Jens Niklas Eberhardt

Curriculum Vitæ

Personal

February 20th, 1991 — Born in Düsseldorf, Germany
Nationality — German

Employment

Academic

from Oct 2024 — **Juniorprofessor**, *University of Mainz*
Research and Teaching

Oct 2024 - Sep 2025 — **Postdoctoral fellow**, *University of Mainz*
Research position funded by my grant "Equivariant K-motives and Koszul Duality"

Oct 2023 - Sep 2024 — **Substitute professor**, *University of Bonn*
Research and Teaching

Oct 2021 - Sep 2023 — **Postdoctoral fellow**, *University of Wuppertal*
Research position funded by my grant "Equivariant K-motives and Koszul Duality"

Oct 2020 - Sep 2021 — **Postdoctoral fellow**, *University of Bonn*
Research and four hours of teaching per week.

Jul 2019 - Sep 2020 — **Postdoctoral fellow**, *Max Planck Institute for Mathematics Bonn*
Research and organization of seminars.

Aug 2017 - Jun 2019 — **Assistant Adjunct Professor**, *University of California Los Angeles*
Research and instructing five lecture courses per year.

Aug 2014 - Aug 2017 — **Doctoral Student**, *GK1821 "Cohomological Methods in Geometry", Freiburg*
Research and organization of seminars.

Oct 2011 - Apr 2014 — **Teaching assistant**, *Lehrstuhl B für Mathematik, RWTH Aachen*, Aachen, Germany
Instructing students in a computer algebra course.

Industry

from 2023 — **Freelance Consultant**, *for example for IQM (largest European company developing a quantum computer)*
Mathematical consulting.

Sep 2018 - May 2019 — **Consultant Quantum Architect**, *PsiQ (company developing a general purpose silicon photonic quantum computer)*, Palo Alto, California
Mathematical consulting.

Awards and Grants

from 2026 — **Research Grant**, *Collaborative Research Center (CRC) 326 – GAUS*, "Geometry and Arithmetic of Uniformized Structures" (`https://crc326gaus.de/`)
Principal investigator in a DFG-funded collaborative research center; successful application for prolongation; includes funding for one postdoctoral position and one PhD position

Jan 2024 — **Research Grant**, *European Union*, "REMOLD - Representations, Motives and Langlands Duality " (`https://remold.org`), funding volume €2,399,688

Principal investigator for a MSCA Doctoral Network with nine PhD positions; co-supervising 3 PhD students

May 2025 **International Visitor Program**, *Sydney Mathematical Research Institute (SMRI)*, Research visit to Australia, funding volume AU$6,000

Grant for a four-week research visit to University of Sydney and UNSW, including two one-week long mini-courses.

Mar 2023 **Indagationes Best Paper Prize**, *Royal Dutch Mathematical Society (KWG) and Elsevier*, "Motivic Springer Theory", price amount €1,000

Price for the best paper published in Indagationes Mathematicae in the past year.

Mar 2023 **Workshop Grant**, *Heilbronn Institute for Mathematical Research (HIMR)*, "Geometric and Representation Theoretic Constructions of Expander Graphs", funding volume £3,900

Grant for a week-long research joint workshop in Bristol.

Jan 2021 **Research Grant**, *German Research Foundation (DFG)*, "Equivariant K-motives and Koszul Duality", funding volume €294,300

Grant for my own research position for the duration of three years.

May 2019 **Distinguished Teaching Award 2019**, *UCLA Department of Mathematics*

Award for best math teaching at UCLA.

2015 **Springorum Denkmünze**, *RWTH Aachen*

Award for best graduates at RWTH Aachen

Education

Aug 2014 – May 2017 **Dr. rer. nat.**, *Albert-Ludwigs-Universität Freiburg*
Mathematics, grade *"summa cum laude"*, Advisor: *Wolfgang Soergel*

Apr 2013 – Apr 2014 **Master of Science with honors**, *RWTH Aachen*
Mathematics with minor computer science, grade *"sehr gut mit Auszeichnung"* , Advisor: *Wilhelm Plesken*

Apr 2010 – Apr 2013 **Bachelor of Science**, *RWTH Aachen*
Mathematics with minor computer science, grade *"sehr gut"* , Advisor: *Wilhelm Plesken*

