Perverse sheaves on semi-abelian varieties**
With Yongqiang Liu and Laurentiu Maxim.
Selecta Mathematica 27 (2021), no. 2, Paper 30, 40 pp.
24. **A numerical approach for computing Euler characteristics of affine varieties**
With Xiaxin Li and José Rodríguez.
In Mathematical Software — ICMS 2020, Lecture Notes in Computer Science 12097.

25. **Defect of Euclidean distance degree**
With Laurentiu Maxim and José Rodríguez.
Advances in Applied Mathematics 121 (2020), 102101.

26. **Lyubeznik numbers of irreducible projective varieties depend on the embedding**
Proceedings of the American Mathematical Society 148 (2020), 2091–2096.

27. **Perverse sheaves on semi-abelian varieties — a survey of properties and applications**
With Yongqiang Liu and Laurentiu Maxim.
European Journal of Mathematics 6 (2020), no. 3, 977–997.

28. **Euclidean distance degree of the multiview variety**
With Laurentiu Maxim and José Rodríguez.
SIAM Journal on Applied Algebra and Geometry 4 (2020), no. 1, 28–48.

29. **Computing Euler obstruction functions using maximum likelihood degrees**
With José Rodríguez.
International Mathematics Research Notices 2020, no. 20, 6699–6712.

30. **Absolute sets and the decomposition theorem**
With Nero Budur.
Annales scientifiques de l'École Normale Supérieure (4) 53 (2020), no. 2, 469–536. Correction: (4) 55 (2022), no. 5, 1473–1474.

31. **Cohomology jump loci of quasi-compact Kähler manifolds**
With Nero Budur.
Pure and Applied Mathematics Quarterly 16 (2020), no. 4, 981–999.

32. **On the length of perverse sheaves and D-modules**
With Nero Budur, Pietro Gatti, and Yongqiang Liu.
Bulletin Mathématique de la Société des Sciences Mathématiques de Roumanie 62(110) (2019), no. 4, 355–369.

33. **Generic vanishing for semi-abelian varieties and integral Alexander modules**
With Yongqiang Liu and Laurentiu Maxim.
Mathematische Zeitschrift 293 (2019), 629–645.

34. **Mellin transformation, propagation, and abelian duality spaces**
With Yongqiang Liu and Laurentiu Maxim.
Advances in Mathematics 335 (2018), 231–260.

35. **Algebraic surfaces with zero-dimensional cohomology support locus**
Taiwanese Journal of Mathematics 22 (2018), no. 3, 607–614.

36. **The monodromy theorem for compact Kähler manifolds and smooth quasi-projective varieties**
With Nero Budur and Yongqiang Liu.
Mathematische Annalen 371 (2018), no. 3–4, 1069–1086.

37. **A family of compact complex-symplectic Calabi–Yau manifolds that are non-Kähler**
With Lizhen Qin.
Geometry & Topology 22 (2018), no. 4, 2115–2144.

38. **Lefschetz classes on projective varieties**
With June Huh.
Proceedings of the American Mathematical Society 145 (2017), no. 11, 4629–4637.

39. **Enumeration of points, lines, planes, etc.**
With June Huh.
Acta Mathematica 218 (2017), 297–317.

40. **Cohomology support loci of local systems**
With Nero Budur, Yongqiang Liu, and Luis Saumell.
Michigan Mathematical Journal 66 (2017), no. 2, 295–307.

41. **Local systems on analytic germ complements**
With Nero Budur.
Advances in Mathematics 306 (2017), 905–928.

42. **Recent results on cohomology jump loci**
With Nero Budur.
In Hodge Theory and L^2-analysis, ALM 39, 205–241.

43. **The maximum likelihood degree of mixtures of independence models**
With José Rodríguez.
SIAM Journal on Applied Algebra and Geometry 1 (2017), no. 1, 484–506.

44. **Maximum likelihood degree of Fermat hypersurfaces via Euler characteristics**
Proceedings of the American Mathematical Society 144 (2016), no. 5, 3649–3655.

