Ben Knudsen

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Employment

Northeastern University

> Assistant Professor, 2019–

Harvard University

> NSF Postdoctoral Fellow and Lecturer, 2016–2019
>> Sponsor: Michael Hopkins

Education

Northwestern University

> Ph.D. in Mathematics, 2016
>> Advisor: John Francis
>> Dissertation: *Higher enveloping algebras and configuration spaces of manifolds*

Princeton University

> B.A. in Mathematics, 2011
>> Advisor: Zoltán Szabó
>> Thesis: *On odd Khovanov homology and its mutation invariance*

Publications (authorship alphabetical)

The topological complexity of pure graph braid groups is stably maximal. Ben Knudsen. Forum of Mathematics, Sigma, 10 (2022).

Projection spaces and twisted Lie algebras. Ben Knudsen. Contemporary Mathematics, in press (2022).

Extremal stability for configuration spaces. Ben Knudsen, Jeremy Miller, and Philip Tosteson. Mathematische Annalen, in press (2022).

Embedding calculus and smooth structures. Ben Knudsen and Alexander Kupers. Geometry and Topology, in press (2022).

On the second homology of planar graph braid groups. Byung Hee An and Ben Knudsen. Journal of Topology, 15 (2022), pp. 666–691.

A Künneth theorem for configuration spaces. Kathryn Hess and Ben Knudsen. Journal of the London Mathematical Society 105 (2022), pp. 639–664.

Farber's conjecture for planar graphs. Ben Knudsen. Selecta Mathematica, New Series 27 (2021).

Asymptotic homology of graph braid groups. Byung Hee An, Gabriel C. Drummond-Cole, and Ben Knudsen. Geometry and Topology, in press (2022).

Edge stabilization in the homology of graph braid groups. Byung Hee An, Gabriel C.

Drummond-Cole, and Ben Knudsen. Gometry and Topology 24 (2020), pp. 421–469.

Subdivisional spaces and graph braid groups. Byung Hee An, Gabriel C. Drummond-Cole, and Ben Knudsen. Documenta Mathematica 24 (2019), pp. 1513–1583.

Configuration spaces of products. William Dwyer, Kathryn Hess, and Ben Knudsen. Transactions of the American Mathematical Society 371 (2019), pp. 2963–2985.

Higher enveloping algebras. Ben Knudsen. Geometry and Topology 22 (2018), pp. 4013–4066.

Betti numbers of configuration spaces of surfaces. Gabriel C. Drummond-Cole and Ben Knudsen. Journal of the London Mathematical Society 96 (2017), pp. 367–393.

Betti numbers and stability for configuration spaces via factorization homology. Ben Knudsen. Algebraic and Geometric Topology 17 (2017), pp. 3137–3187.

PREPRINTS (AUTHORSHIP ALPHABETICAL)

Roberston's conjecture and universal finite generation in the homology of graph braid groups. Ben Knudsen and Eric Ramos. Under review, arXiv:2305.19363.

On the stabilization of the topological complexity of graph braid groups. Ben Knudsen. Under review, arXiv:2302.04346.

The Lubin–Tate theory of configuration spaces: I. Lukas Brantner, Jeremy Hahn, and Ben Knudsen. Under review, arXiv:1908.11321.

Configuration spaces in algebraic topology. Ben Knudsen. arXiv:1803.11165.

IN PREPARATION (AUTHORSHIP ALPHABETICAL)

Representation asymptotics for pure graph braid groups via twisted algebras. Ben Knudsen.

Cyclic orders and configuration spaces. Kathryn Hess and Ben Knudsen.

Pointless Lie algebras. Lukas Brantner, Jeremy Hahn, and Ben Knudsen.

INVITED TALKS

Farber's conjecture and beyond, Louisiana State University topology seminar (May 2023).

The complexity of collision-free motion planning on graphs, UMass Boston topology seminar (March 2023).

