

# STEFAN LÜDTKE

## Junior Research Group Leader in Artificial Intelligence

📍 Buchbinderstr. 17, 18055 Rostock  
★ August 05, 1991

@ stefan\_luedtke@gmx.net

☎ +49 176 3255 6005



## EDUCATION

### PhD in Artificial Intelligence

📅 10/2016 – 03/2021 📍 University of Rostock

Thesis Topic: Lifted Bayesian Filtering in Multi-Entity Systems, *summa cum laude*

### Master in Computer Science

📅 2014 – 2016 📍 University of Rostock

Thesis topic: Sensor-based Sleep Recognition, Final grade: 1.1

### Bachelor in Computer Science

📅 2011 – 2014 📍 University of Lübeck

Thesis topic: Calibration of Laser Scanners, Final grade: 1.4

## ACADEMIC EXPERIENCE

### Junior Research Group Leader

📅 since 02/2023 📍 ScaDS.AI, University of Leipzig

- Neuro-Symbolic Time Series Analysis
- Deep Learning for Tabular and Categorical Data
- Co-supervision of PhD students: neural network explainability, multi-modal machine learning

### Postdoctoral Researcher

📅 08/2021 – 01/2023 📍 University of Mannheim

- Hybrid knowledge-based and data-driven machine learning
- Multi-modal human activity recognition
- Probabilistic Circuits
- Co-supervision of PhD students: neural network explainability, multi-modal machine learning, hybrid goal recognition, control of multi-agent systems

### Research Associate

📅 10/2016 – 07/2021 📍 University of Rostock

#### Lifted Inference for Dynamic Systems

- Neuro-symbolic models of dynamic systems
- Lifted inference algorithms for dynamic multi-entity systems

#### NEISS: Preserving Symmetries in Probabilistic Models

- Conceived and wrote proposal for a sub-project
- Co-supervised PhD student working on the project

#### Sensor-based Assessment of People with Dementia

- Developed algorithms for sensor-based sleep recognition

## METHODS

- neuro-symbolic AI
- explainable AI
- multi-modal machine learning
- lifted inference
- statistical relational AI
- Bayesian filtering
- MCMC
- probabilistic circuits
- probabilistic programming languages

## AWARDS

### INFO.RO Award

📅 2016

Best master thesis in computer science at the University of Rostock

### Silver Medal of Bad Doberan

📅 2011

Best *Abitur* (high-school diploma) in Bad Doberan

## TEACHING

- Decision Support
- Artificial Intelligence
- Introduction to Machine Learning
- Statistical Signal Processing
- Functional Programming
- Imperative Programming
- Paradigms of Programming
- Algorithms and Data Structures

## OTHER ACTIVITIES

- **Guest editor** of *Sensors* special issue “Sensor-Based Activity Recognition and Interaction”
- **Co-organizer** of the 6th International Workshop on Sensor-Based Activity Recognition and Interaction (iWOAR)
- **Reviewer** for IJCAI, AISTATS, ECML PKDD, Computers in Biology and Medicine, Artificial Intelligence in Medicine, Entropy, Sensors, Winter Simulation Conference, iWOAR

# PUBLICATIONS

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## International Conference Proceedings (5 publications)

- Stefan Lüdtkke, Christian Bartelt, and Heiner Stuckenschmidt. **2022**. “Exchangeability-Aware Sum-Product Networks”. In: *Proceedings of the Thirty-First International Joint Conference on Artificial Intelligence, IJCAI-22*, pp. 4864–4870. (CORE ranking: A\*).
- Stefan Lüdtkke, Marcel Gehrke, Tanya Braun, Ralf Möller, and Thomas Kirste. **2020a**. “Lifted Marginal Filtering for Asymmetric Models by Clustering-based Merging”. In: *Proceedings of the 24th European Conference on Artificial Intelligence*. IOS Press. (CORE ranking: A).
- Stefan Lüdtkke, Chimezie O Amaefule, Thomas Kirste, and Stefan J Teipel. **2020b**. “Measuring motion behavior to detect spatial disorientation in a VR environment”. In: *Proceedings of the 13th ACM International Conference on Pervasive Technologies Related to Assistive Environments*.
- Stefan Lüdtkke, Max Schröder, Sebastian Bader, Kristian Kersting, and Thomas Kirste. **2018**. “Lifted Filtering via Exchangeable Decomposition”. In: *Proceedings of the 27th International Joint Conference on Artificial Intelligence*. (CORE ranking: A\*).
- Stefan Lüdtkke, Albert Hein, Frank Krüger, Sebastian Bader, and Thomas Kirste. **2017**. “Actigraphic Sleep Detection for Real-World Data of Healthy Young Adults and People with Alzheimer’s Disease.” In: *BIOSIGNALS*, pp. 185–192.

