Simon Weber

Curriculum Vitae

Department of Computer Science
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Homepage
ORCiD

Education

2021–present **Doctoral Studies, Theoretical Computer Science**, *ETH Zürich*, Switzerland, advised by Prof. Dr. Bernd Gärtner.
Structural and algorithmic aspects of sink-finding in Unique Sink Orientations and related problems.

2018–2020 : **Master of Science, Computer Science**, *ETH Zürich*, Switzerland.
Specialization in Theoretical Computer Science. GPA 5.80/6 (graduated with distinction). Master Thesis: *Unique Sink Orientations: Constructions and Random Facet*, supervised by Prof. Dr. Bernd Gärtner.

2015–2018 : **Bachelor of Science, Computer Science**, *ETH Zürich*, Switzerland.
GPA 5.77/6 (graduated with distinction). Bachelor Thesis: *Accelerating Graph Processing Using Lossy Compression*, supervised by Dr. Maciej Besta and Prof. Dr. Torsten Hoefler.

Teaching

Fall, 2024 : **Geometry: Combinatorics and Algorithms**, ETH Zürich.
Head Assistant: teaching, grading, coordinating

Spring, 2024 : **Introduction to Topological Data Analysis**, ETH Zürich.
Head Assistant: teaching, grading, coordinating

Fall, 2023 : **Algorithms, Probability & Computing**, ETH Zürich.
Teaching Assistant: teaching, grading

Spring, 2023 : **Introduction to Topological Data Analysis**, ETH Zürich, (first iteration of the course).
Head Assistant: teaching, grading, coordinating, creating lecture notes

Fall, 2022 : **Algorithms, Probability & Computing**, ETH Zürich.
Head Assistant: coordinating, grading, design of exam materials

Spring, 2022 : **Algorithmen & Wahrscheinlichkeit**, ETH Zürich.
Teaching Assistant: teaching, grading

Fall, 2021 : **Algorithms, Probability & Computing**, ETH Zürich.
Teaching Assistant: teaching, grading

Fall, 2017 – 2019: **Theoretische Informatik**, ETH Zürich.
Student Teaching Assistant: teaching, grading

Supervised Theses

Ongoing : **Jonas Lill**, *Algorithms for Super-Unique-Tarski*, Semester Thesis.
Co-supervising with Sebastian Haslebacher.

Ongoing : **Andrei Feodorov**, *Feasibility and VC-Dimension of ℓ_p-Halfspaces*, Bachelor Thesis.
Co-supervising with Dr. Patrick Schnider and Sebastian Haslebacher.

Ongoing : **Enrico Mann**, *One Line and n Points in Higher Dimensions*, Semester Thesis.
Co-supervising with Prof. Dr. Bernd Gärtner.

Ongoing : **Tim Utzinger**, *Analyzing a One-Permutation Variant of Random-Facet*, Bachelor Thesis.
Co-supervising with Prof. Dr. Bernd Gärtner.

2025 : **Jonas Lill**, *Finding Fixed Points of ℓ_1-Contraction Maps*, Semester Thesis.
Co-supervised with Sebastian Haslebacher.

2025 : **Ahmet Ala**, *Analyzing the One-Permutation Variant of Sharir-Welzl*, Bachelor Thesis.
Co-supervised with Prof. Dr. Bernd Gärtner.

2024 : **Linus Stalder**, *α-Problems in Geometry and Combinatorics*, Master Thesis.
Co-supervised with Dr. Patrick Schnider and Prof. Dr. Bernd Gärtner. Results published at STACS'25. Linus Stalder has received the prestigious *ETH Medal for Outstanding Master Theses* for this work.

2024 : **Tiago Oliveira Marques**, *The Non-Promise Version of USO*, Research Internship.
Co-supervised with Sebastian Haslebacher, Dr. Patrick Schnider, and Prof. Dr. Bernd Gärtner. Results submitted to DMTCS.

2024 : **Jonas Lill**, *Parameterized Algorithms for MaxCut in Multigraphs*, Bachelor Thesis.
Co-supervised with Dr. Kalina Petrova and Prof. Dr. Angelika Steger. Results published at IPEC'24 and in the special issue of Algorithmica for IPEC'24.

2024 : **Linus Stalder**, *Local Operations for Violator Spaces*, Semester Thesis.
Co-supervised with Prof. Dr. Bernd Gärtner.

2023 : **Josiah Rohrer**, *Extended L-Graphs of Unique Sink Orientations*, Master Thesis.
Co-supervised with Prof. Dr. Bernd Gärtner.

2023 : **Michelle Vieira**, *Visualization and Completion of Partial USOs*, Bachelor Thesis.
Co-supervised with Prof. Dr. Bernd Gärtner.

2023 : **Yuda Fan**, *The USO Polytope*, Semester Thesis.
Co-supervised with Prof. Dr. Bernd Gärtner.

