

Akhil Mathew

Contact Information

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Employment

University of Chicago

Associate Professor (July 2022–).

Visiting Assistant Professor (fall 2018 quarter).

Clay Mathematics Institute

Clay Research Fellow (2017–2022).

Education

Harvard University

PhD in mathematics, 2017.

Thesis advisor: Jacob Lurie.

University of California at Berkeley

PhD student in mathematics, 2014–2015.

Harvard University

A.B., *summa cum laude* in Mathematics, 2014.

Visiting positions

Institute for Advanced Study, Princeton, New Jersey.

Visitor, November 2019.

Member, Fall 2023 (Special year on *p-adic Arithmetic Geometry*).

Mathematical Sciences Research Institute, Berkeley, California.

Research member, Jan.–May 2019. Program on *Derived algebraic geometry*.

Hausdorff Institute of Mathematics, Bonn, Germany.

Program participant for June 2023, trimester program on *Arithmetic of the Langlands program*.

Program participant for October and November 2016, for junior trimester program on *Topology*.

Program participant from May–August 2015. Trimester program on *Homotopy theory, manifolds, and field theories*.

Awards

K-theory prize, 2022

Clay Research Fellowship, 2017

Honorable Mention for Frank and Bennie Morgan Prize for undergraduate research, 2015

NSF Graduate Research Fellowship, 2014

David Mumford Prize at Harvard University, 2014

Thomas T. Hoopes Prize at Harvard University, 2014

Phi Beta Kappa, 2013

3rd place in Intel Science Talent Search, 2010

Current and pending support

Simons Collaborative Grant for *Perfection in Algebra, Geometry, and Topology* with B. Antieau, B. Bhatt, K. Česnavičius, J. de Jong, M. Emerton, T. Gee, J. Lurie, W. Niziol, P. Scholze (2023–2027).

NSF FRG Grant for *Higher Categorical Structures in Algebraic Geometry* (with B. Antieau, A. Căldăraru, M. Lieblich, M. Olsson), 2022–2025, Award DMS-2152311 (\$248,807.00).

Papers

1. Purity in chromatically localized algebraic K -theory, with M. Land, L. Meier, and G. Tamme. To appear in *J. Amer. Math. Soc.* Preprint available at arXiv:2001.10425.
2. Descent and vanishing in chromatic algebraic K -theory via group actions, with D. Clausen, N. Naumann, and J. Noel. To appear in *Annales Scientifiques de l'École Normale Supérieure*. Preprint available at arXiv:2011.08233.
3. The mod p Riemann–Hilbert correspondence and the perfect site. *Tunis. J. Math.* **5** (2023), no. 2, 369–403.
4. Syntomic complexes and p -adic étale Tate twists, with B. Bhatt. *Forum of Mathematics, Pi* **11** (2023), E1.
5. The K -theory of perfectoid rings, with B. Antieau and M. Morrow. *Doc. Math.* **27** (2022), 1923–1952.
6. On the Beilinson fiber square, with B. Antieau, M. Morrow, and T. Nikolaus. *Duke Math. J.* **171** (2022), no. 18, 3707–3806.
7. Faithfully flat descent of almost perfect complexes in rigid geometry. *J. Pure. Appl. Algebra* **226** (2022), no. 5, Paper No. 106938.
8. Some recent advances in topological Hochschild homology. *Bull. Lond. Math. Soc.* **54** (2022), no. 1, 1–44.
9. Hyperdescent and étale K -theory, with D. Clausen. *Invent. Math.* **225** (2021), 981–1076.
10. On $K(1)$ -local TR. *Compos. Math.* **157** (2021), no. 5, 1079–1119.
11. Counterexamples to Hochschild–Kostant–Rosenberg in characteristic p , with B. Antieau and B. Bhatt. *Forum Math. Sigma* **9** (2021), Paper No. e49, 26pp.
12. The arc-topology, with B. Bhatt. *Duke Math J.* **170** (2021), no. 9, 1899–1988.

