Ulrich Bauer

TU München
Zentrum Mathematik
Boltzmannstraße 3
85747 Garching
✉ *mail@ulrich-bauer.org*
🖰 *ulrich-bauer.org*

Positions

since 11/2014 **Technische Universität München**, *assistant professor*, Applied Topology & Geometry.

3/2012–10/2014 **IST Austria**, *postdoctoral research fellow*, Applied Geometry & Topology.
Prof. Herbert Edelsbrunner

8/2008–2/2012 **Georg-August-Universität Göttingen**, *research assistant*, Discrete Differential Geometry lab, Institute of Numerical and Applied Mathematics.
Prof. Max Wardetzky

5/2006–7/2008 **Freie Universität Berlin**, *research assistant*, Mathematical Geometry Processing, Institute of Mathematics.
Prof. Konrad Polthier

11/2005–5/2007 **Self-employed**, *consulting and software development*, geometry processing.
Client: TubeExpert, Ltd.

10/2004–3/2005 **ETH Zürich**, *student assistant*, Combinatorial Structures and Algorithms, Institute of Theoretical Computer Science.
Prof. Angelika Steger

2/2001–9/2004 **Technische Universität München**, *student assistant*, Applied Software Engineering, Institute of Computer Science.
Prof. Bernd Brügge

Education

2011 **Dr. rer. nat (mathematics)**, *summa cum laude (with distinction)*, Georg-August-Universität Göttingen.
Thesis: *Persistence in discrete Morse theory*

2005 **Dipl.-Inf. Univ. (computer science, minor in mathematics)**, *mit Auszeichnung (with distinction)*, Technische Universität München.
Thesis: *Assignment problem with constraints*

Awards & honors

2013 **Best paper award**, *Clear and compress: Computing persistent homology in chunks*, Topological Methods in Data Analysis and Visualization, 2013.

2004 **Scholarship for diploma thesis at ETH Zürich**, DAAD.

2003   **Apple Design Award**, *Best Student Product*, Hydra (collaborative text editor; now called SubEthaEdit).

2003   **O'Reilly Mac OS X Innovators Award**, *International Category*, Hydra.

▬ Publications

Journals

[1] D. Attali, U. Bauer, O. Devillers, M. Glisse, and A. Lieutier. Homological reconstruction and simplification in $\mathbb{R}^3$. *Computational Geometry: Theory and Applications*, 2014. In press.

[2] U. Bauer, C. Lange, and M. Wardetzky. Optimal topological simplification of discrete functions on surfaces. *Discrete & Computational Geometry*, 47(2):347–377, 2012.

[3] U. Bauer, K. Polthier, and M. Wardetzky. Uniform convergence of discrete curvatures from nets of curvature lines. *Discrete & Computational Geometry*, 43(4):798–823, 2010.

[4] U. Bauer and K. Polthier. Generating parametric models of tubes from laser scans. *Computer-Aided Design*, 41(10):719–729, 2009.

Conferences

[5] U. Bauer, M. Kerber, J. Reininghaus, and H. Wagner. PHAT – persistent homology algorithms toolbox. In *Mathematical Software – ICMS 2014*. H. Hong and C. Yap, editors. Vol. 8592. In Lecture Notes in Computer Science. Springer Berlin Heidelberg, 2014, pp. 137–143.

[6] U. Bauer and H. Edelsbrunner. The Morse theory of Čech and Delaunay filtrations. In *Proceedings of the thirtieth annual symposium on Computational geometry (SoCG '14)*. ACM, 2014, pp. 484–490.

[7] U. Bauer and M. Lesnick. Induced matchings of barcodes and the algebraic stability of persistence. In *Proceedings of the thirtieth annual symposium on Computational geometry (SoCG '14)*. Invited to special issue of Journal of Computational Geometry. ACM, 2014, pp. 355–364.

[8] U. Bauer, X. Ge, and Y. Wang. Measuring distance between Reeb graphs. In *Proceedings of the thirtieth annual symposium on Computational geometry (SoCG '14)*. ACM, 2014, pp. 464–473.

[9] U. Bauer, M. Kerber, and J. Reininghaus. Distributed computation of persistent homology. In *Proceedings of the Sixteenth Workshop on Algorithm Engineering and Experiments (ALENEX'14)*. SIAM, 2014, pp. 31–38.

[10] D. Attali, U. Bauer, O. Devillers, M. Glisse, and A. Lieutier. Homological reconstruction and simplification in $\mathbb{R}^3$. In *Proceedings of the twenty-ninth annual symposium on Computational geometry (SoCG '13)*. ACM, 2013, pp. 117–126.

[11] U. Bauer, M. Kerber, and J. Reininghaus. Clear and compress: computing persistent homology in chunks. In *Topological Methods in Data Analysis and Visualization III (TopoInVis '13)*. Springer, 2014, pp. 103–117.

