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 Topics: Graphical Models, Causality, Algebraic Statistics, High-dim. Statistics 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
09/2016 - 02/2017	**Semester abroad at Universidad de Sevilla, Spain**

Awards/ Fellowships

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), *submitted*, `https://arxiv.org/abs/2312.14762`.

3 Mixtures of Discrete Decomposable Graphical Models (with Yulia Alexandr and Jane Coons), *to appear in Algebraic Statistics*, `https://arxiv.org/abs/2401.15950`.

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.*

Conference Presentations

08/2024 Bernoulli-IMS World Congress in Probability and Statistics, Bochum, Germany.
Talk on *Identifiability in Sparse Factor Analysis.*

12/2023 NeurIPS, New Orleans, USA.
Poster presentation on *Unpaired Multi-Domain Causal Representation Learning.*

07/2023 SIAM Conference on Applied Algebraic Geometry, Eindhoven, Netherlands.
Talk on *Introduction to Algebraic Methods in Graphical Models.*

04/2023 Workshop on Causal Representation Learning, Tübingen, Germany.
Talk on *Unpaired Multi-Domain Causal Representation Learning.*

03/2023 YES Causal Inference Workshop, Eindhoven, Netherlands.
Poster presentation on *Parameter Identifiability in Latent Variable Models.*

03/2023 German Probability and Statistics Days, Essen, Germany.
Talk on *Testing Many and Possibly Singular Polynomial Constraints.*

08/2022 17. Doktorand:innentreffen der Stochastik, Klagenfurt, Austria.
Talk on *Half-Trek Criterion for Identifiability of Latent Variable Models.*

06/2022 IMS Annual Meeting in Probability and Statistics, London, UK.
Talk on *Half-Trek Criterion for Identifiability of Latent Variable Models.*

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	**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.
- 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** Proof reading of mathematical school books.
02/2018 - 07/2018	**Internship at BMW** Controlling: inner-year targets of entire BMW Group.

Other Skills

Languages	German (native) English (fluent, DAAD C1) Spanish (fluent) French (good, DELF B1)
Programming languages	Python (expert) R (advanced) Macaulay2 (medium) SageMath (medium) C (medium) Matlab (beginner)