

# Elden Elmanto

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## Areas of specialization

Algebraic  $K$ -theory and cobordism, motivic cohomology and homotopy, derived algebraic geometry.

## Employment

- July 2019- Benjamin Peirce fellow, Harvard University.
- Spring 2019 MSRI Postdoctoral fellow, Mathematical Sciences Research Institute.
- Fall 2018 Postdoctoral fellow, University of Copenhagen.

## Education

- 2018 PhD in Mathematics, Northwestern University.
- 2013 BS in Mathematics, University of Chicago.

## Awards

- 2018 MSRI Postdoctoral fellowship. Awarded a fellowship grant as a participant to the program “Derived Algebraic Geometry” at Mathematical Sciences Research Institute, Berkeley, California (January-May 2019)
- 2018 Northwestern University Department of Mathematics Best Thesis Award
- 2017 Institut Mittag-Leffler Postdoctoral Fellowship. Awarded a fellowship grant as a participant to the program “Algebraic-Geometric and Homotopical Methods” at Institut Mittag-Leffler, Djursholm, Sweden (January-May 2017)

## Visiting appointments

The Centre for Advanced Study (CAS) at the Norwegian Academy of Science and Letters, Oslo, Norway. Remote participation.

Mathematical Sciences Research Institute (MSRI), Berkeley, USA. January-June 2019.

Institut Mittag-Leffler, Djursholm, Sweden. January-May 2017.

Universität Duisburg-Essen, Essen, Germany. May-July 2016 (visiting Marc Levine).

## Publications

### ARTICLES/TO APPEAR

T. Bachmann, E. Elmanto, *Voevodsky's slice conjectures via Hilbert schemes* (2019), to appear in *Alg. Geom.*, arXiv:1912.01595.

E. Elmanto, M. Levine, M. Spitzweck, P. A. Østvær, *Algebraic cobordism and étale cohomology* (2017), to appear in *Geom. Top.*; arXiv:1711.06258.

T. Bachmann, E. Elmanto, M. Hoyois, A. A. Khan, V. Sosnilo, M. Yakerson, *On the infinite loop spaces of algebraic cobordism and the motivic sphere* (2019), to appear in *Épjournal Géom. Algébrique.*; arXiv:1911.02262.

E. Elmanto, J. Shah *Scheiderer motives and equivariant higher topos theory*, *Adv. Math.* **382** (2021) 107651.; arXiv:1912.11557.

B. Antieau, E. Elmanto *Descent for Semiorthogonal Decompositions*, *Adv. Math.* **380** (2021) 107600.; arXiv:1912.08970.

E. Elmanto, M. Hoyois, A. A. Khan, V. Sosnilo, M. Yakerson, *Modules over Algebraic Cobordism*, *Forum Math Pi.* **8** (2020), e14, 44 pp.-43.; arXiv:1908.02162.

E. Elmanto, *THH and TC are (very) far from being homotopy functors*, *J. Pure Appl. Algebra.* **225** (2021), no. 8., 12. pp.; arXiv:2007.09857.

E. Elmanto, M. Hoyois, R. Iwasa, S. Kelly, *Cdh descent, cdarc descent and Milnor excision*, *Math. Ann.* (2020), no. 3-4, 1011–1045.; arXiv:2002.11647.

E. Elmanto, M. Hoyois, A. A. Khan, V. Sosnilo, M. Yakerson, *Framed transfers and motivic fundamental classes*, *J. Topol.* **13** (2020), 460-500.; arXiv:1809.10666.

E. Elmanto, H. Kolderup, *On modules over motivic ring spectra*, *Ann. K-Theory.* **5** (2020), 327-355.; arXiv:1708.05651.

E. Elmanto, A. A. Khan, *Perfection in motivic homotopy theory*, *Proc. Lond. Math. Soc.* **120** (2020), no. 1, 28-38.; arXiv:1812.07506.

B. Antieau and E. Elmanto, *A primer for unstable motivic homotopy theory*, *Surveys on Recent Developments in Algebraic Geometry*, *Proc. Sympos. Pure Math.* **95** (2017), pp. 305 – 370.; arXiv:1605.00929.

I. Kriz and E. Elmanto *Some nontrivial examples of the Baldwin–Ozsváth–Szabó twisted spectral sequence and Heegaard–Floer homology of branched double covers*, *New York J. Math* **22** (2016), 363-378.; arXiv:1604.04260.