Farber's conjecture and beyond, "Configuration Spaces and Related Topics," Kyungpook National University, South Korea (February 2023).

Stability phenomena in the homology of (pure) graph braid groups, "Manifolds, homotopy theory, and related topics" seminar (January 2023).

The complexity of collision-free motion planning on graphs, University of Nevada, Reno colloquium (November 2022).

Smooth structures and embedding calculus. AMS Special Session, "Higher Structures and Homotopical Algebra," UMass Amherst (October 2022).

Stable and unstable homology of graph braid groups. Electronic Computational Homotopy Theory Research Seminar (September 2022).

Farber's conjecture. Northeastern University topology seminar (September 2022).

The topological complexity of pure graph braid groups is stably maximal. Applied Algebraic Topology Research Network Topological Complexity online seminar (July 2022).

Stable and unstable homology of graph braid groups. "Moduli and friends" seminar, Bucharest (July 2022).

Around Farber's conjecture. Topological Complexity and Motion Planning, BIRS-CMO Oaxaca (May 2022).

Smooth structures and embedding calculus. EPFL topology seminar (May 2022).

Extremal stability for configuration spaces. Stockholm University topology seminar (May 2022).

Extremal stability for configuration spaces. "Compactifications, Configurations, and Cohomology," Northeastern University (October 2021).

Smooth structures and embedding calculus. OCHoTop mid-term workshop, Lille (July 2021).

Stable and unstable homology of graph braid groups. Columbia geometric topology seminar (March 2021).

Stable and unstable homology of graph braid groups. Caltech geometry and topology seminar (March 2021).

Topological complexity of pure graph braid groups. Applied Algebraic Topology Research Network Topological Complexity online seminar (February 2021).

Smooth structures and embedding calculus. University of Bonn topology seminar (January 2021).

Stable and unstable homology of graph braid groups. Purdue topology seminar (November 2020).

Smooth structures and embedding calculus. MIT topology seminar (October 2020).

Generalised Lie Algebras in Derived Geometry, Utrecht (June 2020). Canceled due to COVID-19.

Texas Geometry and Topology Conference, Texas Tech (April 2020). Canceled due to COVID-19.

Embedding calculus and smooth structures. "Spaces of Embeddings: Connections and Applications," Banff International Research Station (October 2019).

Connectivity and growth in the homology of graph braid groups. "Arrangements at Western," University of Western Ontario (May 2019).

Higher enveloping algebras and configuration spaces of manifolds. Indiana University topology seminar (May 2019).

Connectivity and growth in the homology of graph braid groups. "Graduate Student Topology and Geometry Conference," UIUC (March 2019).

Connectivity and growth in the homology of graph braid groups. University of Michigan topology seminar (March 2019).

Connectivity and growth in the homology of graph braid groups. University of Louisiana at Lafayette topology seminar (January 2019).

How to build a surface of genus six. University of Louisiana at Lafayette colloquium (January 2019).

Configuration spaces and Lie algebras away from characteristic zero. "Manifolds," Isaac Newton Institute (December 2018).

Configuration spaces of manifolds and graphs. Special seminar, Northeastern University (November 2018).

Connectivity and growth in the homology of graph braid groups. "Upstate New York Topology Seminar," SUNY Albany (November 2018).

Connectivity and growth in the homology of graph braid groups. University of Massachusetts at Amherst geometry and topology seminar (November 2018).

Toward the cohomology of the pure elliptic braid group. MIT topology seminar (October 2018).

Connectivity and growth in the homology of graph braid groups. University of Georgia topology seminar (October 2018).

Connectivity and growth in the homology of graph braid groups. Isaac Newton Institute (July 2018).

Edge stabilization in the homology of graph braid groups. SUNY Albany topology seminar (May 2018).

Edge stabilization in the homology of graph braid groups. University of Minnesota topology seminar (May 2018).

Homology of surface and graph braid groups. AMS Special Session "Arrangements of hypersurfaces," Northeastern University (April 2018).

