

Curriculum Vitae of Manfred Scheucher

Dipl.-Ing. Dr.rer.nat. Manfred Scheucher, BSc BSc



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Main Area of Research

Discrete and Combinatorial Geometry
Extremal Combinatorics
Automated Reasoning
Stochastic Geometry

Education

- 2018 – 2019 **Technische Universität Berlin, Germany**, Doctoral Program in Mathematics.
Supervisor: Prof. Stefan Felsner
External reviewers: Prof. Günter Rote, Prof. Torsten Mütze, and Prof. Pavel Valtr
Topic: “Points, Lines, and Circles: Some Contributions to Combinatorial Geometry”
[\[doi:10.14279/depositonce-9542\]](https://doi.org/10.14279/depositonce-9542)
Scientific defense on August 15, 2019, passed with “very good” (sehr gut, magna cum laude)
- 2013 – 2015 **Graz University of Technology, Austria**, Master Program in Computer Science.
Supervisors: Prof. Oswin Aichholzer and Dr. Thomas Hackl
Topic: “Orthogeodesic Point Set Embeddings of Outerplanar Graphs”
Master’s examination on June 18, 2015, passed with distinction (mit Auszeichnung)
- 2011 – 2015 **Graz University of Technology, Austria**, Bachelor Program in Technical Mathematics.
Supervisors: Prof. Oswin Aichholzer and Dr. Thomas Hackl
Topic: “On Order Types, Projective Classes, and Realizations”
- 2009 – 2013 **Graz University of Technology, Austria**, Bachelor Program in Computer Science.
Supervisors: Prof. Oswin Aichholzer and Dr. Thomas Hackl
Topic: “Counting Convex 5-Holes”
- 2000 – 2008 **High School, Bundesrealgymnasium Leibnitz, Austria**, A-levels (Matura).
Matriculation examination on June 16, 2008, passed with merit (mit gutem Erfolg)

Fellowships, Awards, and Grants

- 2021 – 2024 **DFG Grant SCHE 2214/1-1 (Eigene Stelle, 3 Years)**, “Approaching Problems from Combinatorics and Geometry using Computer Assistance”, Deutsche Forschungsgemeinschaft, Germany.
- 2020 **Anschubfinanzierung (Post-Doc-Förderung – Eigene Stelle)**, Technische Universität Berlin, Germany.

- 2017 **Doctoral Fellowship (ÖAW DOC Stipendium, 2 Years)**, “*Holes in Point Sets and Cells in Arrangements*”, Austrian Academy of Sciences, Austria.
(each year there are only about 100 grantings of the DOC fellowship among all areas)
- 2014 **Scholarship for academic excellence in the academic year 2012/13 (Leistungsstipendium)**, Faculty of Computer Science and Biomedical Engineering, Graz University of Technology, Austria.

Professional Experience

- Since 2021 **Technische Universität Berlin, Germany**, Institut für Mathematik.
Principal investigator of the DFG project SCHE 2214/1-1 and research assistant of Prof. Stefan Felsner.
- 2020 – 2021 **FernUniversität in Hagen, Germany**, Fakultät für Mathematik und Informatik.
Research assistant
- 2018 – 2020 **Technische Universität Berlin, Germany**, Institut für Mathematik.
Research assistant of Prof. Stefan Felsner, supported by the DFG Grant FE 340/12-1 (D-A-CH collaborative project “Arrangements and Drawings”)
- 2018 – 2020 **Technische Universität Berlin, Germany**, Institut für Mathematik.
Research assistant of Prof. Stefan Felsner, supported by TU Berlin-interne Anschubfinanzierung (Post-Doc-Förderung – Eigene Stelle).
- 2017 – 2018 **TBK Automatisierung und Messtechnik GmbH, Graz, Austria**.
Software development and optimization for measurement systems for rolling and production processes.
- 2016 – 2017 **Hungarian Academy of Sciences, Budapest**, Alfréd Rényi Institute of Mathematics.
Research assistant of Prof. Imre Bárány, supported by the ERC Advanced Research Grant no. 267165 (DISCONV).
- 2015 – 2016 **Graz University of Technology, Austria**, Institute of Software Technology.
Research assistant of Prof. Dr. Oswin Aichholzer and Dr. Thomas Hackl, supported by the ESF EUROCORES programme EuroGIGA – CRP ComPoSe, Austrian Science Fund (FWF): I648-N18 and FWF project P23629-N18 ‘Combinatorial Problems on Geometric Graphs’.

Community Service (Zivildienst)

- 2008 – 2009 **Volkshilfe Steiermark**, Seniorenzentrum Wetzelsdorf, Graz, Austria.