Publications

Published/Accepted

Aug 2026 **The Parabolic K-motivic Hecke Category**, *Jens Niklas Eberhardt, Arnaud Eteve*, *International Mathematics Research Notices* (accepted)
arXiv:2511.19618

Jul 2026 **Universal Koszul Duality for Kac-Moody Groups**, *Jens Niklas Eberhardt, Arnaud Eteve*, *Compositio Mathematica*, 162 (2026), no. 5, 1053–1092
DOI:10.1017/S0010437X26102863, arXiv:2408.14716

Apr 2026 **Logical Operators and Derived Automorphisms of Tile Codes**, *Nikolas P. Breuckmann, Shin Ho Choe, Jens Niklas Eberhardt, Francisco Revson Fernandes Pereira, Vincent Steffan*, *Communications in Mathematical Physics* (accepted)
arXiv:2511.14589

Apr 2026 **Cups and Gates I: Cohomology invariants and logical quantum operations**, *Nikolas P. Breuckmann, Margarita Davydova, Jens Niklas Eberhardt, Nathanan Tantivasadakarn*, *Communications in Mathematical Physics*, 407 (2026), article 86
DOI:10.1007/s00220-026-05570-z, arXiv:2410.16250

Apr 2026 **An Intersection Matrix for Affine Hyperplane Arrangements**, *Jens Niklas Eberhardt, Carl Mautner*, *Algebraic Combinatorics*, 9 (2026), no. 2, 499–512
DOI:10.5802/alco.474, arXiv:2407.06008

Oct 2025 **Tile Codes: High-Efficiency Quantum Codes on a Lattice with Boundary**, *Vincent Steffan, Shin Ho Choe, Nikolas P. Breuckmann, Francisco Revson Fernandes Pereira, Jens Niklas Eberhardt*, *Physical Review Letters*
DOI:10.1103/l4mx-l3xx

Nov 2025 **Planar quantum low-density parity-check codes with open boundaries**, *Zijian Liang, Jens Niklas Eberhardt, Yu-An Chen*, *PRX Quantum*
DOI:10.1103/qv65-vmzr

Jul 2025 **Two proofs of a Jantzen Conjecture for Whittaker Modules**, *Jens Niklas Eberhardt, Anna Romanov*, *Selecta Mathematica*
DOI:10.1007/s00029-025-01057-2

Jan 2025 **Logical Operators and Fold-Transversal Gates of Bivariate Bicycle Codes**, *Jens Niklas Eberhardt, Vincent Steffan*, *IEEE Transactions on Information Theory*
DOI:10.1109/TIT.2024.3521638

Jan 2024 **K-theory Soergel Bimodules**, *Jens Niklas Eberhardt*, *Bulletin of the London Mathematical Society*
DOI:10.1112/blms.12987

Jan 2023 **Integral Motivic Sheaves And Geometric Representation Theory**, *Jens Niklas Eberhardt, Jakob Scholbach*, *Advances in Mathematics*
DOI:j.aim.2022.108811

Apr 2022 **K-Motives and Koszul Duality**, *Jens Niklas Eberhardt*, *Bulletin of the London Mathematical Society*
DOI:10.1112/blms.12691

Jan 2022 **Motivic Springer Theory**, *Jens Niklas Eberhardt, Catharina Stroppel*, *Indagationes Mathematicae*
DOI:10.1016/j.indag.2021.11.004

Jan 2022 **Group completion in the K-theory and Grothendieck–Witt theory of proto-exact categories**, *Jens Niklas Eberhardt, Oliver Lorscheid, Matthew B. Young*, *Journal of Pure and Applied Algebra*
DOI:10.1016/j.jpaa.2022.107018

Jan 2022 **Algebraic K-theory and Grothendieck–Witt theory of monoid schemes**, *Jens Niklas Eberhardt, Oliver Lorscheid, Matthew B. Young*, *Mathematische Zeitschrift*
DOI:10.1007/s00209-021-02919-z

Oct 2021 **Quantum Low-Density Parity-Check Codes**, *Nikolas Peter Breuckmann, Jens Niklas Eberhardt*, *PRX Quantum*
DOI:10.1103/PRXQuantum.2.040101