[12] U. Bauer, C. B. Schönlieb, and M. Wardetzky. Total Variation Meets Topological Persistence: A First Encounter. In T. E. Simos, G. Psihoyios, and Ch, editors. Vol. 1281. (1). AIP, 2010, pp. 1022–1026.

[13] U. Bauer, C. Lange, and M. Wardetzky. Persistence simplification of discrete Morse functions on surfaces. In *Discrete Differential Geometry*. A. I. Bobenko, R. Kenyon, J. M. Sullivan, and G. M. Ziegler, editors. Vol. 6. (1) in Oberwolfach reports, 2009, pp. 116–118.

[14] U. Bauer and K. Polthier. Detection of Planar Regions in Volume Data for Topology Optimization. In *Advances in Geometric Modeling and Processing (GMP '08)*, 2008, pp. 119–126.

[15] U. Bauer and K. Polthier. Parametric Reconstruction of Bent Tube Surfaces. In *2007 International Conference on Cyberworlds (CW'07)*. F. Wolter and A. Sourin, editors. IEEE Computer Society, 2007, pp. 465–474.

Preprints

[16] U. Bauer, A. Munk, H. Sieling, and M. Wardetzky. Persistent homology meets statistical inference – a case study: detecting modes of one-dimensional signals. Preprint, submitted to Foundations of Computational Mathematics. arXiv:1404.1214. 2014.

Theses

[17] U. Bauer. Persistence in discrete Morse theory. Dissertation. Georg-August-Universität Göttingen, 2011.

[18] U. Bauer. Assignment problem with constraints. Diplomarbeit. Technische Universität München, 2005.

Teaching

2014 spring	**Geometry & Topology**, *seminar*, IST Austria.
2013 fall	**Geometry & Topology**, *seminar*, IST Austria.
7/2013	**Persistent Homology**, *short course*, Summer School on Computational Topology and Topological Data Analysis, University of Ljubljana.
2013 spring	**Geometry & Topology**, *seminar*, IST Austria.
2013 spring	**Algorithms 2**, *recitation*, IST Austria.
2012 fall	**Geometry & Topology**, *seminar*, IST Austria.
2009 fall	**Differential Geometry I**, *tutorial*, Georg-August-Universität Göttingen.

Advised theses

2011	**Nikolai Deuschle**, *Persistenzpaarauslöschung für 3D-Daten*, Bachelor's thesis, Georg-August-Universität Göttingen.

Third-party funding

5/2006–4/2007	**TubeExpert Ltd.**, *Surface reconstruction of tubular shapes*, research cooperation, €45 000.

Open source software

2014	**DIPHA (Distributed Persistent Homology Algorithm)**	`dipha.googlecode.com`
2013	**PHAT (Persistent Homology Algorithm Toolbox)**	`phat.googlecode.com`

Reviewing

Journals

- Discrete & Computational Geometry (DCG)
- Computational Geometry: Theory and Applications (CGTA)
- Computer Aided Geometric Design (CAGD)
- Computer Aided Design (CAD)
- Applicable Algebra in Engineering, Communication and Computing (AAECC)
- Topological Methods in Nonlinear Analysis
- GAMM-Mitteilungen

Conferences

- ACM–SIAM Symposium on Discrete Algorithms (SODA)
- Symposium on Computational Geometry (SoCG)
- Symposium on Geometry Processing (SGP)
- European Symposium on Algorithms (ESA)
- Workshop on Topological Methods in Data Analysis and Visualization (TopoInVis)
- Conference of the European Association for Computer Graphics (EG)
- SIBGRAPI Conference on Graphics, Patterns and Images
- IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)
- IEEE International Conference on Robotics and Automation (ICRA)

Organizing

6/2013 **Workshop on Computational Topology and Data Analysis**, *ACM Symposium on Computational Geometry*, Rio de Janeiro, Brazil.
Co-organized with Tamal Dey and Jan Reininghaus

Outreach

3/2009 **Information day for prospective undergraduates**, *Georg-August-Universität Göttingen*, presenting research at the Institute of Numerical and Applied Mathematics.

6/2007 **Lange Nacht der Wissenschaften**, *Freie Universität Berlin*, presenting research in applied geometry to the general public.

Administrative duties

2009 **Member of search committee**, *full professor of applied mathematics*, Institute of Numerical and Applied Mathematics, Georg-August-Universität Göttingen.