Publications

16. **A SAT attack on higher dimensional Erdős–Szekeres numbers**
In Proc. of the European Conference on Combinatorics, Graph Theory and Applications, pages 103–110, TM 14, Springer, 2021. [[doi:10.1007/978-3-030-83823-2_17](https://doi.org/10.1007/978-3-030-83823-2_17)]
15. **Tight bounds on the expected number of holes in random point sets**
with Martin Balko and Pavel Valtr.
In Proc. of the European Conference on Combinatorics, Graph Theory and Applications, pages 411–416, TM 14, Springer, 2021. [[doi:10.1007/978-3-030-83823-2_64](https://doi.org/10.1007/978-3-030-83823-2_64)]
To appear in **Random Structures & Algorithms**, 2021+.
14. **Coloring Circle Arrangements: New 4-Vertex-Critical Planar Graphs**
with Man-Kwun Chiu, Stefan Felsner, Felix Schröder, Raphael Steiner, and Birgit Vogtenhuber.
In Proc. of the European Conference on Combinatorics, Graph Theory and Applications, pages 84–91, TM 14, Springer, 2021. [[doi:10.1007/978-3-030-83823-2_14](https://doi.org/10.1007/978-3-030-83823-2_14)]
13. **Topological Drawings meet Classical Theorems from Convex Geometry**
with Helena Bergold, Stefan Felsner, Felix Schröder, and Raphael Steiner.
In Proc. of 28th International Symposium on Graph Drawing and Network Visualization, pages 281–294, LNCS 12590, Springer, 2020. [[doi:10.1007/978-3-030-68766-3_22](https://doi.org/10.1007/978-3-030-68766-3_22)]

12. **Holes and islands in random point sets**
with Martin Balko and Pavel Valtr.
In Proc. of the 36th **International Symposium on Computational Geometry**, pages 14:1–14:16, LIPIcs 164, Dagstuhl, 2020. [[doi:10.4230/LIPIcs.SoCG.2020.14](https://doi.org/10.4230/LIPIcs.SoCG.2020.14)]
In **Random Structures & Algorithms**, 2021. [[doi:10.1002/rsa.21037](https://doi.org/10.1002/rsa.21037)]
11. **On the Average Complexity of the k -Level**
with Man-Kwun Chiu, Stefan Felsner, Patrick Schnider, Raphael Steiner, and Pavel Valtr.
In **Journal of Computational Geometry** 11(1), pages 493–506, 2020. [[doi:10.20382/jocg.v11i1a19](https://doi.org/10.20382/jocg.v11i1a19)]
10. **A Note On Universal Point Sets for Planar Graphs**
with Hendrik Schrezenmaier and Raphael Steiner.
In Proc. of 27th International Symposium on Graph Drawing and Network Visualization, pages 350–362, LNCS 11904, Springer, 2018. [[doi:10.1007/978-3-030-35802-0_27](https://doi.org/10.1007/978-3-030-35802-0_27)]
In **Journal of Graph Algorithms and Applications** 24(3), pages 171–190, 2020. [[doi:10.37236/8531](https://doi.org/10.37236/8531)]
9. **On orthogonal symmetric chain decompositions**
with Karl Däubel, Sven Jäger and Torsten Mütze.
In Proc. of the European Conference on Combinatorics, Graph Theory and Applications, Acta Mathematica Universitatis Comenianae 88(3), pages 611–618, 2019. [[url](#)]
In **Electronic Journal of Combinatorics** 26(3), Research paper P3.64, 32 pages, 2019. [[doi:10.37236/8531](https://doi.org/10.37236/8531)]
8. **Two Disjoint 5-Holes in Point Sets**
In Proc. of the European Conference on Combinatorics, Graph Theory and Applications, Acta Mathematica Universitatis Comenianae 88(3), pages 1049–1056, 2019. [[url](#)]
In **Computational Geometry: Theory and Applications** 91:101670, 2020.
[[doi:10.1016/j.comgeo.2020.101670](https://doi.org/10.1016/j.comgeo.2020.101670)]
7. **On L-shaped Point Set Embeddings of Trees: First Non-embeddable Examples**
with Torsten Mütze.
In Proc. of 26th International Symposium on Graph Drawing and Network Visualization, pages 354–360, LNCS 11282, Springer, 2018. [[doi:10.1007/978-3-030-04414-5_25](https://doi.org/10.1007/978-3-030-04414-5_25)]
In **Journal of Graph Algorithms and Applications** 24(3), pages 343–369, 2020. [[doi:10.7155/jgaa.00537](https://doi.org/10.7155/jgaa.00537)]
6. **Arrangements of Pseudocircles: On Circularizability**
with Stefan Felsner.
In Proc. of 26th International Symposium on Graph Drawing and Network Visualization, pages 555–568, LNCS 11282, Springer, 2018. [[doi:10.1007/978-3-030-04414-5_39](https://doi.org/10.1007/978-3-030-04414-5_39)]
In **Discrete & Computational Geometry** 64(3), 776–813, 2020. Ricky Pollack Memorial Issue.
[[doi:10.1007/s00454-019-00077-y](https://doi.org/10.1007/s00454-019-00077-y)]
5. **Minimal Geometric Graph Representations of Order Types**
with Oswin Aichholzer, Martin Balko, Michael Hoffmann, Jan Kynčl, Wolfgang Mulzer, Irene Parada, Alexander Pilz, Pavel Valtr, Birgit Vogtenhuber, and Emo Welzl.
In Proc. of 27th International Symposium on Graph Drawing and Network Visualization, pages 101–113, LNCS 11904, Springer, 2018. [[doi:10.1007/978-3-030-35802-0_8](https://doi.org/10.1007/978-3-030-35802-0_8)]
In **Journal of Graph Algorithms and Applications** 24(4), pages 551–572, 2020. Special issue on selected papers from GD 2019. [[doi:10.7155/jgaa.00545](https://doi.org/10.7155/jgaa.00545)]
4. **Almost-equidistant sets**
with Martin Balko, Attila Pór, Konrad Swanepoel, and Pavel Valtr.
In **Graphs and Combinatorics** 36, pages 729–754, 2020. [[doi:10.1007/s00373-020-02149-w](https://doi.org/10.1007/s00373-020-02149-w)]
3. **Arrangements of Pseudocircles: Triangles and Drawings**
with Stefan Felsner.
In Proc. of 25th International Symposium on Graph Drawing and Network Visualization, pages 127–139, LNCS 10692, Springer, 2017. [[doi:10.1007/978-3-319-73915-1_11](https://doi.org/10.1007/978-3-319-73915-1_11)]