Edge stabilization in the homology of graph braid groups. University of Chicago topology and geometry/topology joint seminar (April 2018).

Edge stabilization in the homology of graph braid groups. Northwestern topology seminar (April 2018).

Homology of surface and graph braid groups. Brandeis topology seminar (February 2018).

Homology of surface and graph braid groups. Oberwolfach workshop "Topology of Arrangements and Representation Stability" (January 2018).

Subdivisional spaces and graph braid groups. MPIM topology seminar (January 2018).

Subdivisional spaces and graph braid groups. University of Oregon topology seminar (December 2017).

Subdivisional spaces and graph braid groups. MIT topology seminar (November 2017).

Higher enveloping algebras. "Lie Theory and Mathematical Physics," MIT (July 2017).

Configuration spaces of products. IBS Center for Geometry and Physics (June 2017).

Homology of surface and graph braid groups. ICMS workshop "Braids in algebra, geometry and topology" (May 2017).

Subdivisional spaces and graph braid groups. University of Pennsylvania mathematical physics seminar (March 2017).

From Lie algebras to configuration spaces. EPFL topology seminar (February 2017).

A local-to-global approach to configuration spaces. Heidelberg University physical mathematics seminar (February 2017).

Higher enveloping algebras and configuration spaces of manifolds. MIT topology seminar (November 2016).

Higher enveloping algebras. AMS Special Session "Quantum field theories and geometric representation theory," University of St. Thomas (October 2016).

Higher enveloping algebras and configuration spaces of manifolds. "Midwest Topology Seminar," Purdue University (September 2016).

Betti numbers of configuration spaces of surfaces. Purdue topology seminar (September 2016).

Higher enveloping algebras. Oberwolfach workshop "Factorization Algebras and Functorial Field Theories" (May 2016).

Higher enveloping algebras and configuration spaces of manifolds. IBS Center for Geometry and Physics seminar (April 2016).

Configuration spaces, Lie algebras, and factorization. University of Copenhagen topology and algebra seminar (January 2016).

Rational homology of configuration spaces via factorization homology, Ohio State University K-theory and homotopy theory seminar (November 2015)

Rational homology of configuration spaces via factorization homology. University of Chicago topology and geometry/topology joint seminar (November 2015)

Rational homology of configuration spaces via factorization homology. Notre Dame topology seminar (October 2015)

Rational homology of configuration spaces via factorization homology. Johns Hopkins topology seminar (September 2015)

Rational homology of configuration spaces via factorization homology. University of Virginia topology seminar (September 2015)

Rational homology of configuration spaces via factorization homology. University of Illinois at Urbana-Champaign topology seminar (April 2015)

Rational homology of configuration spaces via factorization homology. IBS Center for Geometry and Physics (March 2015)

An algebraic approach to configuration spaces. UIC homotopy algebras seminar (February 2015)

Rational homology of configuration spaces via factorization homology. Northwestern topology seminar (February 2015)

Rational homology of configuration spaces via factorization homology. Purdue topology seminar (October 2014)

Rational homology of configuration spaces via factorization homology. Stanford topology seminar (September 2014)

Rational homology of configuration spaces via factorization homology. University of Wisconsin topology seminar (September 2014)

GRANTS	2020–2023	Conference Grant (co-PI, funded, DMS 2017119, $42,893) *Mid-Atlantic Topology Conference 2020* National Science Foundation
	2019–2023	Research Grant (PI, funded, DMS 1906174, $159,696) *New perspectives on configuration spaces* National Science Foundation
	2019	Travel Grant (funded and declined, $5,000) American Mathematical Society and Simons Center
	2016–2019	Postdoctoral Fellowship (funded, DMS 1606422, $150,000) National Science Foundation

