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## Scientific Focus

Human-Compatible AI, Comprehensible Computation  
Dynamic Probabilistic Relational Modeling, Machine Learning  
Databases, Data Mining, Data Management  
Relational Probabilistic Models, Machine Learning  
Algorithms and Data Structures  
Applications in Medicine, Humanities, Science, and Engineering

## Employment

### Head of Department

Institute of Information Systems  
University of Luebeck  
Lübeck, Germany  
01.02.2024 → 31.12.2024

### Spokesperson of the Research Unit Data Linking in the DFG Cluster of Excellence Understanding Written Artefacts

University of Hamburg  
Hamburg, Germany  
01.01.2018 → 01.01.2025

## Research outputs

### Unsupervised Estimation of Subjective Content Descriptions.

Bender, M., Braun, T., Möller, R. & Gehrke, M., 2023, p. 266-273. 8 p.

### Variables are a Curse in Software Vulnerability Prediction.

Groppe, J., Groppe, S. & Möller, R., 2023, *DEXA (1)*. p. 516-521 6 p. (Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics); vol. 14146 LNCS).

### Using decPOMDPcoms to Holistically Model and Program Nanodevices and Emergent Nanonetworks

Lau, F.-L., Braun, T., Möller, R. & Fischer, S., 03.10.2022, *9th ACM International Conference on Nanoscale Computing and Communication 2022 (ACM NanoCom'22)*. Jornet, J. M. & Pierobon, M. (eds.). Barcelona Catalunya Spain: Association for Computing Machinery, p. 1-7 7 p. 2

### Deep Learning-Based Classification of Customer Communications of a German Utility Company

Groppe, J., Schlichting, R., Groppe, S. & Möller, R., 2022, *Semantic Intelligence: Select Proceedings of ISIC 2022*. Groppe, S., Jain, S. & Bhargava, B. (eds.). Springer Singapore, Vol. 1. (Lecture Notes in Electrical Engineering; vol. 964).

### Embodiment of an Agent by a Pepper Robot for Explaining Retrieval Results.

Schiff, S., Bender, M. & Möller, R., 2022, p. 29-37.

### Estimating Context-Specific Subjective Content Descriptions using BERT.

Bender, M., Kuhr, F., Braun, T. & Möller, R., 2022, p. 171-172.

**Lifting in Multi-agent Systems under Uncertainty**

Braun, T., Gehrke, M., Lau, F. & Möller, R., 2022, *38th Conference on Uncertainty in Artificial Intelligence (UAI 2022), Eindhoven, Netherlands, August 1-5, 2022*. p. 233-243 11 p. (PMLR: Proceedings of Machine Learning Research).

**Identifying and Translating Subjective Content Descriptions among Texts**

Bender, M., Braun, T., Gehrke, M., Kuhr, F., Möller, R. & Schiff, S., 01.12.2021, In: *International Journal of Semantic Computing*. 15, 4, p. 461-485 25 p.

**Lifting DecPOMDPs for Nanoscale Systems – A Work in Progress**

Braun, T., Fischer, S., Lau, F. & Möller, R., 18.10.2021.

**A First Step Towards Even More Sparse Encodings of Probability Distributions.**

Marwitz, F. A., Braun, T. & Möller, R., 2021, *ILP*. p. 183-192 10 p.

**A Hybrid Factor Graph Model for Biomedical Activity Detection.**

Stender, M., Graßhoff, J., Braun, T., Möller, R. & Rostalski, P., 2021, *BHI*. p. 1-4 4 p.

**Complementary Document Representations for Information Retrieval**

Melzer, S., Schiff, S. & Möller, R., 2021, *Proceedings of FLAIRS-34*.

**Concept Drift Detection in Dynamic Probabilistic Relational Models.**

Finke, N., Braun, T., Gehrke, M. & Möller, R., 2021, *FLAIRS Conference*.

**Context-specific Adaptation of Subjective Content Descriptions.**

Kuhr, F., Bender, M., Braun, T. & Möller, R., 2021, *ICSC*. p. 134-139 6 p.

**Dynamic Domain Sizes in Temporal Probabilistic Relational Models.**

Finke, N., Braun, T., Gehrke, M. & Möller, R., 2021, *FLAIRS Conference*.

**Enhancing Relational Topic Models with Named Entity Induced Links.**

Kuhr, F., Lichtenberger, M., Braun, T. & Möller, R., 2021, *ICSC*. p. 314-317 4 p.

**Handling Overlaps When Lifting Gaussian Bayesian Networks.**

Hartwig, M., Braun, T. & Möller, R., 2021, *IJCAI*. p. 4228-4234 7 p.

