Curriculum Vitae — Tobias Boege

Personal information

Name	Dr. Tobias Andreas Boege
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Education and Work Experience

Sep 2024 – present
Marie Skłodowska-Curie Actions postdoctoral fellow at
UiT The Arctic University of Norway, Tromsø.

Sep 2023 – Dec 2023
Visiting scholar at the Institute for Mathematical and Statistical
Innovation (IMSI), Chicago.

Sep 2023 – Sep 2024
Postdoc in the group of Liam Solus at KTH Stockholm.

Sep 2022 – Sep 2023
Postdoc in the group of Kaie Kubjas at Aalto University, Espoo.

Oct 2021 – Sep 2022
Postdoc in the Non-linear Algebra group of Bernd Sturmfels at the
Max-Planck Institute for Mathematics in the Sciences, Leipzig.

Oct 2018 – Oct 2021
PhD studies at OvGU Magdeburg within the research training group
"Mathematical complexity reduction" (MathCoRe).
Thesis title: *The Gaussian conditional independence inference problem*;
advisors: Thomas Kahle and Volker Kaibel.
Defense on 22 April 2022 with total predicate **summa cum laude**.

Oct 2016 – Oct 2018
Master of Science in Mathematics with distinction at University of Magdeburg,
with secondary subject Computer science.

Oct 2013 – Nov 2016
Bachelor of Science in Mathematics with distinction at University of Magdeburg,
with secondary subject Computer science.

Grants

2024 – 2026
Marie Curie postdoctoral fellowship at UiT Tromsø, Norway, with the project
ALGETIQ: Algebraic theory of information quantities (210 911€).

Fall 2023
Visitor scholarship at the Institute for Mathematical and Statistical
Innovation (IMSI) / University of Chicago.

Awards and honors

Apr 2025 Participant in the 12th Heidelberg Laureate Forum.
Nov 2022 "FAIRest MathRepo page of 2022" research data award for *Selfadhesivity in Gaussian conditional independence structures*.
Sep 2022 Best doctoral dissertation of the University of Magdeburg.
Oct 2018 Best M.Sc. graduate of the Mathematics department in Magdeburg.
Nov 2016 Best B.Sc. graduate of the Mathematics department in Magdeburg.

Publications

Preprints under review

- Tobias Boege, Antony Della Vecchia, Marina Garrote López, and Benjamin Hollering. *Algebraic Statistics in OSCAR*. 2026. arXiv: 2601.15807 [stat.CO].
- Carlos Améndola, Tobias Boege, Benjamin Hollering, and Pratik Misra. *Structural identifiability of graphical continuous Lyapunov models*. 2025. arXiv: 2510.04985 [math.ST].
- Tobias Boege, Kamillo Ferry, Benjamin Hollering, and Francesco Nowell. *Polyhedral Aspects of Maxoids*. 2025. arXiv: 2504.21068 [math.CO].
- Tobias Boege. *On the Intersection and Composition properties of conditional independence*. 2025. arXiv: 2504.11978 [cs.IT].
- Tobias Boege. *The entropy profiles of a definable set over finite fields*. 2025. arXiv: 2502.20355 [cs.IT].
- Tobias Boege and Liam Solus. *Real birational implicitization for statistical models*. 2024. arXiv: 2410.23102 [math.ST].

