

SOPHIA WREDE

PhD Student

Teaching and Research Area Combinatorial Optimization
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RESEARCH INTERESTS

- Combinatorial optimisation • Facility location problems • Customer preferences
- Computational complexity • Integer programming

ACADEMIC APPOINTMENTS

RWTH Aachen University, Germany

- Research Assistant (May 2019 – present).
- Supervisor: Prof. Dr. Christina Büsing.

EDUCATION

RWTH Aachen University, Germany.

- Master of Science in Mathematics (April 2019).
- Thesis: On the Price of Anarchy in Atomic Congestion Games under Player-Entrance-Probabilities.
- Advisor: Prof. Dr. Britta Peis, Dr. Marc Schröder

PUBLICATIONS AND PREPRINTS

6. **A combinatorial branch-and-bound algorithm for the capacitated facility location problem under strict customer preferences**
(joint with C. Büsing and F. Engelhardt).
Preprint (2025). [Preprint](#)
5. **Insights into the computational complexity of the single-source capacitated facility location problem with customer preferences**
(joint with C. Büsing and T. Gersing).
Submitted. [Preprint](#)
4. **Minimum-Peak-Cost Flows Over Time**
(joint with M. Anapolska, E. Ahrens, C. Büsing, F. Engelhardt, T. Gersing, C. Mathwieser, S. Schmitz).
Networks (2025). [Article](#)
3. **Cover-based inequalities for the single-source capacitated facility location problem with customer preferences**
(joint with C. Büsing and M. Leitner).
Computers & Operations Research (2025). [Article](#)

2. **Analysing the Complexity of Facility Location Problems with Capacities, Revenues, and Closest Assignments**
 (joint with C. Büsing and T. Gersing).
 INOC open proceedings (2022). [Article](#)
1. **Decision-support systems for ambulatory care, including pandemic requirements: using mathematically optimized solutions**
 (joint with N. Leithäuser, D. Adelhütte, K. Braun, C. Büsing, M. Comis, T. Gersing, S. Johann, A. MCA Koster, S. O. Krumke, F. Liers, E. Schmidt, J. Schneider, M. Streicher, S. Tschuppik).
 BMC Medical Informatics and Decision Making, 22 (132), 2022. [Article](#)

RESEARCH TALKS

12. *A combinatorial branch-and-bound algorithm for the single-source capacitated facility location problem with strict customer preferences.* EWGLA 2025, Universidad de Cádiz, September 2025.
11. *Valid inequalities for the capacitated facility location problem with customer preferences.* Gerhard-Woeginger Colloquium, RWTH Aachen University, May 2025.
10. *Cover-based inequalities for the capacitated facility location problem with customer preferences.* IWO-LOCA 2024, Universidad de Granada, September 2024.
9. *Valid inequalities for the capacitated facility location problem with customer preferences.* EURO 2024, Technical University of Denmark (DTU), Copenhagen, July 2024.
8. *Cover-based inequalities for the capacitated facility location problem with customer preferences.* EWGLA 2024, Sheffield University Management School, June 2024.
7. *Valid Inequalities and Preprocessing for the Capacitated Facility Location Problem with Preference Constraints.* OR 2023, University of Hamburg, August 2023.
6. *Valid Inequalities and Preprocessing for the Capacitated Facility Location Problem with Preference Constraints.* International Symposium on Locational Decisions (ISOLDE 2023), Rheinland-Pfälzische Technische Universität Kaiserslautern-Landau, Kaiserslautern/Baden-Baden, Germany. June 2023
5. *The Effects of Closest Assignment Constraints on the Complexity of Capacitated Facility Location Problems.* OR 2022, Karlsruhe Institute of Technology, Karlsruhe, Germany. September 2022
4. *Analysing the Complexity of Facility Location Problems with Capacities, Revenues, and Closest Assignments.* International Network Optimization Conference (INOC) 2022, RWTH Aachen University, Germany (online participation), June 2022.
3. *A Combinatorial View on Pharmacy Location Problems.* Future Research in Combinatorial Optimization (FRICO) 2021, TU München, September 2021.
2. *Pharmacy Location Problems: A Combinatorial View.* Centre for Computational Engineering Science (MathCCES) Seminar, RWTH Aachen University, Germany, July 2021.
1. *Pharmacy Location Problems: Model Proposition and Analysis.* European Conference on Operations Research (EURO) 2021, University Of West Attica, Athens (online participation), July 2021.