Talks

18.11.2014	**The Morse theory of Čech and Delaunay filtrations**, *SBF colloquium Discretization in Geometry and Dynamics*, TU München.
9.9.2014	**The Morse theory of Čech and Delaunay filtrations**, *TopoSys project meeting*, IST Austria.
24.7.2014	**Induced matchings and the algebraic stability of persistence barcodes**, *Algebra and geometry seminar*, University of Bologna.
18.6.2014	**The Morse theory of Čech and Delaunay filtrations**, *Geometry seminar*, Technische Universität Wien.
11.6.2014	**The Morse theory of Čech and Delaunay filtrations**, *ACM Symposium on Computational Geometry 2014*, Kyoto.
13.1.2014	**The Morse theory of Čech and Delaunay filtrations**, Institute for Mathematics and its Applications, Minneapolis, MN.
9.1.2014	**The Morse theory of Čech and Delaunay filtrations**, *Topology, Geometry, and Data seminar*, Ohio State University, Columbus, OH.
5.1.2014	**Distributed computation of persistent homology**, *ALENEX14: SIAM Meeting on Algorithm Engineering and Experiments*, Portland, OR.
1.8.2013	**Computing persistent homology in chunks**, *SIAM Conference on Applied Algebraic Geometry*, Colorado State University, Fort Collins, CO.
26.7.2013	**Measuring distance between Reeb graphs**, *Carlsson–Guibas Seminar*, Stanford University.
18.6.2013	**Homological reconstruction and simplification in $\mathbb{R}^3$**, *ACM Symposium on Computational Geometry 2013*, Rio de Janeiro.
7.4.2013	**Homological reconstruction and simplification**, *EMS/DMF Joint Mathematical Weekend*, Aarhus.
2.7.2012	**Topological simplification problems**, *ATMCS 5*, IMCS, Edinburgh.
7.11.2011	**Topological simplification of functions on surfaces**, *Workshop on Computational Topology*, Fields Institute, Toronto.
28.6.2011	**Topological simplification of functions on surfaces**, *Media Research Lab*, Courant Institute for Mathematical Scieneces, NYU.
27.5.2011	**Persistenz in der diskreten Morse-Theorie**, *Research seminar Geometry & Visualization*, TU München.
14.4.2011	**Persistence in discrete Morse theory**, *IST Austria*, Klosterneuburg.
13.1.2011	**Topological denoising: Persistence meets total variation**, *Research seminar applied mathematics*, Universität Münster.
7.10.2009	**Topological simplification of discrete Morse functions on surfaces**, *Geometrica seminar*, INRIA Sophia-Antipolis.
11.6.2009	**Persistence simplification of discrete Morse functions on surfaces**, *Seminar Laboratoire Jean Kuntzmann*, Université Joseph Fourier, Grenoble.

15.1.2009	**Persistence simplification of discrete Morse functions on surfaces**, *Workshop on Discrete Differential Geometry*, Mathematisches Forschungsinstitut Oberwolfach.
28.6.2008	**Uniform convergence of discrete curvatures from nets of curvature lines**, *International conference on Mathematical methods for curves and surfaces*, Tønsberg.
23.4.2008	**Detection of Planar Regions in Volume Data for Topology Optimization**, *GMP 2008*, Hangzhou, China.
13.3.2008	**Parametric Reconstruction of Bent Tube Surfaces**, *Industry Challenges in Geometric Modeling, CAD and Simulation*, TU Darmstadt.
27.10.2007	**Parametric Reconstruction of Bent Tube Surfaces**, *NASAGEM Workshop*, Hannover.
21.5.2007	**Tube Reconstruction & Gate Stabbing**, *Colloquium Methods for Discrete Structures*, FU Berlin.

References

Primary references

Herbert Edelsbrunner
Institute of Science and Technology Austria
Am Campus 1
3400 Klosterneuburg, Österreich
Phone +43 (2243) 9000-3301
Fax: +43 (2243) 9000-2000
Mail: herbert.edelsbrunner@ist.ac.at

Max Wardetzky
Georg-August-Universität Göttingen
Institut für Numerische und Angewandte Mathematik
Lotzestr. 16-18
37083 Göttingen, Deutschland
Phone +49 (551) 39-22235
Fax: 49 (551) 39-3944
Mail: wardetzky@math.uni-goettingen.de

Tamal Dey
Ohio State University
Department of Computer Science and Engineering
2015 Neil Av.
Columbus, Ohio 43210, United States
Phone +1 (614) 292-3563
Fax: +1 (614) 292-2911
Mail: tamaldey@cse.ohio-state.edu

Further references

Vin de Silva
Pomona College
Department of Mathematics
333 N College Way
Claremont, California 91711, United States
Phone +1 (909) 607-8656
Mail: vin.desilva@pomona.edu

Dominique Attali
Grenoble Institute of Technology
Gipsa-lab UMR 5216
11 rue des Mathématiques
Grenoble Campus
BP46
38402 Saint Martin d'Hères Cedex, France
Phone +33 (476) 82 62 66
Mail: Dominique.Attali@gipsa-lab.inpg.fr

Yusu Wang
Ohio State University
Department of Computer Science and Engineering
487 Dreese Lab
2015 Neil Ave.
Columbus, Ohio 43210, United States
Phone +1 (614) 292-1309
Fax : +1 (614) 292-2911
Mail: yusu@cse.ohio-state.edu