Peer-reviewed publications

- Tobias Boege, Jesse Selover, and Maksym Zubkov. *Sign patterns of principal minors of real symmetric matrices*. To appear in Linear Algebra and Its Applications. 2024. arXiv: 2407.17826 [math.CO].
- Tobias Boege, Kaie Kubjas, Pratik Misra, and Liam Solus. "Coloured Gaussian directed acyclic graphical models". In: *Journal of the Royal Statistical Society Series B: Statistical Methodology* (2025). DOI: 10.1093/jrsssb/qkaf068.
- Tobias Boege, Mathias Drton, Benjamin Hollering, Sarah Lumpp, Pratik Misra, and Daniela Schkoda. "Conditional independence in stationary diffusions". In: *Stochastic Processes and their Applications* (2025). DOI: 10.1016/j.spa.2025.104604.
- Tobias Boege, Janneke H. Bolt, and Milan Studený. "Self-adhesivity in lattices of abstract conditional independence models". In: *Discrete Applied Mathematics* 361 (2025), pp. 196–225. DOI: 10.1016/j.dam.2024.10.006.
- Tobias Boege. "No Eleventh Conditional Ingleton Inequality". In: *Experimental Mathematics* 33.4 (2024), pp. 808–816. DOI: 10.1080/10586458.2023.2294827.
- Tobias Boege, René Fritze, Christiane Görgen, Jeroen Hanselman, Dorothea Iglezakis, Lars Kastner, Thomas Koprucki, Tabea Krause, Christoph Lehrenfeld, Silvia Polla, Marco Reidelbach, Christian Riedel, Jens Saak, Björn Schembera, Karsten Tabelow, and Marcus Weber. "Research-Data Management Planning in the German Mathematical Community". In: *EMS Magazine* (2023). DOI: 10.4171/MAG/152.
- Tobias Boege. "Selfadhesivity in Gaussian conditional independence structures". In: *International Journal of Approximate Reasoning* 163 (2023). DOI: 10.1016/j.ijar.2023.109027.
- Tobias Boege, Thomas Kahle, Andreas Kretschmer, and Frank Röttger. "The geometry of Gaussian double Markovian distributions". In: *Scandinavian Journal of Statistics* 50.2 (2023), pp. 665–696. DOI: 10.1111/sjos.12604.
- Tobias Boege, Sonja Petrović, and Bernd Sturmfels. "Marginal Independence Models". In: *Proceedings of the 2022 International Symposium on Symbolic and Algebraic Computation*. ISSAC '22. Villeneuve-d'Ascq, France: Association for Computing Machinery (ACM), 2022, pp. 263–271. DOI: 10.1145/3476446.3536193.
- Tobias Boege. "Gaussoids are two-antecedental approximations of Gaussian conditional independence structures". In: *Annals of Mathematics and Artificial Intelligence* 90 (2022), pp. 645–673. DOI: 10.1007/s10472-021-09780-0.
- Tobias Boege, Jane Ivy Coons, Christopher Eur, Aida Maraj, and Frank Röttger. "Reciprocal Maximum Likelihood Degrees of Brownian Motion Tree Models". In: *Le Matematiche* 76.2 (2021), pp. 383–398. DOI: 10.4418/2021.76.2.6.
- Tobias Boege and Thomas Kahle. "Construction Methods for Gaussoids". In: *Kybernetika* 56.6 (2020), pp. 1045–1062. DOI: 10.14736/kyb-2020-6-1045.
- Tobias Boege, Alessio D'Alì, Thomas Kahle, and Bernd Sturmfels. "The Geometry of Gaussoids". In: *Foundations of Computational Mathematics* 19.4 (2019), pp. 775–812. DOI: 10.1007/s10208-018-9396-x.

Expository writing

- Tobias Boege. "Algebra in probabilistic reasoning". In: *Computeralgebra-Rundbrief* 71 (2022), pp. 15–20.

Theses

- Tobias Boege. "The Gaussian conditional independence inference problem". PhD thesis. OvGU Magdeburg, 2022. DOI: 10.25673/86275.
- Tobias Boege. *Construction Methods for Gaussoids*. M.Sc. thesis. 2018.
- Tobias Boege. *On permutations with decidable cycles*. B.Sc. thesis. 2016. arXiv: 1612.05136 [math.LO].

Selected conference talks

- Algebraic methods in dynamics and particle physics, October 2025, MPI-SWS Saarbrücken: "Causality and independence in stationary diffusions".
- 13th Workshop on Uncertainty Processing, June 2025, Třešť: "On the Intersection and Composition properties for discrete random variables".
- Algebraic Statistics, March 2025, München: "Real birational implicitization for statistical models".
- Mørketidens Mattemøte, January 2025, Tromsø: "Polyhedra in information theory".
- AlToGeLiS Day, May 2024, Dresden: "Algebra in probabilistic reasoning".
- Combinatorial Coworkspace, March 2024, Kleinwalsertal: "The Ingleton inequality for random variables".
- Graduate Student Meeting on Applied Algebra and Combinatorics, April 2023, KTH Stockholm: "Matroids in information theory: conditional Ingleton inequalities".
- Workshop on Algebraic structures in statistical methodology, December 2022, Mathematisches Forschungsinstitut Oberwolfach: "The complexity of Gaussian conditional independence inference".
- Workshop on Algorithmic aspects of information theory, July 2022, Schloss Dagstuhl: "Universality of Gaussian conditional independence models".
- 47th International Symposium on Symbolic and Algebraic Computation (ISSAC), July 2022, Lille: "Marginal independence models".
- Annual meeting of the IMS, June 2022, London: "Gaussian conditional independence beyond graphical models".
- 12th Workshop on Uncertainty Processing, June 2022, Kutná Hora: "Selfadhesivity in Gaussian conditional independence structures".
- Tagung der Fachgruppe Computeralgebra, March 2022, München: "The laws of Gaussian conditional independence".