2022 : **Josiah Rohrer**, *Subsets of Nearest-Neighbor Datasets with the Same Decision Boundary*, Semester Thesis.
Co-supervised with Prof. Dr. Bernd Gärtner. Results published at CCCG'23.

2022 : **Joel Widmer**, *Solving Systems of Linear Equations of Matoušek Matrices in the Matrix-Vector Query Model*, Master Thesis.
Co-supervised with Prof. Dr. Bernd Gärtner. Results published at WADS'23 and in The Electronic Journal of Combinatorics.

2021 : **Simon Gautschi**, *P-Matroid Unique Sink Orientations & OM-Graphs*, Bachelor Thesis.
Co-supervised with Prof. Dr. Bernd Gärtner.

Languages

German Native Language
English Full Professional Proficiency
French Elementary Knowledge

Talks

Talks additional to semiannual talks in the *Seminar in Theoretical Computer Science* at ETH Zürich:

06.03.25 STACS: Unfairly Splitting Separable Necklaces
10.10.24 FU Berlin: Proof Complexity and TFNP.
04.09.24 IPEC: Linear-Time MaxCut in Multigraphs Parameterized Above the Poljak-Turzík Bound.
19.06.24 WG: Recognition of Unit Segment and Polyline Graphs is $\exists\mathbb{R}$-Complete.
13.06.24 SoCG: A Topological Version of Schaefer's Dichotomy Theorem.
13.03.24 EuroCG: Recognition of Unit Segment and Polyline Graphs is $\exists\mathbb{R}$-Complete.
04.12.23 ISAAC: An FPT Algorithm for Splitting a Necklace Among Two Thieves.
12.09.23 RANDOM: On Connectivity in Random Graph Models with Limited Dependencies.
03.08.23 CCCG: Reducing Nearest Neighbor Training Sets Optimally and Exactly.
01.08.23 WADS: Realizability Makes a Difference: A Complexity Gap for Sink-Finding in USOs.

31.03.23 EuroCG: On the Complexity of Recognizing Nerves of Convex Sets.

29.03.23 EuroCG: The Complexity of Recognizing Geometric Hypergraphs.

06.12.22 FU Berlin: Training Fully Connected Neural Networks is $\exists\mathbb{R}$-Complete.

11.01.22 SOSA: Topological Art in Simple Galleries.

Publications

Journal Articles

2025 Jonas Lill, Kalina Petrova, and Simon Weber. Linear-time maxcut in multigraphs parameterized above the Poljak-Turzík bound. *Algorithmica*. Springer, 2025.

2025 Bernd Gärtner, Simon Weber, and Joel Widmer. Realizability in Matoušek unique sink orientations: Characterization and complexity gap. *The Electronic Journal of Combinatorics*, volume 32, 2025.

2025 Michaela Borzechowski and Simon Weber. On flipping edge sets in unique sink orientations. *Graphs and Combinatorics*. Springer, 2025.

2025 Daniel Bertschinger, Nicolas El Maalouly, Linda Kleist, Tillmann Miltzow, and Simon Weber. The complexity of recognizing geometric hypergraphs. *Innovations in Graph Theory*, volume 2, pages 157–190, 2025.

2024 Johannes Lengler, Anders Martinsson, Kalina Petrova, Patrick Schnider, Raphael Steiner, Simon Weber, and Emo Welzl. On connectivity in random graph models with limited dependencies. *Random Structures & Algorithms*, volume 65(2), pages 411–448. Wiley, 2024.

2023 Patrick Schnider and Simon Weber. On the complexity of recognizing nerves of convex sets. *Computing in Geometry and Topology*, volume 3(2), page 2:1–2:8, 2023.

2023 Daniel Bertschinger, Nicolas El Maalouly, Tillmann Miltzow, Patrick Schnider, and Simon Weber. Topological art in simple galleries. *Discrete & Computational Geometry*, 2023.

In Conference Proceedings

2025 Michael Hoffmann, Tillmann Miltzow, Simon Weber, and Lasse Wulf. Recognition of unit segment and polyline graphs is $\exists\mathbb{R}$-complete. In Daniel Kráľ and Martin Milanič, editors, *Graph-Theoretic Concepts in Computer Science*, pages 266–281, Cham, 2025. Springer Nature Switzerland. Also appeared in Abstracts 40th European Workshop on Computational Geometry (EuroCG'24), Ioannina, Greece, 2024, 11:1–11:10.

2024 Patrick Schnider and Simon Weber. A Topological Version of Schaefer's Dichotomy Theorem. In *40th International Symposium on Computational Geometry (SoCG'24)*, volume 293 of *LIPIcs*, pages 77:1–77:16, Dagstuhl, Germany, 2024. Schloss Dagstuhl – Leibniz-Zentrum für Informatik.