Jun 2021 **Balanced Product Quantum Codes**, *Nikolas Peter Breuckmann, Jens Niklas Eberhardt*, *IEEE Transactions on Information Theory*, plenary talk at QIP 2022
DOI:10.1109/TIT.2021.3097347

Oct 2020 **Real Springer fibers and odd arc algebras**, *Jens Niklas Eberhardt, Grégoire Naisse, Arik Wilbert*, *Journal of the London Mathematical Society*
DOI:10.1112/jlms.12413

Jul 2020 **Springer Motives**, *Jens Niklas Eberhardt*, *Proceedings of the American Mathematical Society*
DOI:10.1090/proc/15290

Apr 2019 **Mixed Motives and Geometric Representation Theory in Equal Characteristic**, *Jens Niklas Eberhardt, Shane Kelly*, *Selecta Mathematica New Series. 25.2*
DOI:10.1007/s00029-019-0475-x

Sep 2014 **Computing the Tutte Polynomial of a Matroid from its Lattice of Cyclic Flats**, *Jens Niklas Eberhardt*, *Electronic Journal Of Combinatorics Volume 21, Issue 3*
DOI:10.37236/4610

Preprints/Submitted

Oct 2026 **Cups and Gates II: Operads, twists, and addressable intra-code gates**, *Nikolas P. Breuckmann, Margarita Davydova, Jens Niklas Eberhardt, Lucas Ferdinand Hallwirth, Nathanan Tantivasadakarn*
arXiv:2610.05214

Sep 2026 **Condensed configurations and valuative matroid invariants**, *Jens Niklas Eberhardt*
arXiv:2609.20903

Jun 2026 **Nearest-neighbour gates are all you need: High-rate quantum low-density parity-check codes on a planar grid**, *Boren Gu, Tamas Noszko, Vincent Steffan, Jens Niklas Eberhardt, Joschka Roffe, Jens Eisert, Stergios Koutsioumpas*
arXiv:2606.19482

Jan 2024 **K-motives, Springer Theory and the Local Langlands Correspondence**, *Jens Niklas Eberhardt*
arXiv:2401.13052

Oct 2023 **Standard Extension Algebras I: Perverse Sheaves and Fukaya Calculus**, *Jens Niklas Eberhardt, Catharina Stroppel*
arXiv:2310.09206

Mar 2016 **Graded and Geometric Parabolic Induction for Category $\mathcal{O}$**, *Jens Niklas Eberhardt*
arXiv:1603.00327

Other Publications

May 2022 **Soergel and Springer: Motives and Correspondences**, *Jens Niklas Eberhardt*, *Oberwolfach Report*
DOI:10.14760/OWR-2022-23

Apr 2022 **Perverse Sheaves on Flag Varieties**, *Jens Niklas Eberhardt*, *Oberwolfach Report*
DOI:10.14760/OWR-2022-18

Dec 2024 **Pruning qLDPC codes: Towards bivariate bicycle codes with open boundary conditions**, *Jens Niklas Eberhardt, Francisco Revson F. Pereira, Vincent Steffan*
arXiv:2412.04181

Jul 2020 **Challenges and issues of SARS-CoV-2 pool testing**, *Jens Niklas Eberhardt, Nikolas Peter Breuckmann, Christiane Sigrid Eberhardt*, *The Lancet Infectious Diseases*
DOI:10.1016/s1473-3099(20)30467-9

Jul 2020 **Multi-Stage Group Testing Improves Efficiency of Large-Scale COVID-19 Screening**, *Jens Niklas Eberhardt, Nikolas Peter Breuckmann, Christiane Sigrid Eberhardt*, *Journal of Clinical Virology, Volume 128*
DOI:10.1016/j.jcv.2020.104382

Talks

Conferences and Colloquia

Jan 2026 ***Tile Codes***, QIP 2026, Riga

Jul 2025 ***Universal Koszul duality***, Conference "Motives and Arithmetic Geometry", TU Darmstadt

Jan 2025 ***Logical Operators and Fold-Transversal Gates of Bivariate Bicycle Codes***, QIP 2025

Nov 2024 ***Gluing together representations and flag manifolds***, GAUS colloquium, Heidelberg University