13. K -theory and topological cyclic homology of henselian pairs, with D. Clausen and M. Morrow. *J. Amer. Math. Soc.* **34** (2021), 411–473.
14. Revisiting the de Rham-Witt complex, with B. Bhatt and J. Lurie. *Astérisque* No. 424 (2021).
15. Kaledin’s degeneration theorem and topological Hochschild homology. *Geom. Topol.* **24** (2020), no. 6, 2675–2708.
16. Remarks on $K(1)$ -local K -theory, with B. Bhatt and D. Clausen. *Selecta Math. (N.S.)* **26** (2020), no. 3, 39.
17. Descent in algebraic K -theory and a conjecture of Ausoni-Rognes, with D. Clausen, N. Naumann, and J. Noel. *J. Eur. Math. Soc.* **22** (2020), no. 4, 1149–1200.
18. Derived induction and restriction theory, with N. Naumann and J. Noel. *Geom. Topol.* **23** (2019), 541–636.
19. Monadicity of the Bousfield-Kuhn functor, with R. Eldred, G. Heuts, and L. Meier. *Proc. Amer. Math. Soc.* **147** (2019), no. 4, 1789–1796.
20. On the Blumberg-Mandell Künneth theorem for TP, with B. Antieau and T. Nikolaus. *Selecta Math. (N.S.)* **24** (2018), no. 5, 4555–4576.
21. Examples of descent up to nilpotence. *Geometric and topological aspects of the representation theory of finite groups*, 269–311, Springer Proc. Math. Stat., 242, Springer, Cham, 2018.
22. A short proof of telescopic Tate vanishing, with D. Clausen. *Proc. Amer. Math. Soc.* **145** (2017), no. 12, 5413–5417.
23. Picard groups of higher real K -theory spectra at height $p-1$, with D. Heard and V. Stojanoska. *Compos. Math.* **153** (2017), 1820–1854.
24. Residue fields for a class of rational E_∞ -rings and applications. *J. Pure Appl. Algebra* **221** (2017), no. 3, 707–748.
25. Nilpotence and descent in equivariant stable homotopy theory, with N. Naumann and J. Noel. *Adv. Math.* **305** (2017), 994–1084.
26. THH and base-change for Galois extensions of ring spectra. *Algebr. Geom. Topol.* **16** (2016), 1025–1041.
27. The Picard group of topological modular forms via descent theory, with V. Stojanoska. *Geom. Topol.* **20** (2016), no. 6, 3133–3217.
28. The homology of tmf . *Homology Homotopy Appl.* **18** (2016), no. 18, 1–29.
29. Torsion exponents in stable homotopy and the Hurewicz homomorphism. *Algebr. Geom. Topol.* **16** (2016), no. 2, 1025–1041.
30. The Galois group of a stable homotopy theory. *Adv. Math.* **291** (2016), 403–541.
31. Fibers of partial totalizations of a pointed cosimplicial space, with V. Stojanoska. *Proc. Amer. Math. Soc.* **144** (2016), no. 1, 445–458.
32. On a nilpotence conjecture of J.P. May, with N. Naumann and J. Noel. *J. Topol.* **8** (2015), no. 4, 917–932.
33. A thick subcategory theorem for modules over certain ring spectra. *Geom. Topol.* **19** (2015), no. 4, 2359–2392.

34. Affineness and chromatic homotopy theory, with L. Meier. *J. Topol.* **8** (2015), no. 2, 476–528.
35. Categories parametrized by schemes and representation theory in complex rank. *J. Algebra* **381** (2013), 140–163.

Preprints

- K*-theory and polynomial functors, with C. Barwick, S. Glasman, and T. Nikolaus. 2021. arXiv:2102.00936.
- Deformation theory and partition Lie algebras, with L. Brantner. 2019. arXiv:1904.07352.
- Torus actions on stable module categories, Picard groups, and localizing subcategories. 2015. arXiv:1512.01716.
- Appendix to “Representations of finite groups on modules over *K*-theory,” by David Treumann. 2015. arxiv:1503.02477.