**Humanities-Centered AI: From Machine Learning to Machine Training**

Möller, R., 2021, *Humanities-Centred Artificial Intelligence, CHAI 2021: CEUR Workshop Proceedings*. Vol. 3093. p. 40-44

**Identifying Subjective Content Descriptions among Texts.**

Bender, M., Braun, T., Gehrke, M., Kuhr, F., Möller, R. & Schiff, S., 2021, *ICSC*. p. 9-16 8 p.

**KI 2021: Advances in Artificial Intelligence - 44th German Conference on AI, Virtual Event, September 27 - October 1, 2021, Proceedings**

Edelkamp, S. (Editor), Möller, R. (Editor) & Rueckert, E. (Editor), 2021, Springer. (Lecture Notes in Computer Science)(KI)

**Modeling and Simulating Federated Databases for early Validation of Federated Searches using the Broker-based SysML Toolbox.**

Melzer, S., Thiemann, S. & Möller, R., 2021, *SysCon*. p. 1-6 6 p.

**On Human-Aware Information Seeking**

Schiff, S. & Möller, R., 2021, *Humanities-Centred Artificial Intelligence, CHAI 2021: CEUR Workshop Proceedings*. p. 31-39

**On the Behaviour of Weighted Permutation Entropy on Fractional Brownian Motion in the Univariate and Multivariate Setting.**

Mohr, M., Wilhelm, F. & Möller, R., 2021, *FLAIRS Conference*.

**Ordering Principal Components of Multivariate Fractional Brownian Motion for Solving Inverse Problems.**

Mohr, M. & Möller, R., 2021, *APSIPA ASC*. p. 240-247 8 p.

**Recommendations for Data-Driven Degradation Estimation with Case Studies from Manufacturing and Dry-Bulk Shipping.**

Finke, N., Mohr, M., Lontke, A., Züfle, M., Kounev, S. & Möller, R., 2021, *RCIS*. p. 189-204 16 p.

**How to Encode Dynamic Gaussian Bayesian Networks as Gaussian Processes?**

Hartwig, M. & Möller, R., 27.11.2020, *AI 2020: AI 2020: Advances in Artificial Intelligence*. Gallagher, M., Moustafa, N. & Lakshika, E. (eds.). Springer, Cham, Vol. 12576 LNAI. p. 371-382 12 p. (Lecture Notes in Computer Science; vol. 12576 LNAI).

**Lifting Queries for Lifted Inference**

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**Augmenting and Automating Corpus Enrichment**

Kuhr, F., Braun, T., Bender, M. & Möller, R., 01.06.2020, In: *International Journal of Semantic Computing*. 14, 2, p. 173-197 25 p.

**New Approaches in Ordinal Pattern Representations for Multivariate Time Series**

Mohr, M., Wilhelm, F., Hartwig, M., Möller, R. & Keller, K., 01.05.2020, p. 124-129. 6 p.

**Maintaining Topic Models for Growing Corpora**

Kuhr, F., Bender, M., Braun, T. & Moller, R., 02.2020, *2020 IEEE 14th International Conference on Semantic Computing (ICSC)*. IEEE, p. 451-458 8 p. 9031467. (IEEE International Conference on Semantic Computing).

**AI-based Companion Services for Humanities**

Schiff, S., Kuhr, F., Melzer, S. & Möller, R., 2020.

**Branch-and-Bound Ranked Search by Minimizing Parabolic Polynomials.**

Poensgen, P. & Möller, R., 2020, In: *Open J. Databases*. 7, 1, p. 12-20 9 p., 1.

**Constructing Gaussian Processes for Probabilistic Graphical Models.**

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**Investigating Maturity of Probabilistic Graphical Models for Dry-Bulk Shipping.**

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**Lifted Marginal Filtering for Asymmetric Models by Clustering-Based Merging.**

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**Lifted Query Answering in Gaussian Bayesian Networks.**

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**On the Behaviour of Permutation Entropy on Fractional Brownian Motion in a Multivariate Setting.**

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### **Quasi-Convex Scoring Functions in Branch-and-Bound Ranked Search.**

Poensgen, P. & Möller, R., 2020, In: *Open J. Databases*. 7, 1, p. 1-11 11 p., 1.

### **Taming Reasoning in Temporal Probabilistic Relational Models.**

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### **Towards Collaborative Predictive Maintenance Leveraging Private Cross-Company Data.**

Mohr, M., Becker, C., Möller, R. & Richter, M., 2020, *GI-Jahrestagung*. p. 427-432 6 p.