45. **Rank one local systems and forms of degree one**
With Nero Budur and Youngho Yoon.
International Mathematics Research Notices 2016, no. 13, 3849–3855.

46. **Torsion points on the cohomology jump loci of compact Kähler manifolds**
Mathematical Research Letters 23 (2016), no. 2, 545–563.

47. **Bounding the maximum likelihood degree**
With Nero Budur.
Mathematical Research Letters 22 (2015), no. 6, 1613–1620.

48. **The signed Euler characteristic of very affine varieties**
With Nero Budur.
International Mathematics Research Notices 2015, 5710–5714.

49. **Cohomology jump loci of differential graded Lie algebras**
With Nero Budur.
Compositio Mathematica 151 (2015), no. 8, 1499–1528.

50. **Cohomology jump loci of quasi-projective varieties**
With Nero Budur.
Annales scientifiques de l'École Normale Supérieure 48 (2015), no. 1, 227–236.

51. **Homomorphisms between fundamental groups of Kähler manifolds**
Proceedings of the American Mathematical Society 139 (2011), no. 5, 1599–1603.

Invited Talks

- Algebra and Geometry of Matroids, Casa Matemática Oaxaca, UNAM–Oaxaca, Oaxaca, Mexico, September–October 2026
- German Mathematical Association Annual Meeting, University of Konstanz, Konstanz, Germany, September 2026
- Colloquium, University of Iowa, February 2026
- AMS Special session on combinatorial algebraic geometry in JMM Joint Math Meetings, Washington, D.C., January 2026
- Algebra, Algebraic geometry and application seminar, Politecnico di Torino, online, December 2025
- Arizona-New Mexico Symposium on Commutative Algebra and Its Interactions: Geometric Combinatorics, New Mexico State University in Las Cruces, NM, December 2025
- Algebraic geometry seminar, Purdue University, November 2025
- Algebraic Geometry Seminar, Northwestern University, November 2025
- Algebraic geometry seminar, University of Chicago, October 2025
- Combinatorics & Geometry BLT seminar, Online, October 2025
- SIAM Conference on Applied Algebraic Geometry, minisymposium "Discriminants in the sciences", University of Wisconsin-Madison, Madison, July 2025
- Colloquium, Rutgers University-Newark, Newark, March 2025
- Combinatorics of Enumerative Geometry workshop, IAS, Princeton, February 2025
- Combinatorics of Fundamental Physics, IAS, Princeton, November 2024
- Algebraic geometry seminar, Johns Hopkins University, November 2024
- Characteristic classes of singular spaces, Zhejiang University, Hangzhou, China, August 2024
- Summer school on moduli of local systems, Stockholm University, Stockholm, Sweden, May 2024
- Hyperplane arrangement 2023 conference, Rikkyo University, Japan, December 2023
- Summer course, Wuhan University, August 2023
- PKU Mathematics Forum, Peking University, August 2023
- Kentucky–Ohio Algebra Alliance (KOALA), OSU, Columbus, Ohio, May 2023
- Colloquium, University of Arizona, April 2023
- Recent Breakthroughs in Mathematics, Belgian Mathematical Society, Brussels, Belgium, March 2023
- Algebraic Aspects of Matroid Theory, BIRS, Banff, March 2023
- Algebraic geometry seminar, University of Michigan, February 2023

