

Martin Schirneck

Curriculum Vitae

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Research Interests

My interests cover a broad range of topics in computer science and combinatorics. I have been actively working on the following subjects.

- Fault-tolerant data structures
- Enumeration algorithms
- Parameterized & fine-grained complexity
- Time series analysis
- Evolutionary computation
- Algorithmic learning theory

Positions

2025 – today

Principal Investigator, Karlsruhe Institute of Technology, Germany,
DFG project: *Design, Analysis, and Engineering of Enumeration Algorithms*
in the Scalable Algorithms group led by Thomas Bläsius

2022 – 2025

2025

Postdoctoral Researcher, University of Vienna, Austria,
in the Theory and Applications of Algorithms group
led by Wilfried Gansterer and, formerly, Monika Henzinger

Education

2015 – 2022

2022

Ph.D. in Computer Science, Hasso Plattner Institute, Potsdam, Germany,
in the Algorithm Engineering group
Supervisor: Tobias Friedrich
Thesis: *Enumeration Algorithms in Data Profiling*

2012 – 2015

2015

M.Sc. in Computer Science, Friedrich Schiller University, Jena, Germany,
Thesis: *On Restrictions in Computational Language Learning*
2016 Dean's Prize for Best Thesis

2009 – 2012

2012

B.Sc. in Computer Science, Friedrich Schiller University, Jena, Germany,
Thesis: *Betrachtungen über ein distanzbasiertes Klassifikationsverfahren*
(About a Distance-Based Classification Method)

Recognitions

WADS 2023 Invitation to Algorithmica special issue

Compact Distance Oracles with Large Sensitivity and Low Stretch

GECCO 2022 Best Paper Award (Theory Track) and invitation to ACM TELO special issue
Crossover for Cardinality Constrained Optimization

Invited Talks

- 2024 Humboldt University of Berlin
Approximate Distance Sensitivity Oracles in Subquadratic Space
- 2020 Technical University Berlin
Minimal Hitting Set Extension is $W[3]$ -complete
- 2019 Humboldt University of Berlin
Engineering Hitting Set Enumeration Algorithms
- 2018 Dagstuhl Seminar on Algorithmic Enumeration
Efficiently Enumerating Hitting Sets of Hypergraphs Arising in Data Profiling
- 2018 University of Glasgow
On the Enumeration of Minimal Hitting Sets in Lexicographical Order
- 2016 Friedrich Schiller University Jena
Grenzen Algorithmischen Lernens (Limits of Algorithmic Learning Theory)

Teaching at the Karlsruhe Institute of Technology

As Supervisor

- Bachelor thesis ○ Bennet Hörmann,
A Lower Bound for Minimal-to-Maximal Conversion Search
Winter 2025/26

Teaching at the University of Vienna

As Supervisor

- Master project ○ Muhammad Raza Ali,
Parallelizing Hitting Set Enumeration Algorithms for Data Profiling
Winter 2024/25
- Bachelor thesis ○ Marc Dollmann,
Graph Clustering: A Comparison of Louvain and Leiden
Winter 2022/23

As Instructor

- Lectures ○ Algorithms and Data Structures 2
Summer 2025
- Distributed and Parallel Algorithms
Summer 2025 & Summer 2024
- Mathematical Foundations of Computer Science 1
Summer 2025, Winter 2024/25, Summer 2024, Winter 2023/24 & Summer 2023
- Advanced Algorithms
Winter 2022/23

As Teaching Assistant

- Exercise groups ○ Mathematical Foundations of Computer Science 1
Summer 2025, Winter, 2024/25, Winter 2023/24, Summer 2023 & Winter 2022/23

Teaching at the Hasso Plattner Institute

As Co-Advisor

- Master theses
 - Simon Wietheger, *Fair Correlation Clustering in Forests*, Winter 2022/23 (appeared at FORC 2023)
 - Benjamin Feldmann, *Distributed Unique Column Combinations Discovery*, Winter 2019/20
 - Philipp Fischbeck, *On the Effectiveness of Data Reduction for Covering Problems in Real-World Transit Networks*, Winter 2017/18 (appeared at WAW 2019)
- Bachelor theses
 - Linus Heinzl, *Analysis of the Parameter Configuration of the Ramer-Douglas-Peucker Algorithm for Time Series Compression*, Summer 2019
 - Felix Mujkanovic, *Explaining the Predictions of Any Time Series Classifier*, Summer 2019
 - Julius Lischke, *Lexicographic Enumeration of Hitting Sets in Hypergraphs*, Summer 2018 (appeared at ALENEX 2019 & JCSS 2022)
- Bachelor & Master projects
 - Theory of Crossover-Based Optimization
Winter 2021/22 (appeared at GECCO 2022, received a **Best Paper Award**)
 - Fault Tolerant Algorithms
Summer 2021 (appeared at ITCS 2022)
 - Lossy Compression of Time Series Data
Academic Year 2018/19
 - Distributed Evolutionary Search
Winter 2016/17 (appeared at GECCO 2017 & Algorithmica 2019)