In **Discrete & Computational Geometry** 65, pages 261–278, 2021.

[[doi:10.1007/s00454-020-00173-4](https://doi.org/10.1007/s00454-020-00173-4)]

2. **A superlinear lower bound on the number of 5-holes**

with Oswin Aichholzer, Martin Balko, Thomas Hackl, Jan Kynčl, Irene Parada, Pavel Valtr, and Birgit Vogtenhuber.

In Proc. of the 33rd **International Symposium on Computational Geometry**, pages 8:1–8:16, LIPIcs 77, Dagstuhl, 2017. [[doi:10.4230/LIPIcs.SoCG.2017.8](https://doi.org/10.4230/LIPIcs.SoCG.2017.8)]

In **Journal of Combinatorial Theory, Series A**, 173:105236, 2020. [[doi:10.1016/j.jcta.2020.105236](https://doi.org/10.1016/j.jcta.2020.105236)]

1. **Strongly Monotone Drawings of Planar Graphs**

with Stefan Felsner, Alexander Igamberdiev, Philipp Kindermann, Boris Klemz, and Tamara Mchedlidze.

In Proc. of the 32nd **International Symposium on Computational Geometry**, pages 37:1–37:15, LIPIcs 51, Dagstuhl, 2016. [[doi:10.4230/LIPIcs.SoCG.2016.37](https://doi.org/10.4230/LIPIcs.SoCG.2016.37)]

Preprints

- **A SAT attack on higher dimensional Erdős–Szekeres numbers**
Preprint available at [[arXiv:2105.08406](https://arxiv.org/abs/2105.08406)]
- **On Crossing-Families in Planar Point Sets**
with Oswin Aichholzer, Jan Kynčl, and Birgit Vogtenhuber.
Full version submitted. [[arXiv:2109.10705](https://arxiv.org/abs/2109.10705)].
- **Many Order Types on Integer Grids of Polynomial Size**
Full version submitted. [[arXiv:2007.15334](https://arxiv.org/abs/2007.15334)].
- **Topological Drawings meet Classical Theorems from Convex Geometry**
with Helena Bergold, Stefan Felsner, Felix Schröder, and Raphael Steiner.
Full version submitted. [[arXiv:2005.12568](https://arxiv.org/abs/2005.12568)].

