Hubert Wagner–Academic Curriculum Vitae

CONTACT

Hubert Edward Wagner
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EXPERTISE

Computational geometry and topology, data science and machine learning, algorithms and algorithm engineering.

ACADEMIC POSITIONS

Assistant Professor in Data Science at the
University of Florida — 2021-now
Department of Mathematics.

Postdoctoral Research Fellow at the
Institute of Science and Technology Austria (ISTA) — 2015-2020
Host: Prof. H. Edelsbrunner
Algorithms, Computational Geometry and Topology group.

Visiting Researcher at the
Vienna University of Technology (TU Wien) — 2010-2011
Host: Prof. W. Kropatsch
Pattern Recognition and Image Processing Group.

EDUCATION

PhD in Mathematical Sciences — 2009-2014
Jagiellonian University, Krakow, Poland
Advisor: Prof. Marian Mrozek.

Master of Science, Computer Science (with honors) — 2004-2009
Jagiellonian University, Krakow, Poland

GRANTS and AWARDS

"Undergraduate Teacher of the Year"
Only 5 awarded out of 745 faculty in the College — 2024

"Algorithms for Topological Analysis of Neural Networks" (PI)
Google Research Scholar Award (only 5 awarded in Algorithms and Optimization) — 2022-2023

"Toward Computational Information Topology" (co-PI)
Office of Naval Research (ONR) grant. — 2017-2018

"Computational Homology for Massive Data Analysis" (co-PI)
Google Research Award grant. — 2011-2012

"Homology and cohomology algorithms with applications" (awardee)
Foundation of Polish Science, Full PhD Scholarship. — 2010-2014

Three papers in best papers selection at
the International Symposium on Computational Geometry (SoCG) — 2017-2021

Best paper runner-up award at TopoInVis (ETH Zurich) (main author). — 2011

PEER-REVIEWED PUBLICATIONS

My work was cited > 750 times, with h-index of 13 and i10-index of 16 (via google scholar).

1. Tuyen Pham, Hubert Wagner, "Computing Representatives of Persistent Homology Generators with a Double Twist", Canadian Conference on Computational Geometry (CCCG), 2023.
2. Hubert Wagner, "Slice, simplify and stitch: topology-preserving simplification scheme for massive voxel data", Symposium on Computational Geometry (SoCG), 2023.
3. Tuyen Pham, Hubert Wagner, "Kd-trees work with separable Bregman divergences", Young Researcher Symposium of SoCG, (presented by PhD student), 2023.
4. Fan Wang, Hubert Wagner and Chao Chen, "GPU Computation of the Euler Characteristic Curve for Imaging Data", Symposium on Computational Geometry (SoCG 2022), extended version accepted to **Journal of Computational Geometry** in 2023.
5. Songzhu Zheng, Yikai Zhang, Hubert Wagner, Mayank Goswami, Chao Chen, "Topological Detection of Trojaned Neural Networks", Advances in Neural Information Processing Systems 34 (NeurIPS), 2021.
6. P Pranav, R Adler, T Buchert, H Edelsbrunner, B JT Jones, A Schwartzman, H Wagner, R Van de Weygaert, "Unexpected Topology of the Temperature Fluctuations in the Cosmic Microwave Background", **Astronomy & Astrophysics**, 2019.
7. W Tian, H Wagner, H Edelsbrunner, J Liang, "Topological Characterization of High Dimensional Probability Landscapes and Their Dynamical Changes", IEEE-EMBS International Conference on Biomedical and Health Informatics, 2019.
8. H Edelsbrunner, Z Virk, H Wagner, "Topological Data Analysis in Information Space", Symposium on Computational Geometry (SoCG), best papers selection, **Journal of Computational Geometry**, 2020.
9. H Edelsbrunner, Z Virk, H Wagner, "Smallest Enclosing Spheres and Chernoff Points in Bregman Geometry", SoCG, 2018.
10. H Edelsbrunner, H Wagner, "Topological Data Analysis with Bregman Divergences", SoCG, best papers selection, **Journal of Computational Geometry**, 2017.
11. P Franek, M Krcal, H Wagner, "Solving equations and optimization problems with uncertainty", **Journal of Applied and Computational Topology**, 2017.
12. U Bauer, M Kerber, J Reininghaus, H Wagner, "PHAT: persistent homology algorithm toolbox", **Journal of Symbolic Computation**, 2017.
13. T Heiss, H Wagner, "Streaming Algorithm for Euler Characteristic Curves of Multidimensional Images", Conference on Computer Analysis of Images and Patterns (CAIP), 2017.
14. P Franek, M Krcal, H Wagner, "Robustness of zero sets: Implementation", European Workshop on Computational Geometry (EuroCG), 2016.
15. P Franek, M Krcal, H Wagner, "Zero Verification in Systems of Equations: Interval-based Implementation of a Topological Test.", Symposium on Scientific Computing, Computer Arithmetics and Verified Numerics (SCAN), 2016.
16. H Wagner, P. Dlotko, "Towards topological analysis of high-dimensional feature spaces", **Computer Vision and Image Understanding**, 2014.
17. P Dlotko, H Wagner, "Simplification of complexes of persistent homology computations", **Homology, Homotopy and Applications**, 2013.
18. H Wagner, P Dlotko, M Mrozek, "Computational topology in text mining", Computational Topology in Image Context (CTIC) workshop, 2012.
19. R Kudlacik, A Roman, H Wagner, "Effective synchronizing algorithms", **Expert Systems with Applications**, 2012.
20. D Gunther, J Reininghaus, H. Wagner, I. Hotz, "Efficient computation of 3D Morse–Smale complexes and persistent homology using discrete Morse theory", **The Visual Computer**, 2011.
21. D Gunther, J Reininghaus, H Wagner, I Hotz, "Memory-Efficient Computation of Persistent

Homology for 3D Images using Discrete Morse Theory", SIBGRAPI conference, 2011.