As Guest Lecturer

- MOOC
 - Data Profiling, Lecture: Discovery of Unique Column Combinations via Hitting Sets, Winter 2020/21

As Teaching Assistant

- Seminars
 - Theory of Artificial Intelligence
Winter 2020/21 & Winter 2019/20
 - Probability Theory
Summer 2020, Summer 2018 & Summer 2017
 - Algorithmic Hits of the 80s and 90s
Winter 2016/17
 - Algorithmic Gems
Summer 2016
- Lectures
 - Randomized Algorithms II
Winter 2016/17
 - Randomized Algorithms
Summer 2016

Reviewing

Conferences	European Symposium on Algorithms (ESA), 2023
	Innovations in Theoretical Computer Science Conference (ITCS), 2024
	Intern. Colloquium on Automata, Languages and Programming (ICALP), 2023 & 2020
	Intern. Workshop on Combinatorial Algorithms (IWOCA), 2024
	Symposium on Discrete Algorithms (SODA), 2026 & 2023
	Symposium on Foundations of Computer Science (FOCS), 2025
	Symposium on Theoretical Aspects of Computer Science (STACS), 2023 & 2021
	Symposium on Theory of Computing (STOC), 2026
	Workshop on Graph-Theoretic Concepts in Computer Science (WG), 2024 & 2023
Journals	Discrete Applied Mathematics, 2016
	Journal of Computer and System Sciences, 2019
	Theoretical Computer Science, 2019 & 2023
	Transactions on Evolutionary Computation, 2016

Third-Party Funding

Research Grants

DFG #556899211	German Research Foundation (DFG)	382,900€	(\$443,100)
	<i>Design, Analysis, and Engineering of Enumeration Algorithms</i>		

Travel Grants

WEPA 2019	National Institute of Informatics Japan (NII)	1,800€	(\$2,000)
ADFOCS 2018	Max Planck Institute for Informatics (MPII)	300€	(\$350)
FOGA 2017	Association for Computing Machinery (ACM)	350€	(\$400)
GECCO 2016	German Academic Exchange Service (DAAD)	1,900€	(\$2,150)
GECCO 2016	Association for Computing Machinery (ACM)	450€	(\$500)

List of Publications

Journal Articles

- [1] Davide Bilò, Shiri Chechik, Keerti Choudhary, Sarel Cohen, Tobias Friedrich, Simon Krogmann, and **Martin Schirneck**. “Approximate Distance Sensitivity Oracles in Subquadratic Space”. In: *TheoretCS* 3 (2024), 15:1–15:47. DOI: 10.46298/theoretics.24.15.
- [2] Tobias Bleifuß, Thorsten Papenbrock, Thomas Bläsus, **Martin Schirneck**, and Felix Naumann. “Discovering Functional Dependencies through Hitting Set Enumeration”. In: *Proceedings of the ACM on Management of Data* 2 (2024), pp. 43:1–43:24. DOI: 10.1145/3639298.
- [3] Tobias Friedrich, Timo Kötzing, Aishwarya Radhakrishnan, Leon Schiller, **Martin Schirneck**, Georg Tennigkeit, and Simon Wietheger. “Crossover for Cardinality Constrained Optimization”. In: *ACM Transactions on Evolutionary Learning and Optimization* 3 (2023), 5:1–5:32. DOI: 10.1145/3603629.
- [4] Thomas Bläsus, Tobias Friedrich, and **Martin Schirneck**. “The Complexity of Dependency Detection and Discovery in Relational Databases”. In: *Theoretical Computer Science* 900 (2022), pp. 79–96. DOI: 10.1016/j.tcs.2021.11.020.