Teaching

- Fall 2026: Individual Special Curriculum (Master): Computer-assisted mathematics, UiT Tromsø.
- Spring 2025: Individual Special Curriculum (Master): Algebraic geometry, UiT Tromsø.
- Spring 2023: Real algebraic geometry, Aalto University.
- Winter 2020: organized and taught 5-day intensive preparation course "Financial Mathematics and Statistics" for 180 incoming economics students.
- Winter 2019: substitute tutor for "Linear Algebra I".
- Winter 2015 – Summer 2017: tutor for "Linear Algebra I and II".
- Winter 2015: tutor for "Foundations of Theoretical Computer Science I".

Student supervision

- M.Sc. thesis of Emil Verkama on "Repairing the Universality theorem for 4-polytopes" at Aalto University. This thesis won the 2024 *Ernst Lindelöf* prize of the Finnish Mathematical Society.
- Research internship mentor of Garett Cunningham (Ohio University) through the RISE (Research Internship in Science and Engineering) project of the DAAD (Germany Academic Exchange Service). Project: "Formal conditional independence structures", June to August 2020.

Societies

- Member of the Norwegian Mathematical Society.
- Member of the Fachgruppe Computeralgebra.

Organization of workshops and conferences

- Invited session on *Algebraic Statistics* at NORDSTAT, Helsinki, 2026.
- Fall school on *Geometry in Cryptography and Communication* at UiT Tromsø, 2025.
- Workshpo on *Applied Algebra*, Osnabrück, 2023.
- Minisymposium on *Data and certificates in algebra and geometry* at SIAM AG, Eindhoven, 2023.
- Organizer of the workshop on *Mathematical Software: How to get started* at MPI-MiS Leipzig, 2022.
- Organizer of the *Leipzig–Magdeburg seminar day* at MPI-MiS Leipzig, 2022.
- Graduate Student Meeting in *Applied Algebra and Combinatorics*, Copenhagen, 2021.

Service

- Editor of the Oberwolfach workshop report 2249a on *Algebraic structures in statistical methodology*.
- Organizer of the Discrete mathematics and algebra seminar at Aalto University 2022 – 2023.
- Editor of the Dagstuhl seminar report 22301 on *Algorithmic aspects of information theory* contributing an extensive list of open problems gathered from the participants in informal discussions, talks and the dedicated open problem sessions.
- Organizer of the Non-linear algebra seminar at MPI-MiS Leipzig 2022.
- Organizer of the MathCoRe fellow seminar and editor of the website 2020 – 2021.
- Refereed for journals: · Algebraic Statistics · Arnold Mathematical Journal · Biometrika · Discrete Mathematics and Theoretical Computer Science · Duke Mathematical Journal · Electronic Journal of Statistics · International Journal of Approximate Reasoning · International Mathematics Research Notices · Journal of Machine Learning Research · Kybernetika · SIAM Journal on Discrete Mathematics · SIAM Journal on Applied Algebra and Geometry.
- Refereed for conferences: · MEGA '26 · CLeaR '25 · UAI '25 · SODA '23.

Software development

- Developer of the `AlgebraicStatistics` package for the computer algebra system `OSCAR`.
- Developer of the `CInet::Tools` suite for computations with conditional independence structures with associated research data repository https://cinet.link.

Skills

- Languages: German (native), English (fluent).
- Experience in problem modeling and solving using `SAT` (`#SAT`, `AllSAT`) solvers, linear programming and discrete geometry (`soplex`, `normaliz`) as well as computer algebra systems (`OSCAR`, `Macaulay2`, `Wolfram Mathematica`).

References

- Cordian Riener (UiT Tromsø) ⟨cordian.riener@uit.no⟩ (in particular regarding teaching performance)
- Liam Solus (KTH Stockholm) ⟨solus@kth.se⟩
- Mathias Drton (TU Munich) ⟨mathias.drton@tum.de⟩
- Kaie Kubjas (Aalto) ⟨kaie.kubjas@aalto.fi⟩ (in particular regarding teaching performance)
- Thomas Kahle (OvGU Magdeburg) ⟨thomas.kahle@ovgu.de⟩