#### PREPRINTS

- E. Elmanto, R. Haugseng, *On distributivity in higher algebra I: the universal property of bispanns*, submitted, (2020), arXiv:2010.15722.
- E. Elmanto, V. Sosnilo, *Nilpotent extensions of  $\infty$ -categories and the cyclotomic trace* (2020), submitted, arXiv:2010.09155.
- E. Elmanto, D. Nardin, L. Yang, *A descent view on Mitchell's theorem* (2020), arXiv:2008.02821.
- E. Elmanto, M. Hoyois, R. Iwasa, S. Kelly, *Milnor excision for motivic spectra* (2020), submitted, arXiv:2004.12098.
- T. Bachmann, E. Elmanto, P. A. Østvær, *Motivic invariants are eventually étale local* (2020), submitted, arXiv:2003.04006.
- T. Bachmann, E. Elmanto, *Notes on motivic infinite loop space theory* (2019), arXiv:1912.06530.
- D. Carchedi, E. Elmanto, *Relative étale realizations of motivic spaces and Dwyer-Friedlander K-Theory of noncommutative schemes*, (2018), arXiv:1810.05544.
- E. Elmanto *Motivic contractibility of the space of rational Maps (Thesis)*, (2018), available at [www.eldenelmanto.com](http://www.eldenelmanto.com).
- E. Elmanto, M. Hoyois, A. A. Khan, V. Sosnilo, M. Yakerson, *Motivic infinite loop spaces*, (2017), submitted, arXiv:1711.05248.

#### IN PREPARATION (SELECTED)

- E. Elmanto, M. Speirs, *On Bass' NK groups and cdh prismatic sheaves*. (2021), In preparation.
- T. Bachmann, E. Elmanto, J. Heller, *Motivic colimits and extended powers*. (2021), In preparation.
- T. Bachmann, E. Elmanto, J. Heller, *Mod 2 power operations on normed motivic spectra*. (2021), In preparation.
- T. Bachmann, E. Elmanto, J. Heller, *Splitting results for some normed motivic spectra*. (2021), In preparation.
- E. Elmanto, A. Mathew, J. Witaszek, *On the K-theory of universal homeomorphisms*. (2021), in preparation.
- E. Elmanto, G. Kulkarni, M. Wendt, *On the  $A^1$ -connected components of classifying spaces*. (2021), in preparation.

#### INVITED CONFERENCE TALKS

- TBD* at Derived Algebraic Geometry, Centre de Recerca Matemàtica, Barcelona, June 2021.
- TBD* at K-Theory and Motives, Regensburg, Germany, July 2021.
- The K-theory of universal homeomorphisms* at "Motives and what not" online conference, 20 May 2020.
- Algebraic Cobordism and the Moduli Stack of Varieties* at Cascade Topology Seminar, Portland, USA, 12 May 2019.
- Power Operations On Normed Motivic Spectra* at Institut Mittag-Leffler, Stockholm, Sweden, 09 May

2019.

*Contractions (expository)* at Humboldt Universität Berlin Arbeitsgemeinschaft on Motives, Foliations and the Conservativity Conjecture, Berlin, Germany, September 28 2018.

*Topological Periodic Cyclic Homology of Smooth  $F_p$ -algebras (expository)* at Oberwolfach Arbeitsgemeinschaft on Topological Cyclic Homology, Oberwolfach, Germany, April 5 2018.

*Motivic Contractibility of the Space of Rational Maps* at AMS Sectional Meeting on Motivic Homotopy Theory, Portland, USA, April 14 2018.

*Motivic Contractibility of the Space of Rational Maps* at International Workshop in Algebraic Topology, Shenzhen, China, June 9 2018.

#### SELECTED INVITED SEMINAR TALKS

*A sales pitch of  $A^1$ -homotopy theory to geometers*, Zürich Moduli Seminar, April 23 2021.

*On Real algebraic cycles and equivariant homotopy theory*, Toulouse Homotopie en Géométrie Algébrique Seminar, March 16 2021.

*Motivic topology and purity for torsors*, Motivic Geometry seminar at the CAS (Oslo), March 3 2021.

*On Bass' NK groups of schemes in mixed characteristics*,  $A_1$ -topology, Motives and K-theory at St. Petersburg, December 3 2020.

*A report on the framed motivic program*, Michigan Algebraic Topology Seminar, October 12 2020.

*Homotopy invariant phenomena, trace theories and  $p$ -adic Hodge theory*, Leiden Algebra and Number Theory Seminar, September 18 2020.

*Descent for semiorthogonal decompositions*, Harvard-MIT Algebraic Geometry Seminar, September 8 2020.

*Voevodsky's slice conjectures via Hilbert schemes*, UMass Amherst Representation Theory Seminar, 27 April 2020.

*Excision results for motivic cohomology*, Duke Geometry and Topology Seminar, 13 April 2020.

*Compactifying the étale topos*, Minnesota Topology Seminar, 28 October 2019.

*On the K-theory of Universal Homeomorphisms*, MIT Topology Seminar, 07 October 2019.

*On the Motivic Sphere Spectrum and Hilbert Schemes* at Institute for Basic Science Korea, 05 March 2019.

*Spaces of Algebraic Cobordism and Derived Algebraic Geometry* at Mathematical Sciences Research Institute, 15 February 2019.

*Perfection in Motivic Homotopy Theory* at Universität Regensburg, 18 December 2018.

*Power Operations on Normed Motivic Spectra* at Universitetet i Oslo, 17 October 2018.

*Motivic Fundamental Classes and Framed Motives* at Institut Fourier Algebraic Geometry Seminar, 8 October 2018.

