Daniel A. Ramras

Curriculum Vitae

December 2022

Department of Mathematical Sciences Phone: (317) 274-6918

402 N. Blackford, LD 270 Fax: (317) 274-3460 (c/o Ramras)

Indiana University-Purdue University Indianapolis Email: dramras@iupui.edu

Indianapolis IN 46202 Website: math.iupui.edu/~dramras/

Research Interests

Geometry and Topology: Representations spaces and character varieties; K-theory; Large-scale geometry;

Non-commutative geometry; Yang-Mills theory; Gauge theory.

Education

2007 Stanford University Ph.D. in Mathematics; Advisor: Gunnar Carlsson

Thesis: Stable Representation Theory of Infinite Discrete Groups.

2002 Cornell University B.A. in Mathematics

Summa Cum Laude, with Distinction in All Subjects

Senior Honors Thesis: Connectivity of the Coset Poset. arXiv:math/0208176

Professional Appointments

Fall 2022 – Spring 2023	Visiting Scholar, Department of Mathematics,
	Indiana University, Bloomington
Fall 2019 – Present	Associate Professor, Department of Mathematical Sciences,
	Indiana University-Purdue University Indianapolis
Fall 2013 – Summer 2019	Assistant Professor, Department of Mathematical Sciences,
	Indiana University-Purdue University Indianapolis
November $2009 - 2015$	Member of the Graduate Faculty, New Mexico State University
Fall 2009 – Spring 2013	Assistant Professor, Department of Mathematical Sciences,
	New Mexico State University
Fall 2007 – Summer 2009	Postdoctoral Fellow, Department of Mathematics, Vanderbilt University

Funding and Awards

9/2018 - 8/2023 Collaboration Grant for Mathematicians, Simons Foundation (total award amount: \$42,000) 9/2013 - 8/2018: Collaboration Grant for Mathematicians, Simons Foundation (total award amount: \$35,000)

9/2008 - 8/2012: NSF grant, DMS-0804553/0968766/1057557 (total award amount: \$94,041)

Deformation K-theory and the Topology of Representation Spaces

Included supplement for undergraduate research, awarded 12/2010 (\$4,722)

2007 – 2008: Vanderbilt Research Training Group Fellow, DMS-0353640
2002 – 2005: National Defense Science and Engineering Graduate Fellowship
2002 – 2007: National Science Foundation Graduate Research Fellowship

2000 – 2002: Barry M. Goldwater Scholarship

Conference funding

2020 (awarded): Wabash Modern Analysis Seminar and Mini-Conference. Total award amount: \$11,000.

PI: Thomas Sinclair (Purdue);

Co-PIs: Hari Bercovici (IU), Marius Junge (UIUC), Daniel Ramras.

2016 (awarded): Workshop on Large-scale Geometry and its Applications, held in May 2018.

Total award amount: \$30,000.00, including \$5,000 in NSF funding.

Co-organizers: David Rosenthal and Andrew Nicas. Funded by the Fields Institute, Toronto, Canada.

Professional Memberships

2016 – 2022: GEAR Network (Geometric Structures and Representation Varieties).

This program was funded by a \$5M grant from the U.S. National Science

Foundation's Research Networks in Mathematical Sciences program.

2009 – present: Mathematical Association of America 2003 – present: American Mathematical Society

Academic Honors

Trustees Teaching Award, IUPUI
Bernie Morrell Teaching Award, Department of Mathematical Sciences, IUPUI
Kieval Prize, Department of Mathematics, Cornell University
Cornell Presidential Research Scholar

Publications and Submitted Work

- 1. (with Clément Guérin and Sean Lawton) Bad Representations and Homotopy of Character Varieties. Ann. H. Lebesgue 5 (2022), 93–140. arXiv:1908.02915
- 2. (with Mentor Stafa) Homological stability for spaces of commuting elements in Lie groups. Int. Math. Res. Not. IMRN 2021, no. 5, 3927–4002. arXiv:1805.01368
- 3. (with Bernardo Villarreal) Commutative cocycles and stable bundles over surfaces. Forum Math. 31 (2019), no. 6, 1395–1415. arXiv:1807.03736
- 4. (with Indranil Biswas and Sean Lawton) Wonderful compactification of character varieties. With an Appendix by Arlo Caine and Sam Evens. Pacific J. Math. 302 (2019), no. 2, 413–435. arXiv:1703.04431
- 5. The homotopy groups of a homotopy group completion. Israel J. Math. 234 (2019), no. 1, 81–124. arXiv:1807.02613
- 6. (with Mentor Stafa) Hilbert-Poincaré series for spaces of commuting elements in Lie groups. Math. Z. 292 (2019) no. 1–2, 591–610. arXiv:1704.05793
- 7. (with Bobby Ramsey) Extending properties to relatively hyperbolic groups. Kyoto J. Math. 59 (2019), no. 2, 343–356. arXiv:1410.0060
- 8. Orbit categories, classifying spaces, and generalized homotopy fixed points. J. Homotopy Relat. Struct. 13 (2018), no. 1, 237–249. arXiv:1507.06112
- 9. (with Lisa Jeffrey and Jonathan Weitsman) The prequantum line bundle on the moduli space of flat SU(N) connections on a Riemann surface and the homotopy of the large N limit. Lett. Math. Phys. 107 (2017), no. 9, 1581-1589. arXiv:1411.4360
- 10. (with David Pengelley) How efficiently can one untangle a double-twist? Waving is believing! The Math. Intelligencer, 39 (2017), no. 1, 27-40. Erratum: Math. Intelligencer 39 (2017), no. 2, 107. Animations: http://www.math.iupui.edu/~dramras/double-tip.html
- 11. (with Carlos Florentino and Sean Lawton) Homotopy groups of free group character varieties. Ann. Sc. Norm. Super. Pisa Cl. Sci. 17(1) (2017), 143–185. arXiv:1412.0272
- 12. (with Indranil Biswas and Sean Lawton) Fundamental groups of character varieties: surfaces and tori. Math. Z., 281(1-2):415–425, 2015. arXiv:1412.4389