Talks

- **Erdős–Szekeres-type Problems on Planar Point Sets**
2021.11.08: Facets of Complexity: Monday Lecture, Technische Universität Berlin
- **A SAT attack on higher dimensional Erdős–Szekeres numbers**
2021.09.10: European Conference on Combinatorics, Graph Theory and Applications, Online/Zoom
- **Tight bounds on the expected number of holes in random point sets**
2021.09.08: European Conference on Combinatorics, Graph Theory and Applications, Online/Zoom
- **On 4-Crossing-Families in Point Sets and an Asymptotic Upper Bound**
2021.04.08: 37th European Workshop on Computational Geometry, Online/Zoom
- **Many Order Types on Integer Grids of Polynomial Size**
2021.04.08: 37th European Workshop on Computational Geometry, Online/Zoom
- **Holes and islands in random point sets**
2020.06.25: 32nd International Symposium on Computational Geometry, Online/Zoom
2020.03.16: 36th European Workshop on Computational Geometry, Online/Zoom
- **Topological Drawings meet SAT Solvers and Classical Theorems of Convex Geometry**
2020.02.04: Mittagsemnar, Department of Computer Science, ETH Zürich
2020.01.09: Noon lectures, Department of Applied Mathematics, Charles University, Prague
2019.11.25: Facets of Complexity: Monday Colloquium, Freie Universität Berlin
- **A Note on Universal Point Sets for Planar Graphs**
2019.09.18: 27th International Symposium on Graph Drawing & Network Visualization, Charles University, Prague
- **Using SAT Solvers in Combinatorics and Geometry**
2021.04.09: Tutorial at 37th European Workshop on Computational Geometry, Online/Zoom
2020.01.21: Copenhagen-Jerusalem Combinatorics Seminar, Online/Zoom
2019.11.09: 38th Colloquium on Combinatorics, Paderborn University
2019.08.02: Midsummer Combinatorial Workshop XXIV, Charles University, Prague

- **On Disjoint Holes in Point Sets**
2019.08.28: European Conference on Combinatorics, Graph Theory and Applications, Bratislava
2019.03.20: 35th European Workshop on Computational Geometry, Utrecht
- **On L-shaped Point Set Embeddings of Trees: First Non-embeddable Examples**
2018.09.27: 26th International Symposium on Graph Drawing & Network Visualization, Universitat Politècnica de Catalunya, Barcelona
- **Almost-equidistant sets**
2018.04.05: 34th European Workshop on Computational Geometry, Freie Universität Berlin
- **Minimal Geometric Graph Representations of Order Types**
2018.04.05: 34th European Workshop on Computational Geometry, Freie Universität Berlin
- **Arrangements of Pseudocircles**
2019.07.01: Facets of Complexity: Monday Colloquium, Freie Universität Berlin
- **Arrangements of Pseudocircles: On Circularizability**
2018.12.12: HOMONOLO workshop, Bedřichov, Czech Republic
2018.11.23: 37th Colloquium on Combinatorics, Paderborn University
2018.09.28: 26th International Symposium on Graph Drawing & Network Visualization, Universitat Politècnica de Catalunya, Barcelona
2018.04.05: 34th European Workshop on Computational Geometry, Freie Universität Berlin
- **Arrangements of Pseudocircles: Triangles and Drawings**
2017.11.22: Noon lectures, Department of Applied Mathematics, Charles University, Prague.
2017.09.25: 25th International Symposium on Graph Drawing & Network Visualization, Northeastern University, Boston
2017.04.05: 33rd European Workshop on Computational Geometry, Malmö University
- **A superlinear lower bound on the number of 5-holes**
2017.04.05: 33rd European Workshop on Computational Geometry, Malmö University
2017.02.17: Institute Colloquium, Alfréd Rényi Institute of Mathematics, Budapest
- **Planar L-Shaped Point Set Embeddings of Trees**
2016.03.30: 32nd European Workshop on Computational Geometry, University of Lugano
2015.09.04: Geometric Graph Workshop 2015, Freie Universität Berlin

Teaching and Organizational Experience

- substitute lecturer for “Diskrete Geometrie 2”
- second examiner for written examination
- second reviewer of Diploma thesis
- exercise preparation and supervision of the course “Kombinatorische Optimierung”
- organization and supervision of various student seminars (one each semester)
- co-supervision of various Bachelor students, Master students, a DAAD student research project, and a student internship
- organization of the weekly Discrete Mathematics noon seminar
- member of a doctoral committee
- student assistant for the courses “Analysis T1” and “Diskrete Mathematik TE”

Peer Review Activities for Journals

Discrete & Computational Geometry,
 Discrete Applied Mathematics,
 Discrete Mathematics,
 Electronic Journal of Combinatorics,
 Computational Geometry: Theory and Applications,
 Journal of Geometry,
 Information Processing Letters,
 Periodica Mathematica Hungarica,
 Journal of Integer Sequences,
 Rocky Mountain Journal of Mathematics

Peer Review Activities for Conferences

ACM-SIAM Symposium on Discrete Algorithms,
Symposium on Computational Geometry,
European Conference on Combinatorics, Graph Theory and Applications,
Symposium on Graph Drawing and Network Visualization,
International Workshop on Graph-Theoretic Concepts in Computer Science,
European Workshop on Computational Geometry,
Canadian Conference on Computational Geometry,
Conference on Fun with Algorithms

Berlin, November 2021