*Motivic Landweber Exact Theories and Étale Cohomology* at Freie Universität Berlin Algebraic Geometry Seminar, 19 July 2018.

*Infinite Loop Spaces in Algebraic Geometry* at University of Copenhagen Algebra/Topology Seminar, 15 January 2018.

*Infinite Loop Spaces in Algebraic Geometry* at University of Chicago Topology Seminar, 28 November 2017.

*Infinite Loop Spaces in Algebraic Geometry* at University of Illinois at Chicago  $K$ -theory Seminar, 20 September 2017.

*Infinite Loop Spaces in Algebraic Geometry* at USC/UCLA joint Algebraic Geometry Seminar, 12 September 2017.

*Motivic Landweber Exact Theories and Étale Cohomology* at National University of Singapore Topology Seminar, 16 March 2017.

## Service to the profession

Referee for Adv. Math., Algebra Number Theory., Ann. K-Theory., Camb. J. Math., Contemp. Math., JEMS., J. Topol., Math. Z., Proc. Lond. Math. Soc.

Quick opinion for EPIGA, Invent. Math., IMRN and Selecta,

Reviewer for an NSF grant

Course assistant for Berlin Summer School in Motivic Homotopy Theory (2018).

Organizer (with Benjamin Antieau and Jeremiah Heller) for “Vitamin  $K_1$ : Kerz-Strunk-Tamme’s Proof of Weibel’s Conjecture”; organizer for a “learning-by-doing” style seminar (2018).

Organizer (with Benjamin Antieau, Akhil Mathew and Maria Yakerson) for “electronic Algebraic  $K$ -theory seminar (eAKTS)”; organizer of an international online seminar on algebraic  $K$ -theory (2020-).

## Service to the department

Graduate admissions committee at Harvard (2019-20, 2020-21 cycles).

Co-organizer of the “Open Neighborhood Seminar” at Harvard University, an undergraduate colloquium, 2020.

Organizer of the “Thursday Seminar” at Harvard University: *Motivic Infinite Loop Spaces*, 2018 and *Condensed Mathematics*, 2020.

Organizer of the Graduate Learning Seminar at Københavns Universitet. Topic:  *$p$ -adic Hodge Theory*, 2018.

Organizer of the Algebraic  $K$ -Theory Learning Seminar at Northwestern University. Topic: *Topological Cyclic Homology*, 2017.

Organizer of the Algebraic  $K$ -Theory Learning Seminar at Northwestern University. Topic: *Rotation Invariance in Algebraic  $K$ -Theory*, 2016.

Mentor for the “Buddy Program” at Northwestern University. Helped incoming graduate students with adjusting to graduate student life, 2015-2016.

## Advising

Matthew Lipman (undergraduate at Harvard): undergraduate thesis on prismatic cohomology.

Tristan Yang (undergraduate at Harvard): undergraduate thesis on algebraic  $K$ -theory.

Ola Sande (PhD student at Oslo): joint advising with Paul Arne Østvær (expected 2024, topic: étale motivic spectra).

## Teaching

### HARVARD UNIVERSITY

- 2019 Linear algebra (proof based, undergraduate), fall semester, instructor.
- 2019 Reading class with Lucy Chen (Harvard graduate student): algebraic  $K$ -theory, fall semester.
- 2020 Algebraic cobordism (graduate topics class), spring semester, instructor.
- 2020 Linear algebra and differential equations (computational, undergraduate), fall semester, instructor.
- 2020 Algebraic geometry I, (graduate) fall semester, instructor.
- 2021 Algebraic geometry II (graduate), spring semester, instructor.
- 2021 Derived categories in algebra and geometry (undergraduate), spring semester, instructor.

### UNIVERSITY OF COPENHAGEN

- 2018 Topics in Topology (with Lars Hesselholt), fall semester, teaching assistant.

### NORTHWESTERN UNIVERSITY

- 2016 Abstract algebra-I, fall quarter, teaching assistant.
- 2016 Differential geometry, fall quarter, teaching assistant.
- 2015 Abstract algebra-I, fall quarter, teaching assistant.
- 2015 Differential calculus, fall quarter, teaching assistant.
- 2015 Abstract algebra-III, spring quarter, teaching assistant.
- 2015 Graduate commutative algebra, spring quarter, teaching assistant.
- 2015 Abstract algebra-II, winter quarter, teaching assistant.
- 2015 Linear algebra, winter quarter, teaching assistant.
- 2014 Abstract algebra-I, fall quarter, teaching assistant.
- 2014 Differential calculus, fall quarter, teaching assistant.

### EXTERNAL MATHEMATICS OUTREACH

- 2011 Young Scholar's Program (advanced math program for high school students), summer, teaching assistant, ran by Paul J. Sally Jr.

- 2012 Collegiate Scholar's Program (advanced math program for high school students), summer, teaching assistant, ran by Paul J. Sally Jr.
- 2013 SESAME Program (certification program for middle school mathematics teachers), summer, teaching assistant, ran by Paul J. Sally Jr.