## Journal Articles (9 publications)

- Friedrich Niemann, Stefan Lüdtkke, Christian Bartelt, and Michael Ten Hompel. **2022a**. “Context-aware human activity recognition in industrial processes”. In: *Sensors* 22.1. (IF 3.3).
- Sascha Marton, Stefan Lüdtkke, and Christian Bartelt. **2022b**. “Explanations for neural networks by neural networks”. In: *Applied Sciences* 12.3.
- Stefan Teipel, Chimezie O Amaefule, Stefan Lüdtkke, Doreen Görß, Sofia Faraza, Sven Bruhn, and Thomas Kirste. **2022c**. “Prediction of disorientation by accelerometric and gait features in young and old adults navigating in a virtually enriched environment”. In: *Frontiers in Psychology*. accepted (IF 2.9).
- Stefan Lüdtkke, Wiebke Hermann, Thomas Kirste, Heike Benes, and Stefan Teipel. **2020a**. “An Algorithm for Actigraphy-based Sleep/Wake Scoring: Comparison with Polysomnography”. In: *Clinical Neurophysiology* 132.1, pp. 137–145. (IF 3.6).
- Chimezie O Amaefule, Stefan Lüdtkke, Thomas Kirste, and Stefan J Teipel. **2020b**. “Effect of Spatial Disorientation in a virtual environment on gait and vital features in patients with dementia: Pilot Single-Blind Randomized Control Trial”. In: *JMIR Serious Games* 8.4, e18455. (IF 4.1).
- Stefan Lüdtkke and Thomas Kirste. **2020c**. “Lifted Bayesian Filtering in Multiset Rewriting Systems”. In: *Journal of Artificial Intelligence Research* 69, pp. 1203–1254. (IF 2.4, CORE ranking: A).
- Kristina Yordanova, Stefan Lüdtkke, Samuel Whitehouse, Frank Krüger, Adeline Paiement, Majid Mirmehdi, Ian Craddock, and Thomas Kirste. **2019a**. “Analysing cooking behaviour in home settings: Towards health monitoring”. In: *Sensors* 19.3. (IF 3.3).
- Stefan Lüdtkke, Maximilian Popko, and Thomas Kirste. **2019b**. “On the Applicability of Probabilistic Programming Languages for Causal Activity Recognition”. In: *KI-Künstliche Intelligenz* 33.4, pp. 389–399.
- Stefan Lüdtkke, Max Schröder, Frank Krüger, Sebastian Bader, and Thomas Kirste. **2018**. “State-space abstractions for probabilistic inference: a systematic review”. In: *Journal of Artificial Intelligence Research* 63, pp. 789–848. (IF 2.4, CORE ranking: A).

## Workshops and National Conference Proceedings (20 publications)

- Timon Felske, Stefan Lüdtkke, Sebastian Bader, and Thomas Kirste. **2022a**. “Activity Recognition in Assembly Tasks by Bayesian Filtering in Multi-Hypergraphs”. In: *2nd Workshop on Graphs and More Complex Structures for Learning and Reasoning*.
- Maximilian Popko, Sebastian Bader, Stefan Lüdtkke, and Thomas Kirste. **2022b**. “Discovering Behavioral Predispositions in Data to Improve Human Activity Recognition”. In: *Proceedings of the 7th International Workshop on Sensor-Based Activity Recognition and Interaction*. accepted.
- Nils Wilken, Lea Cohausz, Johannes Schaum, Stefan Lüdtkke, Christian Bartelt, and Heiner Stuckenschmidt. **2022c**. “Leveraging planning landmarks for hybrid online goal recognition”. In: *2022 Workshop on Scheduling and Planning Applications (SPARK)*.
- Michael Oesterle, Christian Bartelt, Stefan Lüdtkke, and Heiner Stuckenschmidt. **2022d**. “Self-Learning Governance of Black-Box Multi-Agent Systems”. In: *International Workshop on Coordination, Organizations, Institutions, Norms and Ethics for Governance of Multi-Agent Systems (COINE)*. accepted (CORE ranking: B).
- Chimezie O Amaefule, Stefan Lüdtkke, Thomas Kirste, and Stefan J Teipel. **2021a**. “Gait changes among older adults during a virtual wayfinding task: The role of spatial disorientation and heart rate variability”. In: *Alzheimer’s & Dementia*. Wiley Online Library, e053101.