Nov 2024 ***Gluing together representations and flag manifolds***, Pure Mathematics colloquium, Hamburg University

Aug 2022 ***A K-theoretic approach to geometric representation theory***, Conference "Building(s) in Aarhus", Aarhus University

Jul 2022 ***Soergel and Springer: Motives And Correspondences***, GK Colloquium, University of Freiburg

Jun 2022 ***Motivic Springer Theory***, Conference "Representation theory and Flag and Quiver Varieties", Université Paris Cité

May 2022 ***Motivic Springer Theory***, Workshop "Interactions between Algebraic Geometry and Noncommutative Algebra", Oberwolfach

Jan 2022 ***Balanced Product Quantum Codes***, QIP 2022 (plenary talk)

Sep 2021 ***Motivic Springer Theory***, Conference "Representation theory's hidden motives", University of Münster and University of Sydney

Jun 2020 ***K-motives and Koszul duality***, Twinned conference "Geometric Representation Theory", Max Planck Institute in Bonn, Germany and Perimeter Institute in Waterloo, Canada

Sep 2019 ***Motives in (Modular) Representation Theory***, Clay workshop on "Modular representation theory", Oxford

Oct 2016 ***Six Operations Formalisms in Geometric Representation Theory***, Workshop "Kac-Moody Groups and L-Functions", University of Nottingham

Jun 2014 ***A New Algorithm for the Tutte Polynomial***, Workshop "Recent Methods in Sphere Packing and Optimization", Oberwolfach

Lecture Series

Aug 2023 ***Motives in Geometric Representation Theory***, Five lectures, Hong Kong University of Science and Technology

Seminars

Nov 2025 ***REMOLD Opening School***, Essen

Jan 2025 ***Universal Koszul Duality***, Seminar on Arithmetic Geometry, TU Darmstadt

Oct 2024 ***Sheaves on Stratified Spaces***, Seminar on Conformal Field Theory, FAU Erlangen

Mar 2024 ***Sheaves on Stratified Spaces***, Algebraic Geometry and Number Theory Seminar, IST Austria

Feb 2024 ***K-motives and Local Langlands***, Number Theory Seminar, University of Tokyo

Feb 2023 ***Hyperbolic Localization and Extension Algebras***, Algebra seminar, University of Freiburg

Feb 2023 ***A K-theoretic Approach to Geometric Representation Theory***, Algebra seminar, Free University of Brussels

Jan 2023 ***A K-theoretic Approach to Geometric Representation Theory***, Algebra/Topology seminar, University of Strasbourg

Dec 2022 ***Soergel and Springer: Motives And Correspondences***, Algebra Seminar, University of Virginia

Nov 2022 ***Soergel and Springer: Motives And Correspondences***, Algebra Seminar, University of Picardy

May 2022 ***Motivic Springer Theory***, Paris algebra seminar, Université Paris Cité

Apr 2022 ***Perverse Sheaves on Flag Varieties***, Arbeitsgemeinschaft, Oberwolfach

Jan 2022 ***Motivic Springer Theory***, University of Rome Tor Vergata

Nov 2021 ***Motivic Springer Theory***, University of Wuppertal

Jun 2021 ***Algebraic K-theory and Grothendieck–Witt theory in non-additive settings***, University of Bonn

Mar 2021 ***K-Motives and Koszul Duality in Geometric Representation Theory***, IAS Princeton

Nov 2020 ***Geometric Coding Theory***, University of Freiburg

Jul 2020 ***K-motives and Koszul duality***, University of Freiburg

May 2020 ***Motives in Geometric Representation Theory***, University of Münster

Dec 2019 ***Motives in Geometric Representation Theory***, RWTH Aachen University

Oct 2019 ***Motives in Geometric Representation Theory***, University of Kaiserslautern

Oct 2019 ***Motives in Geometric Representation Theory***, University of Bochum

Oct 2018 ***Category $\mathcal{O}$ and Mixed Geometry***, University of Toronto

Feb 2018 ***Category $\mathcal{O}$ and Mixed Geometry***, University of Southern California

Feb 2018 ***Category $\mathcal{O}$ and Mixed Geometry***, UC Riverside

Jun 2017 ***Six Operations Formalisms in Geometric Representation Theory***, Univ. Clermont-Ferrand