- [5] Thomas Bläsius, Tobias Friedrich, Julius Lischied, Kitty Meeks, and **Martin Schirneck**. “Efficiently Enumerating Hitting Sets of Hypergraphs Arising in Data Profiling”. In: *Journal of Computer and System Sciences* 124 (2022), pp. 192–213. DOI: 10.1016/j.jcss.2021.10.002.
- [6] Johann Birnick, Thomas Bläsius, Tobias Friedrich, Felix Naumann, Thorsten Papenbrock, and **Martin Schirneck**. “Hitting Set Enumeration with Partial Information for Unique Column Combination Discovery”. In: *Proceedings of the VLDB Endowment* 13 (2020), pp. 2270–2283. DOI: 10.14778/3407790.3407824.
- [7] Tobias Friedrich, Timo Kötzing, J.A. Gregor Lagodzinski, Frank Neumann, and **Martin Schirneck**. “Analysis of the (1+1) EA on Subclasses of Linear Functions under Uniform and Linear Constraints”. In: *Theoretical Computer Science* 832 (2020), pp. 3–19. DOI: 10.1016/j.tcs.2018.04.051.
- [8] Feng Shi, **Martin Schirneck**, Tobias Friedrich, Timo Kötzing, and Frank Neumann. “Correction to: Reoptimization Time Analysis of Evolutionary Algorithms on Linear Functions Under Dynamic Uniform Constraints”. In: *Algorithmica* 82 (2020), pp. 3117–3123. DOI: 10.1007/s00453-020-00739-x.
- [9] Benjamin Doerr, Philipp Fischbeck, Clemens Frahnw, Tobias Friedrich, Timo Kötzing, and **Martin Schirneck**. “Island Models Meet Rumor Spreading”. In: *Algorithmica* 81 (2019), pp. 886–915. DOI: 10.1007/s00453-018-0445-2.
- [10] Feng Shi, **Martin Schirneck**, Tobias Friedrich, Timo Kötzing, and Frank Neumann. “Reoptimization Time Analysis of Evolutionary Algorithms on Linear Functions Under Dynamic Uniform Constraints”. In: *Algorithmica* 81 (2019), pp. 828–857. DOI: 10.1007/s00453-018-0451-4.

Conference Proceedings

- [11] Davide Bilò, Keerti Choudhary, Sarel Cohen, Tobias Friedrich, and **Martin Schirneck**. “Efficient Fault-Tolerant Search by Fast Indexing of Sub-Networks”. In: *Proceedings of the 39th AAAI Conference on Artificial Intelligence (AAAI)*. 2025, pp. 26463–26471. DOI: 10.1609/AAAI.V39I25.34846.
- [12] Davide Bilò, Shiri Chechik, Keerti Choudhary, Sarel Cohen, Tobias Friedrich, and **Martin Schirneck**. “Improved Distance (Sensitivity) Oracles with Subquadratic Space”. In: *Proceedings of the 65th Symposium on Foundations of Computer Science (FOCS)*. 2024, pp. 1550–1558. DOI: 10.1109/FOCS61266.2024.00097.
- [13] Davide Bilò, Shiri Chechik, Keerti Choudhary, Sarel Cohen, Tobias Friedrich, Simon Krogmann, and **Martin Schirneck**. “Approximate Distance Sensitivity Oracles in Subquadratic Space”. In: *Proceedings of the 55th Symposium on Theory of Computing (STOC)*. 2023, pp. 1396–1409. DOI: 10.1145/3564246.3585251.
- [14] Davide Bilò, Keerti Choudhary, Sarel Cohen, Tobias Friedrich, Simon Krogmann, and **Martin Schirneck**. “Compact Distance Oracles with Large Sensitivity and Low Stretch”. In: *Proceedings of the 18th Algorithms and Data Structures Symposium (WADS)*. [Invitation to Algorithmica special issue](#). 2023, pp. 149–163. DOI: 10.1007/978-3-031-38906-1_11.
- [15] Davide Bilò, Keerti Choudhary, Sarel Cohen, Tobias Friedrich, Simon Krogmann, and **Martin Schirneck**. “Fault-Tolerant ST-Diameter Oracles”. In: *Proceedings of the 50th International Colloquium on Automata, Languages, and Programming (ICALP)*. 2023, 24:1–24:20. DOI: 10.4230/LIPICS.ICALP.2023.24.
- [16] Katrin Casel, Tobias Friedrich, **Martin Schirneck**, and Simon Wietheger. “Fair Correlation Clustering in Forests”. In: *Proceedings of the 4th Symposium on Foundations of Responsible Computing (FORC)*. 2023, 9:1–9:12. DOI: 10.4230/LIPICS.FORC.2023.9.
- [17] Davide Bilò, Katrin Casel, Keerti Choudhary, Sarel Cohen, Tobias Friedrich, J.A. Gregor Lagodzinski, **Martin Schirneck**, and Simon Wietheger. “Fixed-Parameter Sensitivity Oracles”. In: *Proceedings of the 13th Innovations in Theoretical Computer Science Conference (ITCS)*. 2022, 23:1–23:18. DOI: 10.4230/LIPICS.ITCS.2022.23.