2024 Patrick Schnider, Linus Stalder, and Simon Weber. Unfairly splitting separable necklaces. In *42nd International Symposium on Theoretical Aspects of Computer Science (STACS'25)*, volume 327 of *LIPIcs*, pages 29:1–29:20. Schloss Dagstuhl – Leibniz-Zentrum für Informatik, 2024.

2024 Jonas Lill, Kalina Petrova, and Simon Weber. Linear-time maxcut in multigraphs parameterized above the Poljak-Turzík bound. In *19th International Symposium on Parameterized and Exact Computation (IPEC 2024)*, volume 321 of *LIPIcs*, pages 2:1–2:19, Dagstuhl, Germany, 2024. Schloss Dagstuhl – Leibniz-Zentrum für Informatik.

2024 Michaela Borzechowski, John Fearnley, Spencer Gordon, Rahul Savani, Patrick Schnider, and Simon Weber. Two Choices Are Enough for P-LCPs, USOs, and Colorful Tangents. In *51st International Colloquium on Automata, Languages, and Programming (ICALP'24)*, volume 297 of *LIPIcs*, pages 32:1–32:18, Dagstuhl, Germany, 2024. Schloss Dagstuhl – Leibniz-Zentrum für Informatik.

2023 Simon Weber and Joel Widmer. Realizability makes a difference: A complexity gap for sink-finding in USOs. In *Algorithms and Data Structures (WADS'23)*, pages 704–718. Springer Nature Switzerland, 2023.

2023 Josiah Rohrer and Simon Weber. Reducing nearest neighbor training sets optimally and exactly. In *Proceedings of the 35th Canadian Conference on Computational Geometry (CCCG'23)*, pages 113–121, 2023.

2023 Johannes Lengler, Anders Martinsson, Kalina Petrova, Patrick Schnider, Raphael Steiner, Simon Weber, and Emo Welzl. On connectivity in random graph models with limited dependencies. In *Approximation, Randomization, and Combinatorial Optimization. Algorithms and Techniques (APPROX/RANDOM'23)*, volume 275 of *LIPIcs*, pages 30:1–30:22. Schloss Dagstuhl - Leibniz-Zentrum für Informatik, 2023.

2023 Michaela Borzechowski, Patrick Schnider, and Simon Weber. An FPT algorithm for splitting a necklace among two thieves. In *34th International Symposium on Algorithms and Computation (ISAAC'23)*, volume 283 of *LIPIcs*, pages 15:1–15:14. Schloss Dagstuhl – Leibniz-Zentrum für Informatik, 2023.

2023 Daniel Bertschinger, Christoph Hertrich, Paul Jungeblut, Tillmann Miltzow, and Simon Weber. Training fully connected neural networks is $\exists\mathbb{R}$-complete. In *Advances in Neural Information Processing Systems 36 (NeurIPS'23), New Orleans, LA, USA*, 2023.

2023 Daniel Bertschinger, Nicolas El Maalouly, Linda Kleist, Tillmann Miltzow, and Simon Weber. The complexity of recognizing geometric hypergraphs. In *Graph Drawing and Network Visualization (GD'23)*, pages 163–179. Springer Nature Switzerland, 2023.

2022 Daniel Bertschinger, Nicolas El Maalouly, Tillmann Miltzow, Patrick Schnider, and Simon Weber. Topological art in simple galleries. In *Symposium on Simplicity in Algorithms (SOSA'22)*, pages 87–116. SIAM, 2022.

2019 Maciej Besta, Simon Weber, Lukas Gianinazzi, Robert Gerstenberger, Andrey Ivanov, Yishai Oltchik, and Torsten Hoefler. Slim graph: Practical lossy graph compression for approximate graph processing, storage, and analytics. In *Proceedings of the International Conference for High Performance Computing, Networking, Storage and Analysis (SC'19)*, pages 1–25. ACM, 2019.

Preprints

2025 Sebastian Haslebacher, Jonas Lill, Patrick Schnider, and Simon Weber. Query-efficient fixpoints of ℓ_p-contractions. *arXiv:2503.16089*, 2025.

2023 Michaela Borzechowski and Simon Weber. On degeneracy in the P-matroid oriented matroid complementarity problem. *arXiv:2302.14585*, 2023. Appeared in Abstracts 39th European Workshop on Computational Geometry (EuroCG'23), Barcelona, Spain, 2023, 9:1–9:7.

2022 Michaela Borzechowski, Joseph Doolittle, and Simon Weber. A universal construction for unique sink orientations. *arXiv:2211.06072*, 2022. Appeared in Abstracts 40th European Workshop on Computational Geometry (EuroCG'24), Ioannina, Greece, 2024, 9:1–9:8.

Reviewing

I have participated in the peer review process for SoCG'25, STACS'25, Algorithmica, SODA'24, ESA'24, STACS'24, MFCS'24, LATIN'24, SoCG'23, MFCS'23, EuroCG'23, and SoCG'22.