- Conference on Periods, Shafarevich Maps and Applications, IMSA, University of Miami, January 2023
- Optimization, Algebra, and Geometry Seminar (online), Carnegie Mellon University, November 2022
- Lectures at YMSC (online), Tsinghua University, November 2022
- Online seminar, Chinese University of Hong Kong, Hong Kong, October 2022
- Algebraic geometry seminar, KU Leuven, Leuven, Belgium, June 2022
- Summer school on nonabelian Hodge theory, St Jacut, France, June 2022
- Colloquium, Purdue University, April 2022
- AMS Sectional Meeting AMS Special Session on Optimization, Complexity, and Real Algebraic Geometry, virtual meeting, March 2022
- Geometry and topology seminar, University of Wisconsin-Madison, November 2021
- CA+ conference, University of Minnesota, October 2021
- Conference on Compactifications, configurations, and cohomology, Northeastern University, October 2021
- Workshop on D-modules, Group Actions, and Frobenius: Computing on Singularities, ICERM, online, August 2021
- Sokcho Algebraic Geometry conference, Sokcho, Korea, online, July 2021
- Algebraic geometry seminar, Stony Brook University, online, March 2021
- Geometry and Combinatorics Seminar, Western University, online, March 2021
- Seminar on Geometry and Arithmetic, UCSB, online, January 2021
- 10 lectures on matroid theory, Suzhou University, online, October–November 2020
- Combinatorics seminar, University of Wisconsin-Madison, February 2020
- Colloquium, University of Michigan, January 2020
- Special Session on Singularities and Characteristic Classes, AMS–JMM Joint Meeting, Denver, January 2020
- Algebraic topology seminar, Princeton University, November 2019
- Workshop on Topological and Analytical Methods in Singularity Theory, CIMAT, Guanajuato, Mexico, November 2019
- Leuven-PKU mini-conference, BICMR, Beijing, China, August 2019
- Workshop on Algebraic Geometry, Fudan University, Shanghai, China, July 2019
- Workshop on algebra, geometry and combinatorics, KIAS, Seoul, Korea, June 2019
- Tianyuan advanced seminar on Hodge theory, Center for Applied Mathematics of Tianjin University, Tianjin, China, May 2019
- Algebraic geometry conference, BCAM, Bilbao, Spain, May 2019
- Algebraic geometry seminar, KU Leuven, Leuven, Belgium, May 2019
- Geometry and topology seminar, University of Massachusetts Amherst, April 2019
- Algebraic geometry seminar, Johns Hopkins University, February 2019
- Algebra seminar, Georgia Tech, February 2019
- Workshop on D-modules and Hodge theory, UIC, November 2018
- WAGS (Western Algebraic Geometry Symposium), University of Oregon, October 2018
- Colloquium and Algebra Seminar, Central Michigan University, September 2018
- Algebraic geometry seminar, Suzhou University, Suzhou, China, August 2018
- Algebraic geometry seminar, BICMR, Beijing, China, August 2018
- Workshop on algebraic geometry, Morningside Center for Mathematics, Chinese Academy of Sciences, Beijing, China, June 2018
- Algebraic geometry seminar, East China Normal University, Shanghai, China, June 2018
- Topology and Geometry, a conference dedicated to the memory of Stefan Papadima. IMAR, Bucharest, Romania, May 2018
- Workshop on Geometry and Physics, III Sun Yat-sen University, May 2018
- Algebra seminar at University of Arkansas, March 2018
- Algebraic geometry seminar at Purdue University, February 2018
- Hodge Theory, Moduli and Representation Theory Conference at Stony Brook University, August 2017
- Algebraic geometry seminar at Shanghai center for mathematical sciences, China, August 2017
- One week summer course at Nanjing University, China, July 2017