- Stefan Lüdtkke, Fernando Moya Rueda, Waqas Ahmed, Gernot A Fink, and Thomas Kirste. **2021b**. “Human Activity Recognition using Attribute-Based Neural Networks and Context Information”. In: *3rd International Workshop on Deep Learning for Human Activity Recognition (held in conjunction with IJCAI 2021)*.
- Iris Hochgraeber, Christiane Pinkert, Sumaiya Suravee, Stefan Lüdtkke, Margareta Halek, and Bernhard Holle. **2021c**. “Wissenschaftsbasierte Ontologieentwicklung als Grundlage für KI-basierte Beratung von pflegenden Angehörigen. Einblicke in das Projekt eDEM-CONNECT”. in: *20. deutscher Kongress für Versorgungsforschung*.
- Charlotte A Hinz, Chimezie O Amaefule, Stefan Lüdtkke, Thomas Kirste, and Stefan J Teipel. **2020a**. “Assessing accelerometer, gait and physiological parameters of induced spatial orientation in people with MCI or mild dementia and older healthy cohorts: Dementia care research (research projects; nonpharmacological)/Use of technologies”. In: *Alzheimer’s & Dementia*. Wiley Online Library, e039910.
- Anne Klostermann, Chimezie O Amaefule, Stefan Lüdtkke, Thomas Kirste, and Stefan J Teipel. **2020b**. “Physiological and Gait Pattern Effects of Induced Disorientation in a 3D Virtual Environment”. In: *Alzheimer’s & Dementia*.
- Fernando Moya Rueda, Stefan Lüdtkke, Max Schröder, Kristina Yordanova, Thomas Kirste, and Gernot A Fink. **2019a**. “Combining Symbolic Reasoning and Deep Learning for Human Activity Recognition”. In: *15th Workshop on Context Modeling and Recognition*. IEEE, pp. 22–27.
- Stefan Lüdtkke, Alejandro Molina, Kristian Kersting, and Thomas Kirste. **2019b**. “Gaussian Lifted Marginal Filtering”. In: *KI 2019: Advances in Artificial Intelligence*. Springer, pp. 230–243.
- Stefan Lüdtkke, Kristina Yordanova, and Thomas Kirste. **2019c**. “Human Activity and Context Recognition using Lifted Marginal Filtering”. In: *15th Workshop on Context Modeling and Recognition*, pp. 83–88.
- Stefan Lüdtkke, Max Schröder, and Thomas Kirste. **2018a**. “Approximate Probabilistic Parallel Multiset Rewriting Using MCMC”. in: *KI 2018: Advances in Artificial Intelligence*. Springer, pp. 73–85.
- Samuel Whitehouse, Kristina Yordanova, Stefan Lüdtkke, Adeline Paiement, and Majid Mirmehdi. **2018b**. “Evaluation of cupboard door sensors for improving activity recognition in the kitchen”. In: *2018 IEEE International Conference on Pervasive Computing and Communications Workshops (PerCom Workshops)*. IEEE, pp. 167–172.
- Stefan Lüdtkke, Alejandro Molina, and Thomas Kirste. **2018c**. “Gaussian Lifted Marginal Filtering”. In: *Proceedings of the 5th international Workshop on Sensor-based Activity Recognition and Interaction*. ACM, p. 21.
- Sarah Weschke, Stefan Lüdtkke, Samer Schaat, Martin Gube, Matthias Weippert, Sven Bruhn, Thomas Kirste, and Stefan J Teipel. **2018d**. “Measuring gait characteristics of induced disorientation in a VR environment”. In: *Alzheimer’s & Dementia*. Wiley Online Library, P791.
- Max Schröder, Stefan Lüdtkke, Sebastian Bader, Frank Krüger, and Thomas Kirste. **2017a**. “Abstracting from observation-equivalent entities in human behavior modeling”. In: *AAAI Workshop: Plan, Activity, and Intent Recognition*.
- Max Schröder, Stefan Lüdtkke, Sebastian Bader, Frank Krüger, and Thomas Kirste. **2017b**. “LiMa: Sequential Lifted Marginal Filtering on Multiset State Descriptions”. In: *KI 2017: Advances in Artificial Intelligence*. Springer, pp. 222–235.
- Max Schröder, Stefan Lüdtkke, Sebastian Bader, Frank Krüger, and Thomas Kirste. **2017c**. “Sequential Lifted Bayesian Filtering in Multiset Rewriting Systems”. In: *UAI Workshop: Statistical Relational Artificial Intelligence*.
- Stefan Lüdtkke, Max Schröder, Frank Krüger, and Thomas Kirste. **2017d**. “Where Are My Colleagues? Tracking and Counting Multiple Persons Using Lifted Marginal Filtering.” In: *Proceedings of the 4th International Workshop on Sensor-Based Activity Recognition and Interaction*.

### Preprints (2 publications)

- Sascha Marton, Stefan Lüdtkke, Christian Bartelt, Andrej Tschalzev, and Heiner Stuckenschmidt. **2022a**. “Explaining Neural Networks without Access to Training Data”. In: *arXiv preprint arXiv:2206.04891*.
- Stefan Lüdtkke, Christian Bartelt, and Heiner Stuckenschmidt. **2022b**. “Outlier Explanation via Sum-Product Networks”. In: *arXiv preprint arXiv:2207.08414*.