### **Efficient Multiple Query Answering in Switched Probabilistic Relational Models**

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### **Exploring Unknown Universes in Probabilistic Relational Models**

Braun, T. & Möller, R., 25.11.2019, *AI 2019: Advances in Artificial Intelligence*. Liu, J. & Bailey, J. (eds.). Springer, Cham, Vol. 11919 LNAI. p. 91-103 13 p. (Lecture Notes in Computer Science; vol. 11919 LNAI).

### **To Extend or Not to Extend? Context-Specific Corpus Enrichment**

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### **Approximate Query Answering in Complex Gaussian Mixture Models**

Hartwig, M., Gehrke, M. & Möller, R., 11.2019, *2019 IEEE International Conference on Big Knowledge (ICBK)*. IEEE, p. 81-86 6 p. 8944433. (IEEE International Conference on Big Knowledge).

### **Which Patient to Treat Next? Probabilistic Stream-Based Reasoning for Decision Support and Monitoring**

Gehrke, M., Schiff, S., Braun, T. & Möller, R., 11.2019, *2019 IEEE International Conference on Big Knowledge (ICBK)*. IEEE, p. 73-80 8 p. 8944691. (IEEE International Conference on Big Knowledge).

### **Lifted Temporal Most Probable Explanation**

Gehrke, M., Braun, T. & Möller, R., 19.06.2019, *ICCS 2019: Graph-Based Representation and Reasoning*. Endres, D., Alam, M. & Şotropa, D. (eds.). Springer, Cham, Vol. 11530 LNAI. p. 72-85 14 p. (Lecture Notes in Computer Science; vol. 11530 LNAI).

### **On Bounded-Memory Stream Data Processing with Description Logics**

Özçep, Ö. L. & Möller, R., 01.06.2019, *Description Logic, Theory Combination, and All That*. Springer Verlag, p. 639-660 22 p. (Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics); vol. 11560 LNCS).

### **Lifted Temporal Maximum Expected Utility**

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### **Uncertain Evidence for Probabilistic Relational Models**

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### **Constructing and Maintaining Corpus-Driven Annotations**

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Gao, Y. (Editor), Möller, R. (Editor), Wu, X. (Editor) & Kotagiri, R. (Editor), 2019, IEEE. (ICBK)

**Corpus-Driven Annotation Enrichment.**

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**Influence-based independence**

Ozcep, O. L., Kuhr, F. & Moller, R., 2019, p. 26 - 31. 6 p.

**Lifted Maximum Expected Utility**

Gehrke, M., Braun, T., Möller, R., Waschkau, A., Strumann, C. & Steinhäuser, J., 2019, *Artificial Intelligence in Health*. Koch, F., Koster, A., Riaño, D., Montagna, S., Schumacher, M., ten Teije, A., Guttmann, C., Reichert, M., Bichindaritz, I., Herrero, P., Lenz, R., López, B., Marling, C., Martin, C., Montani, S. & Wiratunga, N. (eds.). Cham: Springer International Publishing, p. 131-141 11 p.

**Relational Forward Backward Algorithm for Multiple Queries.**

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**Taming Reasoning in Temporal Probabilistic Relational Models.**

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**Adaptive Inference on Probabilistic Relational Models**

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**Answering Multiple Conjunctive Queries with the Lifted Dynamic Junction Tree Algorithm**

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**An Ontology-mediated Analytics-aware Approach to Support Monitoring and Diagnostics of Static and Streaming Data**

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**Fusing First-Order Knowledge Compilation and the Lifted Junction Tree Algorithm**

Braun, T. & Möller, R., 30.08.2018, *KI 2018: Advances in Artificial Intelligence*. Trollmann, F. & Turhan, A.-Y. (eds.). Cham: Springer International Publishing, Vol. 11117. p. 24-37 14 p. (Lecture Notes in Computer Science; vol. 11117).

**Towards Preventing Unnecessary Groundings in the Lifted Dynamic Junction Tree Algorithm**

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**Answering Hindsight Queries with Lifted Dynamic Junction Trees**

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**Parameterised Queries and Lifted Query Answering**

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### **Lifted Dynamic Junction Tree Algorithm**

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### **Towards Foundations of Agents Reasoning on Streams of Percepts**

Özçep, Ö. L. & Möller, R., 10.05.2018, p. 80-85. 6 p.

