

Nils Sturma

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Education

- 04/2021 - 09/2024 **Ph.D. in Mathematical Statistics**
Technical University of Munich (TUM), Germany
Advisor: Prof. Mathias Drton
Thesis: Identifiability and Statistical Inference in Latent Variable Modeling
Grade: summa cum laude; date of defense: September 24, 2024.
- 09/2022 - 12/2022 **Research stay at MIT/ Broad Institute in Cambridge, USA**
Prof. Caroline Uhler
Project: Unpaired Multi-Domain Causal Representation Learning
- 10/2018 - 01/2021 **Master in Mathematical Finance and Actuarial Science**
Technical University of Munich (TUM), Germany
Thesis: Testing Algebraic Constraints on Statistical Parameters
Final grade: 1.2, with distinction (scale: 1 best, 6 worst)
- 02/2020 - 07/2020 **Semester abroad at University of Melbourne, Australia**
- 10/2014 - 01/2018 **Bachelor in Mathematics**
Albert-Ludwigs-University of Freiburg, Germany
Thesis: Formal Group Laws
Minor: Management; Final grade: 1.1 (scale: 1 best, 6 worst)
- 09/2016 - 02/2017 **Semester abroad at Universidad de Sevilla, Spain**

Academic Employment

- 10/2024 - today **Postdoctoral Researcher at Technical University of Munich**
Department of Mathematics, research group Mathematical Statistics
Topics: Graphical Models, Causality, Algebraic Statistics, High-dim. Statistics

Awards/ Fellowships

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| SIAM Student Travel Award | Competitive travel award for the 2023 SIAM Conference on Applied Algebraic Geometry. |
| MDSI/Linde PhD Fellowship | Competitive grant awarded to PhD students at TUM working on topics related to data science. The grant consists of living expenses. |
| Alumni-prize 2018 | Every year the prize is awarded by Alumni Freiburg e.V. to the two most outstanding theses (Bachelor or Master) at the Faculty of Mathematics at the University of Freiburg. |

Publications and Preprints

- 1 Singularity-Agnostic Incomplete U-statistics for Testing Polynomial Constraints in Gaussian Covariance Matrices (with Dennis Leung), *submitted*, <https://arxiv.org/abs/2401.02112>.
- 2 Algebraic Sparse Factor Analysis (with Mathias Drton, Alexandros Grosdos and Irem Portakal), *to appear in SIAM Journal on Applied Algebra and Geometry*, <https://arxiv.org/abs/2312.14762>.
- 3 Mixtures of Discrete Decomposable Graphical Models (with Yulia Alexandr and Jane Coons), *Algebraic Statistics, 2024, Vol. 15, No. 2, 269-293*.
- 4 Testing Many Constraints in Possibly Irregular Models Using Incomplete U-Statistics (with Mathias Drton and Dennis Leung), *Journal of the Royal Statistical Society Series B: Statistical Methodology, 2024, Vol. 86, No. 4, 987-1012*.
- 5 Unpaired Multi-Domain Causal Representation Learning (with Chandler Squires, Mathias Drton and Caroline Uhler), *Advances in Neural Information Processing Systems 36, NeurIPS 2023, Spotlight*.
- 6 Half-Trek Criterion for Identifiability of Latent Variable Models (with Rina Barber, Mathias Drton and Luca Weihs), *The Annals of Statistics, 2022, Vol. 50, No. 6, 3174-3196*.

Talks & Presentations

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| 08/2024 | Bernoulli-IMS World Congress in Probability and Statistics, Bochum, Germany.
Invited talk on <i>Identifiability in Sparse Factor Analysis</i> . |
| 03/2024 | Statistics Seminar at University of Melbourne, Australia.
Invited talk on <i>Identifiability in Sparse Factor Analysis</i> . |
| 12/2023 | NeurIPS, New Orleans, USA.
Poster presentation on <i>Unpaired Multi-Domain Causal Representation Learning</i> . |
| 07/2023 | SIAM Conference on Applied Algebraic Geometry, Eindhoven, Netherlands.
Contributed talk on <i>Introduction to Algebraic Methods in Graphical Models</i> . |
| 04/2023 | Workshop on Causal Representation Learning, Tübingen, Germany.
Contributed talk on <i>Unpaired Multi-Domain Causal Representation Learning</i> . |
| 03/2023 | YES Causal Inference Workshop, Eindhoven, Netherlands.
Poster presentation on <i>Parameter Identifiability in Latent Variable Models</i> . |
| 03/2023 | German Probability and Statistics Days, Essen, Germany.
Contributed talk on <i>Testing Many and Possibly Singular Polynomial Constraints</i> . |
| 08/2022 | 17. Doktorand:innentreffen der Stochastik, Klagenfurt, Austria.
Contributed talk on <i>Half-Trek Criterion for Identifiability of Latent Variable Models</i> . |
| 06/2022 | IMS Annual Meeting in Probability and Statistics, London, UK.
Contributed talk on <i>Half-Trek Criterion for Identifiability of Latent Variable Models</i> . |

Teaching Experience

Lectures	Instructor for Exercise Classes High-dimensional Statistics at TUM, summer term 2024. Linear Algebra 2 at University of Freiburg, summer terms 2016 and 2017. Substitute Lecturer One lecture of the master course High-dimensional Statistics at TUM, summer term 2024. Two lectures of the master course Graphical Models at TUM, summer term 2023.
Seminars	Master Seminars Advances in Statistical Inference at TUM, winter term 2024/2025.
Mentoring	Carolina Kornitzer, Bachelor thesis, 2025 “Dimension of Sparse Factor Analysis Models” Miriam Kranzlmüller, Interdisciplinary Project, 2024 “Identifiability in Sparse Factor Analysis” Javier Yraola Meins, Bachelor thesis, 2023 “Divergence of Maximum Likelihood Estimation in Structural Equation Models” Moritz Ebert, Master thesis, 2023 “Causal Structure Learning for Renewable Energy Time Series Data” Julian Rittmaier, Bachelor thesis, 2022 “Identifiability of Linear Structural Equation Models with Equiconfounded Variables”

Professional Activities

- Reviewer for The Annals of Statistics, Electronic Journal of Statistics, Journal of Machine Learning Research, Bernoulli, Algebraic Statistics, La Matematica, CLear conference.
- Part of the organizing committee for the 2025 *CLear conference*.
- Co-organizer of the Workshop *Causal Inference for Time Series Data* at UAI 2024.
- Co-organizer of the *European Workshop on Algebraic Statistics and Graphical Models* 2024.
- Co-organizer of the minisymposium *Algebraic Methods in Graphical Models* at the SIAM Conference on Applied Algebraic Geometry 2023.

Industry Experience

09/2018 - 02/2021	Part-time internship in the Data Analytics department at Zeppelin Development of machine learning applications for the construction industry. Focus on predictive maintenance, demand forecasting and process optimization.
04/2019 - 08/2019	BMW & TUM Data Innovation Lab (project) Deep Learning approach to predict lane changes using vehicle sensor data.
01/2017 - 03/2021	Freelancer at Ernst-Klett-Verlag Proofreading of mathematical school books.
02/2018 - 07/2018	Internship at BMW Controlling: inner-year targets of entire BMW Group.