- 13. (with Sean Lawton) Covering spaces of character varieties. New York J. Math., 21:383–416, 2015. With an Appendix by Ho and Liu. arXiv:1402.0781
- (with Thomas Baird) Smoothing maps into algebraic sets and spaces of flat connections. Geom. Dedicata, 174:359–374, 2015. arXiv:1206.3341
- 15. (with Romain Tessera and Guoliang Yu) Finite decomposition complexity and the integral Novikov conjecture for higher algebraic K-theory. J. reine angew. Math. (Crelle's Journal) 694 (2014), 129–178. With an Addendum, to appear in Crelle (published Online: 09/12/2017). arXiv:1111.7022
- 16. Periodicity in the stable representation theory of crystallographic groups. Forum Math. 26 (2014), no. 1, 177–219. arXiv:1007.0406
- 17. (with Rufus Willett and Guoliang Yu) A finite dimensional approach to the strong Novikov conjecture. Algebr. Geom. Topol. 13 (2013), no. 4, 2283–2316. arXiv:1203.6168
- 18. The stable moduli space of flat connections over a surface. Trans. Amer. Math. Soc. 363 (2011), no. 1, 1061–1100. arXiv:0810.1784
- 19. Invariant tubular neighborhoods in infinite-dimensional Riemannian geometry, with applications to Yang-Mills theory. Arch. Math. (Basel) 96 (2011) no. 6, 589–599. arXiv:1006.0063
- 20. On the Yang–Mills stratification for surfaces. Proc. Amer. Math. Soc. 139 (2011), no. 5., 1851–1863. arXiv:0805.2587
- 21. (with Nan-Kuo Ho and Chiu-Chu Melissa Liu) Orientability in Yang-Mills theory over nonorientable surfaces. Comm. Anal. Geom. 17 (2009), no. 5, 903-954. arXiv:0810.4882
- 22. Yang-Mills theory over surfaces and the Atiyah-Segal theorem. Algebr. Geom. Topol. 8 (2008) 2209–2251. arXiv:0710.0681
- 23. Excision in deformation K-theory. Algebr. Geom. Topol. 7 (2007), 2239–2270. arXiv:math/0703463
- 24. Connectivity of the coset poset and the subgroup poset of a group. J. Group Theory 8 (2005), no. 6, 719–746. arXiv:math/0210001
- 25. (with Anant Godbole and Sam Greenberg) Cliques and independent neighbor sets in random graphs. Proceedings of the Thirty-second Southeastern International Conference on Combinatorics, Graph Theory and Computing (Baton Rouge, LA, 2001), Congr. Numer. 153 (2001), 113–128.

Work in Progress

- 1. (w/ C. Neuffer) Dynamical induction and cohomology of crystallographic groups. Work in progress.
- 2. Variations on the Nerve Theorem. Work in progress.
- 3. A combinatorial viewpoint on regular neighborhoods in simplicial complexes. Work in progress.
- 4. Homotopy groups in Algebraic Quantum Field Theory. Work in progress.
- 5. Fine covers and homotopy groups. Work in progress.
- 6. The topological Atiyah-Segal map. Preprint, 2016; updated Fall 2022. Submitted.

Editorial positions

Guest editor, Tbilisi Mathematical Journal, Special issue on Homotopy Theory, Spectra and Structured Ring Spectra, 2020. With John Harper (Lead editor), Gregory Arone, David Barnes, Mark Behrens, Kathryn Lesh, Cary Malkiewich, and, Kirsten Wickelgren.

Doctoral Students

Andy Davis, 2022-present.

Chris Neuffer, Ph.D., 2018–2021. Dissertation title: Genera of Integer Representations and the Lyndon–Hochschild–Serre Spectral Sequence.

Virgil Chan, Ph.D., 2015–2020. Dissertation title: An Explicit Formula for the Loday Assembly Map.

Undergraduate Research Projects Supervised

Katie Hamill, Fall 2020. Capstone project: Persistent homology.

Clay Kellog, Summer 2016. Representations of crystallographic groups.

Harrison Hicks, Spring 2016. Face vectors of simplicial spheres.

Chris Neuffer, Spring and Summer 2014. Crystallographic groups.

Jonah Wyatt, Fall 2011–Summer 2012. Homotopy theory for graphs. Funded in part by NSF grant DMS-1057557 (P.I. Ramras).

Mychael Sanchez, Spring 2010–Spring 2011. *Homology of Hom complexes*. Rose-Hulman Undergrad. Math. J. 13 (2012), 212-223. Funded in part by NSF grants DMS-0968766/1057557 (P.I. Ramras)