RESEARCH STAYS AND WORKSHOPS

4. *PhD School: Machine Learning and Optimization.* CWI Amsterdam, Amsterdam, The Netherlands, 2. – 4. September 2025.
3. *Summer School: Computational Optimization at Work (CO@Work2024).* TU Berlin in cooperation with the Berlin Mathematical School and with support of the Berlin Mathematics Research Center MATH+, Berlin, Germany, 16. – 27. September 2024.
2. *Department of Operations Analytics.* School of Business & Economics, Vrije Universiteit Amsterdam, Amsterdam, The Netherlands, November 2023, Host: Markus Leitner (3 days).
1. *Autumn School on Bilevel Optimization.* Universität Trier, Germany, October 2020, Organisation: Research Training Group on Algorithmic Optimization.

EXPERIENCE

RWTH Aachen University

Teaching

- Teaching Assistant, Seminar: *Exploring the Behaviour of Stakeholders in Facility Location Problems* (Summer Semester 2024)
- Teaching Assistant, *Algorithms and Datastructures* (Summer Semester 2024)
- Teaching Assistant, *Introduction to Business Mathematics* (Winter Semester 2022 – 2024).

Organisation

- Co-organisation of the evening event “Women Career Wine 2024” to discuss getting and doing a PhD with female master students (7 students)
- Organisation of the annual **CAMMP Week Pro** mathematical modelling retreat in summer semesters 2019 – 2022 (**approx. 40 students every year**)
- Organisation of the education lab **CAMMP** – Computational and Mathematical Modeling Program (Academic years 2019 – 2023, **led a team of approx. 10 student assistants every year**)

SUPERVISION EXPERIENCE

Graduate Thesis Co-supervision

- **Julian Berghaus:** **On capacitated facility location problems with strict preferences**, RWTH Aachen University, Currently running.
- **Tobias Bork:** **A Combinatorial Optimization Approach to Pruning Strategies in Product Portfolio Management**, RWTH Aachen University, 2024.

Undergraduate Thesis Co-supervision

- **Michael Kewa:** **Algorithms for Clique-Separation**, RWTH Aachen University, 2025.
- **Danje Petersen:** **Analyse von zwei polynomiellen Algorithmen für Facility Location Probleme auf Bäumen** (Analysis of two polynomial time algorithms for facility location problems on trees), RWTH Aachen University, 2024.

- Marvin Erler: **Heuristiken für die Verteilung von Notfallzentren in der medizinischen Versorgung**, RWTH Aachen University (Heuristics for the distribution of emergency centers), 2021.
- Johannes Rüben: **Apothekenstandortplanung mit Methoden der Ganzzahligen Linearen Optimierung** (Locating pharmacies through integer linear optimisation methods), RWTH Aachen University, 2021.

Additional

- Support at the math booth at RWTH Aachen's science night “[5 to 12](#)” in years 2019, 2022 – 2024.
- Tutor for the annual [CAMMP Week](#) mathematical modelling retreat for high-school students in summer semesters 2019, 2021 (RWTH Aachen University).

TRAVEL AWARDS

- [DAAD Kongressreisenprogramm](#) for attending the annual meeting of the “EURO Working Group on Location Analysis” (EWGLA) at the Universidad de Cádiz, Spain in September 2025.
- [Young Researcher Travel Grant](#) for attending the annual meeting of the “EURO Working Group on Location Analysis” (EWGLA) at the Sheffield University Management School, United Kingdom in June 2024.