- [18] Davide Bilò, Keerti Choudhary, Sarel Cohen, Tobias Friedrich, and **Martin Schirneck**. “Deterministic Sensitivity Oracles for Diameter, Eccentricities and All Pairs Distances”. In: *Proceedings of the 49th International Colloquium on Automata, Languages, and Programming (ICALP)*. 2022, 22:1–22:19. DOI: 10.4230/LIPIcs.ICALP.2022.22.
- [19] Tobias Friedrich, Timo Kötzing, Aishwarya Radhakrishnan, Leon Schiller, **Martin Schirneck**, Georg Tennigkeit, and Simon Wietheger. “Crossover for Cardinality Constrained Optimization”. In: *Proceedings of the 2022 Genetic and Evolutionary Computation Conference (GECCO)*. **Best Paper Award (Theory Track), invitation to ACM TELO special issue**. 2022, pp. 1399–1407. DOI: 10.1145/3512290.3528713.
- [20] Davide Bilò, Sarel Cohen, Tobias Friedrich, and **Martin Schirneck**. “Near-Optimal Deterministic Single-Source Distance Sensitivity Oracles”. In: *Proceedings of the 29th European Symposium on Algorithms (ESA)*. 2021, 18:1–18:17. DOI: 10.4230/LIPIcs.ESA.2021.18.
- [21] Davide Bilò, Sarel Cohen, Tobias Friedrich, and **Martin Schirneck**. “Space-Efficient Fault-Tolerant Diameter Oracles”. In: *Proceedings of the 46th International Symposium on Mathematical Foundations of Computer Science (MFCS)*. 2021, 18:1–18:16. DOI: 10.4230/LIPIcs.MFCS.2021.18.
- [22] Thomas Bläsus, Tobias Friedrich, and **Martin Schirneck**. “The Minimization of Random Hypergraphs”. In: *Proceedings of the 28th European Symposium on Algorithms (ESA)*. 2020, 21:1–21:15. DOI: 10.4230/LIPIcs.ESA.2020.21.
- [23] Thomas Bläsus, Philipp Fischbeck, Tobias Friedrich, and **Martin Schirneck**. “Understanding the Effectiveness of Data Reduction in Public Transportation Networks”. In: *Proceedings of the 16th Workshop on Algorithms and Models for the Web Graph (WAW)*. 2019, pp. 87–101. DOI: 10.1007/978-3-030-25070-6_7.
- [24] Thomas Bläsus, Tobias Friedrich, Julius Lischke, Kitty Meeks, and **Martin Schirneck**. “Efficiently Enumerating Hitting Sets of Hypergraphs Arising in Data Profiling”. In: *Proceedings of the 21st Meeting on Algorithm Engineering and Experiments (ALENEX)*. 2019, pp. 130–143. DOI: 10.1137/1.9781611975499.11.
- [25] Benjamin Doerr, Philipp Fischbeck, Clemens Frahnöw, Tobias Friedrich, Timo Kötzing, and **Martin Schirneck**. “Island Models Meet Rumor Spreading”. In: *Proceedings of the 2017 Genetic and Evolutionary Computation Conference (GECCO)*. 2017, pp. 1359–1366. DOI: 10.1145/3071178.3071206.
- [26] Tobias Friedrich, Timo Kötzing, J.A. Gregor Lagodzinski, Frank Neumann, and **Martin Schirneck**. “Analysis of the (1+1) EA on Subclasses of Linear Functions under Uniform and Linear Constraints”. In: *Proceedings of the 14th Conference on Foundations of Genetic Algorithms (FOGA)*. 2017, pp. 45–54. DOI: 10.1145/3040718.3040728.
- [27] Timo Kötzing, **Martin Schirneck**, and Karen Seidel. “Normal Forms in Semantic Language Identification”. In: *Proceedings of the 28th International Conference on Algorithmic Learning Theory (ALT)*. 2017, pp. 493–516. URL: <http://proceedings.mlr.press/v76/k%C3%B6tzing17a>.
- [28] Feng Shi, **Martin Schirneck**, Tobias Friedrich, Timo Kötzing, and Frank Neumann. “Reoptimization Times of Evolutionary Algorithms on Linear Functions Under Dynamic Uniform Constraints”. In: *Proceedings of the 2017 Genetic and Evolutionary Computation Conference (GECCO)*. 2017, pp. 1407–1414. DOI: 10.1145/3071178.3071270.
- [29] Tobias Friedrich, Timo Kötzing, Martin S. Krejca, Samadhi Nallaperuma, Frank Neumann, and **Martin Schirneck**. “Fast Building Block Assembly by Majority Vote Crossover”. In: *Proceedings of the 2016 Genetic and Evolutionary Computation Conference (GECCO)*. 2016, pp. 661–668. DOI: 10.1145/2908812.2908884.
- [30] Thomas Bläsus, Tobias Friedrich, and **Martin Schirneck**. “The Parameterized Complexity of Dependency Detection in Relational Databases”. In: *Proceedings of the 11th International Symposium on Parameterized and Exact Computation (IPEC)*. 2016, 6:1–6:13. DOI: 10.4230/LIPIcs.IPEC.2016.6.

- [31] Timo Kötzing and **Martin Schirneck**. “Towards an Atlas of Computational Learning Theory”. In: *Proceedings of the 33rd Symposium on Theoretical Aspects of Computer Science (STACS)*. 2016, 47:1–47:13. DOI: 10.4230/LIPIcs.STACS.2016.47.