Aug 2016 ***Graded Category $\mathcal{O}$ and Motivic Six Operations***, Max-Planck-Institut für Mathematik, Bonn

Oct 2016 ***Category $\mathcal{O}$ and Mixed Geometry***, GK-Kolloquium, Univ. of Regensburg

May 2014 ***The Tutte Polynomial of Highly Symmetrical Matroids***, Colloquium, RWTH Aachen

Jul 2013 ***Linearization of Matroid Automorphisms***, Summer School in Algorithmic Mathematics, Univ. of Hamburg

Teaching Experience

Lectures and Seminars

Oct 2025 – Feb 2026 **Representation Theory of Algebraic Groups I**, *University of Mainz*, Instructor

Apr 2024 – Jul 2024 **Advanced Topics in Representation Theory - Kac-Moody Algebras and Flag Varieties**, *Bonn University*, Instructor

Oct 2023 – Feb 2024 **Representation Theory II - Spaces In Geometric Representation Theory**, *Bonn University*, Instructor

Oct 2020 – Feb 2021 **Seminar on Geometric Representation Theory of Weyl Groups**, *Bonn University*, Instructor

Oct 2020 – Feb 2021 **Seminar on Real Reductive Groups**, *Bonn University*, Instructor

Oct 2019 – Feb 2020 **Seminar on Hall Algebras**, *Bonn University*, Instructor

Apr 2019 – Jun 2019 **Real Analysis**, *UCLA*, Instructor

Jan 2019 – Mar 2019 **Differential and Integral Calculus**, *UCLA*, Instructor

Jan 2019 – Mar 2019 **Linear Algebra Honors (115AH)**, *UCLA*, Instructor

Jan 2019 – Mar 2019 **Differential and Integral Calculus**, *UCLA*, Instructor

Sep 2018 – Dec 2018 **Linear Algebra Honors (115AH)**, *UCLA*, Instructor

Sep 2018 – Dec 2018 **Differential and Integral Calculus (31A)**, *UCLA*, Instructor

Apr 2018 – Jun 2018 **Linear Algebra (115A)**, *UCLA*, Instructor

Apr 2018 – Jun 2018 **Differential and Integral Calculus (31A)**, *UCLA*, Instructor

Jan 2018 – Mar 2018 **Introduction to Discrete Structures (61)**, *UCLA*, Instructor

Sep 2017 – Dec 2017 **Differential and Integral Calculus (31A)**, *UCLA*, Instructor

Sep 2017 – Dec 2017 **Linear Algebra (115A)**, *UCLA*, Instructor

Oct 2016 – Feb 2017 **Seminar on** SL_2, *University Freiburg*, Organizer

Apr 2015 – Jul 2015 **Seminar on Sheaf cohomology**, *University Freiburg*, Organizer

Oct 2011 - Apr 2014 **Teaching assistant**, *Lehrstuhl B für Mathematik, RWTH Aachen*, Aachen, Germany

Students

from 2022 **Luka Bizjak**, *Free University of Brussels*, Doctoral Student, 'K-motives and Toric Varieties'

from 2025 **Antoine Labelle**, Doctoral Student, 'Endoscopy for K-motives'

from 2025 **Leonardo Colombo**, Doctoral Student, 'Non-homotopy Invariant K-motives'

from 2025 **Ayman Toufik**, Doctoral Student, 'K-motives on Langlands Parameters'

from 2025 **Lucas Ferdinand Hallwirth**, *University of Mainz*, Master Student, 'Fault-tolerant Quantum Circuits via Cohomology Operations'

from 2025 **Renzhi Liang**, *University of Bonn*, Master Student, 'Whittaker Functors'

from 2025 **Hanno Reents**, *University of Mainz*, Bachelor Student

2024 – 2025 **Ori Bar Gendel**, *University of Bonn*, Master Student, 'Extension of Verma Modules'

2023 – 2024 **Seungkyu Lee**, *University of Bonn*, Master Student (co-supervised), 'Combinatorics of Quasi-Hereditary Koszul Algebras in Hyperplane Arrangements'

2022 – 2023 **Xiaoxiang Zhou**, *University of Bonn*, Master Student, 'Geometry of Quiver Flag Varieties'