- Singularity theory conference at East China Normal University, China, July 2017
- Workshop on Hyperplane Arrangements and Singularities, KIAS, Korea, June 2017
- Workshop on Algebraic Varieties With a Special Emphasis on Calabi-Yau Varieties and Mirror Symmetry at Fields Institute, Toronto, March 2017
- Special colloquium at University of Toronto, January 2017
- Algebraic geometry seminar and Colloquium at UCSD, January 2017
- Colloquium at University of Wisconsin–Madison, December 2016
- Colloquium at Washington University in St. Louis, November 2016
- Algebraic geometry seminar at OSU, November 2016
- Algebraic geometry seminar at University of Wisconsin–Madison, October 2016
- Conference "Young Researcher Symposium on Topology" at Nanjing University, China, August 2016
- Algebraic geometry seminar at KAIST, Korea, July 2016
- Algebraic geometry seminar at IBS-CGP, Pohang, Korea, July 2016
- Special session on "Algebraic geometry and singularities" in the Second Joint Conference of the Belgian, Royal Spanish and Luxemburg Mathematical Societies at University of La Rioja, Spain, June 2016
- Algebraic geometry seminar at University of Chicago, April 2016
- Algebraic geometry seminar at Princeton University, April 2016
- Algebraic geometry seminar at Purdue University, March 2016
- Conference "Singularities in the Midwest, III" at University of Wisconsin-Madison, March 2016
- AMS Sectional meeting " Special Session on Topology and Combinatorics of Arrangements (in honor of Mike Falk)" at Stony Brook University, March 2016
- AMS Sectional meeting "Special Session on Singularities in Algebra, Geometry and Topology", Loyola University Chicago, October 2015
- Workshop on "Geometry, Topology, and Combinatorics of Hyperplane Arrangements and Related Problems", University of Zaragoza, Spain, September 2015
- Topology and Geometry seminar, University of Wisconsin–Madison, March 2015
- Special colloquium, University of Wisconsin–Madison, January 2015
- Algebraic geometry seminar, University of Michigan, February 2014
- Algebraic geometry and commutative algebra seminar, University of Notre Dame, January 2014
- Algebra seminar, University of Nice, France, October 2013
- Number Theory and Algebraic Geometry seminar, KU Leuven, Belgium, October 2013
- Algebraic geometry seminar, UIC, September 2013
- Joint meeting of AMS and RMS, University of Alba Iulia, Romania, June 2013
- Algebraic geometry seminar, Purdue University, February 2013
- Algebraic geometry and commutative algebra seminar, University of Notre Dame, October 2012
- Algebra seminar, Wayne State University, September 2012
- Workshop on surface group representations, CRM, Barcelona, Spain, May 2012
- Algebraic geometry seminar, Purdue University, October 2011
- Midwest Algebraic Geometry Graduate Conference, University of Wisconsin-Madison, October 2010
- Algebraic geometry seminar, Purdue University, September 2009

Graduate Mentoring

Connor Simpson; Colin Crowley; Yiyu Wang; Omega Tong — Ph.D. students

Putnam Club — Undergraduate
Chair of the Putnam Club Committee

Conference and Workshop Organization

Nankai Workshop on Combinatorics and Geometry — 2026
Nankai University, Tianjin

Weihai Workshop on Hodge Theory and Singularities 2026
Weihai, Shandong

Singularities in the Midwest X 2026
University of Wisconsin–Madison

Combinatorial Aspects of Algebraic Geometry 2025
Summer Research Institute in Algebraic Geometry, Colorado State University

Characteristic Classes of Singular Spaces 2024
Zhejiang University

Suzhou Workshop on Matroid Theory 2024
Soochow University

Matroids Day 2022
University of Wisconsin–Madison

Conference on Hodge Theory in Honor of Donu Arapura's 60th Birthday 2019
University of Wisconsin–Madison; with Ajneet Dhillon, Kenji Matsuki, and Deepam Patel

Singularities in the Midwest VI 2019
University of Wisconsin–Madison; with Laurentiu Maxim

Special Session on Singularities in Geometry, Topology and Algebra 2018
AMS–CMS Joint Meeting, Shanghai; with Rong Du, Yongqiang Liu, and Laurentiu Maxim

Singularities in the Midwest V 2018
University of Wisconsin–Madison; with Laurentiu Maxim

Singularities in the Midwest IV 2017
University of Wisconsin–Madison; with Manuel Gonzalez Villa and Laurentiu Maxim

Professional Service

- Chair, Putnam Club Committee; member, Graduate Admissions Committee, University of Wisconsin–Madison.
- Referee for journals including *Annals of Mathematics*, *Journal of the European Mathematical Society*, *Transactions of the American Mathematical Society*, *Advances in Mathematics*, *Mathematische Annalen*, and *Algebra & Number Theory*.
- Coordinator, 54th International Mathematical Olympiad, Colombia, 2013.

Selected Research Visits

Institute for Advanced Study 2024–2025
Princeton, New Jersey

Peking University 2023–2024
Beijing, China

Institute for Advanced Study 2019
Princeton, New Jersey

KU Leuven 2013–2016
Multiple research visits, Leuven, Belgium

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