22. P Dlotko, W Kropatsch, H Wagner, "Characterizing obstacle-avoiding paths using cohomology theory", Conference on Computer Analysis of Images and Patterns (CAIP), 2011.
23. H Wagner, C Chen, E Vucini, "Efficient computation of persistent homology for cubical data", TopoInVis conference, 2011.
24. S Harker, K Mischaikow, M Mrozek, V Nanda, H Wagner, M Juda, P Dlotko, "The Efficiency of a Homology Algorithm based on Discrete Morse Theory and Coreductions", Computational Topology in Image Context (CTIC) workshop, 2010.

SELECTED TALKS

1. "Modern persistence computations", guest talk at the Computational Topology course at MSU, February 2024.
2. "Persistence computations for 3D images with billions of voxels", UF-FSU Geometry and Topology Meeting, Florida State University, November 2023.
3. "Slice, simplify and stitch: topology-preserving simplification scheme for massive voxel data", Symposium on Computational Geometry (SoCG), June 2023.
4. "Topology of... surprisal: or how to combine information theory with Vietoris-Rips filtrations", invited, Applied Algebraic Topology Research Network (AATRN): Vietoris-Rips seminar, invited, online, April 2023
5. "Is topology useful in solving real-world problems?", UF UMS, March 2023
6. "Data-analysis with topological fingerprints", UF GMA, March 2023
7. "Proofs, refutations... and topological computations", UF TDA conference, invited, keynote talk, February 2023
8. "Topology of imaging data", UF, SIAM + Applied and Numerical Analysis Seminar, February 2023
9. "Topology-preserving preprocessing of cubical filtrations", UF Topology-dynamics seminar, February 2023
10. "Topological Data Analysis in Non-Euclidean Spaces", AATRN, (online, invited), ($>$ 4800 views on youtube), 2022.
11. "GPU Computation of the Euler Characteristic Curve for Imaging Data", SoCG, (in-person, international conference), Berlin, June 2022.
12. "Capturing higher-order interactions using topological constructions", Computational Persistence Workshop, Purdue University (online, invited), 2021.
13. "Topological Data Analysis in Information Space", Symposium on Computational Geometry (SoCG), Portland, 2019 (contributed).
14. "Measuring Point-Clouds with Information-Theoretic Non-Distances", *Topology, Computation and Data Analysis* Dagstuhl Seminar, 2019 (invited).
15. "On data, information theory and topology", Workshop on Topology and Neuroscience, Ecole polytechnique federale de Lausanne (EPFL), 2019 (invited).
16. "Smallest Enclosing Spheres and Chernoff Points in Bregman Geometry", Symposium on Computational Geometry (SoCG), Budapest, 2018 (contributed).
17. "Topological Data Analysis with Bregman Divergences", Symposium on Computational Geometry (SoCG), Brisbane, 2017 (contributed).
18. "Computing persistent homology of images with(out) discrete Morse theory", *Topological Image Analysis: Methods, Algorithms, Applications* mini-symposium, SIAM Conference on Imaging Science, Bologna, 2017 (invited).
19. "Topological Analysis in Information Spaces", CATS, Sydney, 2017 (invited).
20. "Topological Analysis in Information Spaces", Applied and Computational Algebraic Topology program, Hausdorff Institute, Bonn, Germany, 2017 (invited).
21. "Algorithms for Topological Data Analysis with Bregman Divergences", ATMCS7, Torino, Italy 2016 (contributed)
22. "Topological Data Analysis", Mathematical Foundations of Learning, Alan Turing Institute, London, UK, 2016 (invited).
23. "Topological Data Analysis with Bregman Divergences", Accelerating Applied Topology, Aalborg, Denmark, 2016 (invited).

TEACHING

Lecture course: "Linear Algebra for Data Science", BSc level	2021-2023
Lecture course: "Computational Geometry and Topology", PhD level.	2016
Lab classes: "Design Patterns", "Generic Programming", MSc level.	2010/11
Lab classes: "Programming I, II", BSc level.	2009/10

EXPERIENCE in INDUSTRY

Google Poland, *Software Engineer, PhD Internship*	Spring 2014
Google Norway, *Software Engineer, Internship*	Summer 2008
Motorola Poland, *Software Developer*	2007-2008

OTHER SERVICES

- I served as a reviewer for: Journal of Applied and Computational Topology, Discrete and Computational Geometry (DCG) journal, Foundations of Computational Mathematics (FoCM) journal, Computational Geometry: Theory and Applications journal, International Symposium on Computational Geometry (SoCG), Symposium on Discrete Algorithms (SoDA), Journal of Mathematical Imaging and Vision, Journal of Machine Learning Research (JMLR), International Conference on Discrete Geometry for Computer Imagery (DGCI), Conference on Computer Vision and Pattern Recognition (CVPR), Pattern Recognition Letters (PRL), Entropy journal, and others.
- I served as a Program Committee member for: International Symposium on Computational Geometry (SoCG) in 2020, Annual Fall Workshop on Computational Geometry (2022).
- I co-organized the 7th Workshop on Geometry and Machine Learning at SoCG 2023 (with Jeff M. Phillips).
- I helped organize Applied Topology: Methods, Computation and Science (ATMCS8) conference at IST Austria, and a number of smaller events.
- I organized the weekly Geometry and Topology seminar at IST Austria (2015-2020).

REFERENCE LETTERS WRITERS

Prof. Marian Mrozek, Jagiellonian University, Krakow (PhD advisor)
Prof. Herbert Edelsbrunner, Institute of Science and Technology Austria (IST Austria), Vienna.
Prof. Chao Chen, Stony Brook University, NY.