### **Counting and Conjunctive Queries in the Lifted Junction Tree Algorithm**

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### **Efficient Enriching of Synthesized Relational Patient Data with Time Series Data**

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### **Lifted Most Probable Explanation**

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### **Ontology-based Data Access to Big Data**

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### **Preventing Unnecessary Groundings in the Lifted Dynamic Junction Tree Algorithm.**

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### **Preventing Unnecessary Groundings in the Lifted Dynamic Junction Tree Algorithm.**

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### **Towards lifted maximum expected utility.**

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### **Towards Lifted Maximum Expected Utility. Proceedings of the Joint Workshop on AI in Health in Conjunction with the 27th IJCAI, the 23rd ECAI, the 17th AAMAS, and the 35th ICML**

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### **Selection of Pareto-efficient response plans based on financial and operational assessments**

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### **Time Series Data Mining for Network Service Dependency Analysis**

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### **Preventing Groundings and Handling Evidence in the Lifted Junction Tree Algorithm**

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### **Unsupervised Text Annotations**

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#### **Indirect Causes in Dynamic Bayesian Networks Revisited**

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#### **Semantic access to streaming and static data at Siemens**

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#### **Context- and bias-free probabilistic mission impact assessment**

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#### **Semantic Normalization and Merging of Business Dependency Models**

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#### **Abductive Conjunctive Query Answering w.r.t. Ontologies**

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#### **Reasoning about Imprecise Beliefs in Multi-Agent Systems with PDT Logic**

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#### **Towards Analytics Aware Ontology Based Access to Static and Streaming Data**

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#### **Lifted Junction Tree Algorithm**

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#### **Using a Deep Understanding of Network Activities for Workflow Mining**

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#### **PDT Logic: A probabilistic doxastic temporal logic for reasoning about beliefs in multi-Agent systems**

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#### **Using a Deep Understanding of Network Activities for Network Vulnerability Assessment**

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#### **Ontology-Based Integration of Streaming and Static Relational Data with Optique**

Brandt, S., Neuenstadt, C., Özçep, Ö., Pinkel, C., Zheleznyakov, D., Horrocks, I., Möller, R., Kharlamov, E., Jiménez-Ruiz, E., Kotidis, Y., Lamparter, S., Mailis, T., Svingos, C. & Ioannidis, Y., 26.06.2016, *Proceedings of the 2016 International Conference on Management of Data*. New York, NY, USA: ACM, p. 2109-2112 4 p. (Proceedings of the ACM SIGMOD International Conference on Management of Data).

### **Enabling Semantic Access to Static and Streaming Distributed Data with Optique: Demo**

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### **A semantic approach to polystores**

Kharlamov, E., Mailis, T., Bereta, K., Bilidas, D., Brandt, S., Jimenez-Ruiz, E., Lamparter, S., Neuenstadt, C., Ozcep, O., Soylu, A., Svingos, C., Xiao, G., Zheleznyakov, D., Calvanese, D., Horrocks, I., Giese, M., Ioannidis, Y., Kotidis, Y., Moller, R. & Waaler, A., 2016, *2016 IEEE International Conference on Big Data (Big Data)*. IEEE, p. 2565-2573 9 p. 7840898. (IEEE International Conference on Big Data Proceedings).

### **Probabilistic Mission Defense and Assurance**

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### **Scalable semantic access to siemens static and streaming distributed data?**

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### **Towards Analytics Aware Ontology Based Access to Static and Streaming Data (Extended Version).**

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**Layoutspezifikationen für komplexe graphische Objekte.**

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## **Projects**

### **EXC 2176: Understanding Written Artefacts**

Bausi, A. (Speaker, Coordinator), Friedrich, M. (Speaker, Coordinator), Harter-Uibopuu, K. (Speaker, Coordinator), Bondarev, D. (Project Staff), Brockmann, C. (Project Staff), Depreux, P. (Project Staff), Fehrenbach, F. (Project Staff), Fischer, M. (Project Staff), Friedrich, M. (Project Staff), Grabowsky, V. (Project Staff), Hahn, O. (Project Staff), Heidemann, S. (Project Staff), Huck, O. (Project Staff), Isaacson, H. (Project Staff), Jacobsen, T. (Project Staff), Kern, M. (Project Staff), Kießling, R. (Project Staff), Klein, G. (Project Staff), Michel, C. (Project Staff), Mihailova, B. (Project Staff), Möller, R. (Project Staff), Quenzer, J. B. (Project Staff), Schneider, G. A. (Project Staff), Veltri, G. (Project Staff) & Wilden, E. (Project Staff)

01.01.19 → ...

### **Optimization techniques for descriptive-logical reasoning systems in the field of geo-data (GeoDL)**

Möller, R. (Principal Investigator (PI)) & Grütter, R. (Associated Staff)

01.01.09 → 31.12.12

### **Probabilistic preference measures for knowledge-based scene interpretation**

Neumann, B. (Principal Investigator (PI)) & Möller, R. (Associated Staff)

01.01.07 → 31.12.12

### **Semantics-based formal representation and inference techniques for spatial problems**

Neumann, B. (Principal Investigator (PI)), Haarslev, V. (Associated Staff) & Möller, R. (Associated Staff)

01.01.00 → 31.12.05