Graduate teaching

Fall 2022	MATH 7721 Readings in topology (1 student)
Spring 2022	MATH 5121 Topology 1 (14 students)
Spring 2022	MATH 7721 Readings in topology (6 students)
Fall 2021	MATH 5111 Algebra 1 (14 students)
Spring 2021	MATH 7321 Topology 3 (8 students)
Spring 2021	MATH 7721 Readings in topology (1 student)
Fall 2020	MATH 7221 Topology 2 (7 students)
Spring 2020	MATH 7721 Readings in topology (1 student)
Spring 2020	MATH 5121 Topology 1 (15 students)
Fall 2019	MATH 5111 Algebra 1 (17 students)

Undergraduate teaching

Spring 2023	MATH 2331 Linear algebra (29 students)
Fall 2022	MATH 4992 Directed study (1 student)
Fall 2022	MATH 2331 Linear algebra (19 students)
Fall 2021	MATH 2331 Linear algebra (17 students)
Spring 2021	MATH 4971 Junior/senior honors project (1 student)
Fall 2020	MATH 4993 Independent study (1 student)

Courses developed

| Fall 2019 | MATH 5111 Algebra 1 |

Graduate advising

2021–	Dezhou Li, graduate advisor, Northeastern
2021	Whitney Drazen, thesis committee member, Northeastern
2019	Danny Shi, thesis committee member, Harvard

Graduate mentoring

2023–	Nicholas Payne, graduate mentor, Northeastern
2022–	Xiaochen Xiao, graduate mentor, Northeastern
2021–	Shengnan Huang, graduate mentor, Northeastern
2021–	Brad Turow, graduate mentor, Northeastern
2021	Xiaochen Xiao, first-year mentor, Northeastern
2019	Dezhou Li, first-year mentor, Northeastern

Institutional service

2022–	PhD program working group Northeastern University Committee member
2022	Mathematics PhD program open house Northeastern University Faculty spotlight speaker
2020–2022	Colloquium committee Northeastern University Chair
2020–2021	Faculty search committee Northeastern University Committee Member
2020	Research cluster "Topological robotics and machine learning" Northeastern University Proposal author
2020	Departmental tea Northeastern University Organizer
2020–2022	Postdoctoral hiring committee Northeastern University Committee member
2019–	Graduate committee Northeastern University Committee member
2019–	PhD qualifying exams Northeastern University Author and grader
2019–	Topology seminar Northeastern University Organizer

Professional service

2022   French National Research Agency review panel
       Reviewer (declined due to conflict)

2022   PhD thesis defense (Haoqing Wu)
       École Polytechnique Fédérale de Lausanne
       Juror

2022   Licentiate thesis defense (Louis Hainaut)
       Stockholm University
       Opponent

2022   "Split" conference on homotopy theory and applications
       MPIM Bonn and Fields Institute
       Organizer

2020   National Science Foundation review panel
       Panelist

2020   Mid-Atlantic Topology Conference
       University of Pennsylvania (postponed)
       Organizer

2020   Workshop on "Configuration spaces of graphs"
       American Institute of Mathematics
       Organizer

2019   Topology "kickoff" mini-conference
       Northeastern University
       Organizer

2016–   Geom. Topol., Compos. Math., Math. Ann., Adv. Math.,
       Notices Am. Math. Soc., Algebr. Geom. Topol.,
       Homol. Homotopy Appl., Order, Topology Appl.
       Rev. Mat. Complut., Int. Math. Res. Not.
       Discrete Comput. Geom.
       Referee

Public service

2022   Admissions
       Summer Science Program
       Volunteer

2021   Calculus Field Day
       Northeastern University
       Volunteer

Professional development

2020	Guest program
	Max Planck Institute for Mathematis
2019	"Arrangements at Western" intensive research period
	University of Western Ontario
2018	"Homotopy Harnessing Higher Structures" programme
	Isaac Newton Institute for Mathematical Sciences
2015	"Homotopy Theory, Manifolds, and Field Theories" trimester
	Hausdorff Research Institute for Mathematics