Conference/workshop talks

- A Conference in Arithmetic Algebraic Geometry in memory of Jan Nekovář, IHÉS (Oct. 2023).
- Arbeitstagung on Condensed Mathematics, Max Planck Institute, Bonn (June 2023).
- Homotopy Theory, Fruit of the Fertile Furrow, Isaac Newton Institute in Cambridge, U.K. (June 2023).
- Homotopical Representation Theory, Master Class at University of Copenhagen (March 2023, lecture series).
- Twinned conference on Homotopy Theory with Applications to Arithmetic and Geometry, Fields Institute, Toronto (June 2022).
- Workshop on Derived Geometry, CRM, Barcelona (June 2022, two lectures).
- Summer school on Arithmetic Geometry, CIRM, Luminy, France. Mini-course (3 hours). (May 2022).
- Fields Medal Symposium (in honor of Peter Scholze), Fields Institute (October 2021).
- Michigan Algebra and Number Theory Symposium (MANTIS), University of Michigan, Ann Arbor (October 2021).
- Arithmetic Geometry, Chinese Academy of Sciences and IHÉS (in honor of Luc Illusie), Beijing (June 2021).
- (∞, n) -Categories, Factorization Homology, and Algebraic *K*-theory, MSRI (March 2020, online). Lecture series (two lectures).
- Equivariant Stable Homotopy Theory and *p*-adic Hodge Theory, Banff International Research Station (March 2020).
- JHU-UMD Algebra and Number Theory Day, University of Maryland at College Park (Nov. 2019).
- Midwest Topology Seminar, University of Chicago (in honor of Peter May) (Oct. 2019).
- Mathematisches Forschungsinstitut Oberwolfach Workshop on Algebraic *K*-theory (June 2019).

Derived Algebraic Geometry and its Applications, MSRI (March 2019).
Mini-conference on topological cyclic homology, Northwestern (Nov. 2018).
CATS5, Categories and Stacks in Algebraic Geometry, Lisbon (Oct. 2018).
Witt Vectors, Deformations, and Absolute Geometry, University of Vermont (July 2018).
Mathematisches Forschungsinstitut Oberwolfach Workshop on Topologie (July 2018).
Berlin Mathematics School, Homotopy Theory Summer (June 2018). Mini-course (three lectures).
Midwest Topology Seminar, Northwestern University (March 2018).
SUNY Buffalo Topology day (Sep. 2017).
Stacks Project Workshop, University of Michigan at Ann Arbor (July 2017).
Triangulated Categories and Geometry, University of Bielefeld (in honor of Amnon Neeman) (May 2017).
Cascade Topology Seminar, University of British Columbia (May 2017).
NRW Topology Meeting, University of Wuppertal (April 2017).
Subfactors, Higher Geometry, Higher Twists and Almost Calabi-Yau Algebras at Isaac Newton Institute, Cambridge, U.K. (March 2017).
Geometric and Topological Aspects of the Representation Theory of Finite Groups, PIMS, University of British Columbia (in honor of Dave Benson) (Aug. 2016).
Young Topologists Meeting at University of Copenhagen (July 2016). Mini-course (four lectures).
Group Actions Classical and Derived at the Fields Institute (June 2016).
Operations in Highly Structured Homology Theories, Banff International Research Station (May 2016).
Equivariant Derived Algebraic Geometry, Banff International Research Station (February 2016).
Homotopy Theory, Manifolds, and Field Theories, at Max Planck Institute for Mathematics (June 2015).
Mathematisches Forschungsinstitut Oberwolfach workshop on Homotopy Theory (March 2015).
Modular Invariants in Topology and Analysis, University of Regensburg (Sep. 2014).

