

CONTACT

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EDUCATION

Ph.D. (Dr. rer. nat.), Computer Science
Heidelberg University, 2021–2025
Advisor: Prof. Christian Schulz

M.Sc., Mathematics
Heidelberg University, 2019–2020

B.Sc., Mathematics
Heidelberg University, 2015–2019

LANGUAGES

German
native

English
fluent

Norwegian
A2–B1

Ernestine Großmann

POSTDOCTORAL RESEARCHER · ALGORITHM ENGINEERING

Ph.D. (Dr. rer. nat.) Computer Science · M.Sc. Mathematics
Heidelberg, Germany

PROFILE

I develop practical, efficient algorithms for large-scale graph problems — data reductions, maximum-weight independent sets, and combinatorial optimization.

APPOINTMENTS

since 2025 **Postdoctoral Researcher**, Algorithm Engineering Group (Prof. Christian Schulz), Heidelberg University.

2024 **Research visits**, University of Bergen (Jun–Jul and Nov–Dec 2024).

RESEARCH INTERESTS

Maximum Weight Independent Sets · 2-Packing Sets · Weighted Connectivity Augmentation · Hypergraph b-Matching · Dynamic Independent Sets

TEACHING

- **Winter 2026 / 2027** **Algorithms and Data Structures 2**. Lecture, bachelor level · with Dr. Kenneth Langedal and Prof. Christian Schulz · split equally
- **Summer 2026** **Algorithm Engineering**. Lecture, master level · with Dr. Kenneth Langedal and Prof. Christian Schulz · split equally
- **Winter 2025 / 2026** **Algorithms and Data Structures 2**. Lecture, bachelor level · with Dr. Kenneth Langedal · split equally
- **Summer 2025** **Distributed and Parallel Algorithms**. Lecture, master level · with Dr. Kenneth Langedal · split equally

PROFESSIONAL SERVICE

- **2026** Program Committee — ESA'26 (European Symposium on Algorithms (ESA/ALGO))
  Program Committee — GraphSys'26 (Workshop on Serverless, Extreme-Scale, and Sustainable Graph Processing Systems (Euro-Par))
- **2025** Program Committee — CompAI (Workshop on Composite AI)
- **2022** Organizing Committee — SEA'22 (Symposium on Experimental Algorithms (SEA))
  Organizing Committee — PACE'22 (Parameterized Algorithms and Computational Experiments (PACE))
- Reviewer (Journals & conferences — ESA (2023, 2026), ALENEX (2024), IEEE TCDS (2025), IPDPS (2025), ANOR (2025), SISC (2026), OMS (2026))

PUBLICATIONS

2027

- Kenneth Langedal, Martin Vatshelle, **Ernestine Großmann**. Expand & Reduce: A Framework Bridging Branch-and-Reduce and Dynamic Programming. *Workshop on Algorithm Engineering and Experimentation (ALENEX), SIAM, to appear*.

2026

- Jannick Borowitz, **Ernestine Großmann**, Christian Schulz. Finding Maximum Weight 2-Packing Sets on Arbitrary Graphs. *Networks, 87(4):404–427*. [paper] [arXiv] [code]
- Jannick Borowitz, **Ernestine Großmann**, Matthias Schimek. Distributed Reductions for the Maximum Weight Independent Set Problem. *Workshop on Algorithm Engineering and Experimentation (ALENEX), pages 85–98, SIAM*. [paper] [arXiv] [code]
- **Ernestine Großmann**, Felix Joos, Henrik Reinstädtler, Christian Schulz. Engineering Hypergraph b-Matching Algorithms. *Journal of Graph Algorithms and Applications, 30(1):1–24*. [paper] [arXiv] [code]
- **Ernestine Großmann**, Jonas Sauer, Christian Schulz, Patrick Steil, Sascha Witt. FLASH-TB: Integrating Arc-Flags and Trip-Based Public Transit Routing. *Transportation Science, 60(2)*. [paper] [arXiv] [code]

2025

- Jannick Borowitz, **Ernestine Großmann**, Christian Schulz, Dominik Schweisgut. Scalable Algorithms for 2-Packing Sets on Arbitrary Graphs. *Journal of Graph Algorithms and Applications, 29(1):159–186*. [paper] [arXiv] [code]
- Jannick Borowitz, **Ernestine Großmann**, Christian Schulz. Optimal Neighborhood Exploration for Dynamic Independent Sets. *Workshop on Algorithm Engineering and Experimentation (ALENEX), SIAM*. [paper] [arXiv] [code]
- **Ernestine Großmann**, Kenneth Langedal, Christian Schulz. Accelerating Reductions Using Graph Neural Networks for the Maximum Weight Independent Set Problem. *SIAM Conference on Applied and Computational Discrete Algorithms (ACDA)*. [paper] [arXiv] [code]
- **Ernestine Großmann**, Kenneth Langedal, Christian Schulz. Concurrent Iterated Local Search for the Maximum Weight Independent Set Problem. *Symposium on Experimental Algorithms (SEA)*. [paper] [arXiv] [code]
- **Ernestine Großmann**, Henrik Reinstädtler, Christian Schulz, Fabian Walliser. Engineering Fully Dynamic Exact Δ-Orientation Algorithms. *Workshop on Algorithm Engineering and Experimentation (ALENEX), SIAM*. [paper] [arXiv] [code]

2024

- Marcelo Fonseca Faraj, **Ernestine Großmann**, Felix Joos, Thomas Möller, Christian Schulz. Engineering Weighted Connectivity Augmentation Algorithms. *Symposium on Experimental Algorithms (SEA), Volume 301 of LIPIcs, pages 11:1–11:22*. [paper] [code]
- **Ernestine Großmann**, Sebastian Lamm, Christian Schulz, Darren Strash. Finding Near-Optimal Weight Independent Sets at Scale. *Journal of Graph Algorithms and Applications, 28(1):439–473 (journal version). Earlier in Proceedings of GECCO, pages 293–302, ACM, 2023*. [paper] [arXiv] [code (KaMIS)]

2022

- **Ernestine Großmann**, Tobias Heuer, Christian Schulz, Darren Strash. The PACE 2022 Parameterized Algorithms and Computational Experiments Challenge: Directed Feedback

Vertex Set. *17th International Symposium on Parameterized and Exact Computation (IPEC 2022), LIPIcs, Volume 249, pages 26:1–26:18*. [paper]

PREPRINTS

2024

- **Ernestine Großmann**, Kenneth Langedal, Christian Schulz. A Comprehensive Survey of Data Reduction Rules for the Maximum Weight Independent Set Problem. *Preprint, not yet published*. [arXiv]

TALKS

2025

- Accelerating Reductions Using Graph Neural Networks for the Maximum Weight Independent Set Problem. SIAM Conference on Applied and Computational Discrete Algorithms (ACDA), Montréal, Canada (Best-student-presentation finalist)

2024

- Engineering Weighted Connectivity Augmentation Algorithms. Symposium on Experimental Algorithms (SEA), Vienna, Austria
- Talk. Dagstuhl Seminar 24441 — Machine Learning Augmented Algorithms for Combinatorial Optimization Problems, Schloss Dagstuhl, Germany

2023

- Finding Near-Optimal Weight Independent Sets at Scale. Genetic and Evolutionary Computation Conference (GECCO), Lisbon, Portugal
- Talk. Dagstuhl Seminar 23491 — Scalable Graph Mining and Learning, Schloss Dagstuhl, Germany

RESEARCH PROJECTS

- **Maximum Weight Independent Sets** — Reductions, evolutionary search (KaMIS), concurrent local search (CHILS), GNN-accelerated and distributed kernelization at scale. [KaMIS] [CHILS] [LearnAndReduce] [KaDisRedu]
- **2-Packing Sets** — Scalable and maximum-weight algorithms for 2-packing sets on arbitrary graphs. [red2pack]
- **Weighted Connectivity Augmentation** — Engineering practical algorithms for the weighted connectivity augmentation problem. [HeiConnect]
- **Hypergraph b-Matching** — Heuristics and reduction rules for weighted hypergraph b-matching. [Bmatching]
- **Dynamic Independent Sets** — Optimal neighborhood exploration for independent sets under graph updates. [DynWMIS]

CO-SUPERVISED THESES

2026

- Supernova: From Cycles to Stars for Efficient Connectivity Augmentation. T. M. A. Cavalcanti, B.Sc.
- Engineering Local Search for the Maximum Independent Set Problem on Hypergraphs. P. Oehler, B.Sc.

2025

- Engineering Semi-Streaming Maximum Independent Set Algorithms. B. Vidic, M.Sc.
- Engineering Good Upper Bounds for the Maximum Weight Independent Set Problem. R. Heuberger, B.Sc.
- Distributed Kernelization Techniques for the Maximum Weight Independent Set Problem. J. Borowitz, M.Sc.
- Engineering Fast Maximum Flows to Speed Up Critical Weighted Independent Set Reductions. M. Everling, B.Sc.
- Combining Known Techniques to Solve the Dominating Set Problem in Practice. M. Dittes, B.Sc.
- Engineering Hypergraph Independent Set Algorithms. A. L. Wagner, B.Sc.
- Maximum Independent Set Algorithms on the GPU. E. Waldherr, B.Sc.

2024

- Finding 2-Packing Sets using Hypergraph Matching. T. L. Tran, B.Sc.
- Evolutionary Algorithm for the Weighted Connectivity Augmentation Problem. N.-N. Funk, B.Sc.
- Exploring Edge Orientation Algorithms in the Static and Dynamic Case. F. Walliser, B.Sc.
- Engineering Data Reduction and Expansion Rules for the Maximum Weight Independent Set Problem. K. Straube, M.Sc.

2023

- Engineering Weighted Connectivity Augmentation Algorithms. T. Möller, M.Sc.
- Edge Sparsification for Centrality Computation. M.-C. Litzinger, M.Sc.
- Engineering Heuristics and Reductions for Weighted Hypergraph b-Matching. H. Reinstädtler, M.Sc.

2022

- Arc-Flags for Public Transit Routing. P. Steil, B.Sc.
- Local Search with Optimal Neighborhood Exploration for the Maximum Weight Independent Set Problem. J. Borowitz, B.Sc.