Colloquium talks

Columbia University (December 2023).
Hausdorff Center, Bonn (June 2021, online).
University of Chicago (January 2021, online).
University of Utah (February 2020).
École Normale Supérieure, Paris (January 2020).
University of Oregon (May 2018).
University of California at Berkeley (Feb. 2018).
Cornell University (Feb. 2018).
University of Hamburg, Kolloquium über Reine Mathematik (Nov. 2016).
University of Regensburg, Kepler-Kolloquium (July 2016).

Seminar talks

Seminar talks (online and in-person) including at Berkeley, Bilkent, Bonn, Caltech, Columbia, Copenhagen, Cornell, Duke, EPFL, George Mason, Georgia Tech, Johns Hopkins, Michigan, Minnesota, MIT, MPIM, Münster, Nagoya, Northwestern, Notre Dame, Ohio State, Orsay, Oslo, Oxford, Paris-Nord, Princeton, Purdue, Regensburg, Stanford, Strasbourg, UBC, UChicago, UIC, UIUC, UCLA, UC Irvine, UC Riverside, Toronto, UMD College Park, University of Oregon, Utah, Wisconsin.

Service (at the University of Chicago)

Served on: Colloquium Committee (2021–2024), Junior Hiring Committee (2022–2024), Graduate Admissions Committee (2022–2024).

Primary or secondary advisor to Samanda Zhang, Iris Yunxuan Li, Alicia Lima, Callum Sutton, Paweł Poczobut, and Catherine Li.

Local organizer for Midwest Topology Seminar in honor of Peter May, UChicago, October 2019.

Mini-courses at UChicago Research Experience for Undergraduates, July 2019 and June–July 2020. Mentor for two students, 2020 and 2021.

Co-organizer, Algebraic Topology seminar at UChicago (2017–2018, fall 2018).

Service

Member of editorial boards for *Compositio Mathematica* (2022–), *International Mathematics Research Notices* (2022–), *Journal of Topology* (2022–), and *Nagoya Mathematical Journal* (2022–).

Member of advisory board for Springer *Graduate Texts in Mathematics* (2022–2024).

Referee or quick opinion for journals including *Acta*, *Advances*, *Algebr. Geom. Topol.*, *Algebra Number Theory*, *Annales Scientifiques de l'ENS*, *Annals of Mathematics*, *Annals of K-theory*, *Cambridge J. Math.*, *Compositio*, *Crelle*, *Documenta*, *Duke*, *Geom. Topol.*, *IMRN*, *Inventiones*, *J. of Algebra*, *JAMS*, *J. Euro. Math. Soc.*, *J. Inst. Math. Jussieu*, *J. Pure Appl. Alg.*, *J. Topol.*, *Math. Ann.*, *Math. Z.*, *Mem. Amer. Math. Soc.*, *Pacific J. Math*, *Proc. Amer. Math. Soc.*, *Publ. Math. IHES*, *Selecta Mathematica*, *Trans. Amer. Math. Soc.*, *Tunisian J. Math.*

Co-organizer for Special Year Research Seminar at IAS, Fall 2023.

Scientific committee for IHÉS summer school on algebraic K -theory, 2023.

Co-organizer for workshop “ p -adic Hodge theory and Applications,” Clay Research Conference (September 2022).

Lecturer for Undergraduate Summer School, Park City Mathematics Institute (July 2021).

Reviewer for NSF panel.

External reviewer for European Research Council and U.S.-Israel Binational Science Foundation.

Co-organizer for electronic Algebraic K -theory Seminar (June 2020–July 2021).

Co-organizer for Oberwolfach Seminar, “Topological Cyclic Homology and Arithmetic,” October 2019.

Project assistant for Arizona Winter School, March 2019.

Co-organizer for conference “Invertible objects and duality in derived algebraic geometry” at University of Regensburg, April 2017.

Mentor for MIT-PRIMES (2013-2014, 2016).