

Hsien-Chih Chang

Curriculum Vitæ

Department of Computer Science
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Research Interests

Discrete and computational topology/geometry, with focus on low-dimensional objects like plane curves, polygons, and point sets. Graph theory and algorithms, usually from a structural or spectral perspective. More broadly, I am interested in connections between mathematics and theoretical computer science, especially in applying topological tools to understand complexities of computation.

Education

University of Illinois at Urbana-Champaign (Urbana-Champaign, IL, USA) 2012–2018
Ph.D. in Computer Science
Advisor: *Jeff Erickson*

National Taiwan University (Taipei, Taiwan) 2005–2010
B.Sc. in Computer Science and Information Engineering
Undergrad thesis advisor: *Hsueh-I Lu*

Employment

Postdoctoral research associate, Department of Computer Science Fall 2018–
Duke University

Research assistant, Department of Computer Science Fall 2016–Spring 2018
University of Illinois at Urbana-Champaign Spring 2015
Supervisor: *Jeff Erickson* Fall 2012–Spring 2013

Research assistant, Department of Computer Science Fall 2015–Spring 2016
University of Illinois at Urbana-Champaign
Supervisor: *Alexandra Kolla*

Teaching assistant, Department of Computer Science Fall 2013–Fall 2014
University of Illinois at Urbana-Champaign
Instructor: *Jeff Erickson*

Awards and Honors

Richard T. Cheng Endowed Fellowship 2012–2013

Publications

All the papers listed below can be found on <http://hchang17.web.engr.illinois.edu/papers>.
The coauthors are listed *alphabetically*.

Conference Publications

- [1] *Near-Optimal Distance Emulator for Planar Graphs*, with Paweł Gawrychowski, Shay Mozes, and Oren Weimann, to appear in the 26th Annual European Symposium on Algorithms (ESA'18).
- [2] *Tightening Curves on Surfaces via Local Moves*, with Jeff Erickson, David Letscher, Arnaud de Mesmay, Saul Schleimer, Eric Sedgwick, Dylan Thurston, and Stephan Tillmann, in Proceedings of the 29th Annual ACM-SIAM Symposium on Discrete Algorithms (SODA'18), pages 121–135, 2018.

- [3] *Unwinding Annular Curves and Electrically Reducing Planar Networks*, with Jeff Erickson, extended abstract appeared in Computational Geometry: Young Researchers Forum from the 33rd International Symposium on Computational Geometry (SoCG'17), 2017.
- [4] *Untangling Planar Curves*, with Jeff Erickson, in Proceedings of the 32nd International Symposium on Computational Geometry (SoCG'16), pages 29:1–29:16, 2016. Invited to the special issue of Discrete & Computational Geometry devoted to the conference. Won the *best student presentation award*.
- [5] *Detecting Weakly Simple Polygons*, with Jeff Erickson and Chao Xu, in Proceedings of the 26th Annual ACM-SIAM Symposium on Discrete Algorithms (SODA'15), pages 1655–1670, 2015.
- [6] *From Proximity to Utility: A Voronoi Partition of Pareto Optima*, with Sariel Har-Peled and Benjamin Raichel, in Proceedings of the 31st International Symposium on Computational Geometry (SoCG'15), pages 689–703, 2015.
- [7] *A Faster Algorithm to Recognize Even-Hole-Free Graphs*, with Hsueh-I Lu, in Proceedings of the 23rd Annual ACM-SIAM Symposium on Discrete Algorithms (SODA'12), pages 1286–1297, 2012.
- [8] *Computing the Girth of a Planar Graph in Linear Time*, with Hsueh-I Lu, in Proceedings of the 17th International Computing and Combinatorics Conference (COCOON'11), Lecture Notes in Computer Science 6842, pages 225–236, 2011.

Journal Publications

- [9] *Untangling Planar Curves*, with Jeff Erickson, Discrete & Computational Geometry, volume 58, issue 4, pages 889–920, 2017. Special issue of invited papers from the 32nd International Symposium on Computational Geometry (SoCG'16).
- [10] *From Proximity to Utility: A Voronoi Partition of Pareto Optima*, with Sariel Har-Peled and Benjamin Raichel, Discrete & Computational Geometry, volume 56, issue 3, pages 631–656, 2016. Conference version in the 31st International Symposium on Computational Geometry (SoCG'15).
- [11] *A Faster Algorithm to Recognize Even-Hole-Free Graphs*, with Hsueh-I Lu. Journal of Combinatorial Theory, Series B, volume 113, pages 141–161, 2015. Conference version in the 23rd Annual ACM-SIAM Symposium on Discrete Algorithms (SODA'12).
- [12] *Computing the Girth of a Planar Graph in Linear Time*, with Hsueh-I Lu, SIAM Journal on Computing 42(3), pages 1077–1094, 2013. Conference version in the 17th International Computing and Combinatorics Conference (COCOON'11).

Current Submissions and Manuscripts

- [13] *Tightening Curves on Surfaces: Better and Faster*, with Arnaud de Mesmay, in preparation, 2018.
- [14] *Spectral Aspects of Symmetric Matrix Signings*, with Charles Carlson, Karthik Chandrasekaran, Naonori Kakimura, and Alexandra Kolla, submitted, 2017.
- [15] *Lower Bounds for Planar Electrical Reduction*, with Jeff Erickson, submitted, 2017.
- [16] *Invertibility and Largest Eigenvalue of Symmetric Matrix Signings*, with Charles Carlson, Karthik Chandrasekaran, and Alexandra Kolla, preprint, 2016.
- [17] *Electrical Reduction, Homotopy Moves, and Defect*, with Jeff Erickson, preprint, 2015.
- [18] *Asymptotically Optimal Thickness Bounds of Generalized Bar Visibility Graphs*, with Hsueh-I Lu and Yen-Peng Sung, unpublished manuscript, 2009.

Invited Talks

- Discrete and Computational Topology: Planar Curves (and Beyond)* [2][9][15][17], Feb 2018
University of Colorado Boulder, Colorado, USA.
- On Local Crossing Numbers of Complete Graphs and Hypercubes,* Jan 2018
AMS Special Session on Beyond Planarity: Crossing Numbers of Graphs (a Mathematics Research Communities Session)", Joint Mathematics Meetings,
San Diego, California, USA.
- Discrete and Computational Topology: Untangling Planar Curves (and Beyond)* [2][9][15][17], Dec 2017
Theory Day in Taiwan (2017C),
Institute of Information Science, Academia Sinica, Taipei, Taiwan.
- Untangling Graphs and Curves on Surfaces via Local Moves* [9][15][17], Feb 2017
Dagstuhl Seminar 17072: "Applications of Topology to the Analysis of 1-Dimensional Objects",
Schloß Dagstuhl, Wadern, Germany.
- Untangling Curves on Surfaces via Local Moves* [9][15][17], Jan 2017
Saint Louis University, Missouri, USA.

Conference and Workshop Talks

- Tightening Curves on Surfaces via Local Moves* [2], Jan 2018
29th Annual ACM-SIAM Symposium on Discrete Algorithms (SODA'18),
New Orleans, Louisiana, USA.
- Unwinding Annular Curves and Electrically Reducing Planar Networks* [3], Jul 2017
Computational Geometry: Young Researchers Forum, 33rd International Symposium on Computational
Geometry (SoCG'17),
Brisbane, Australia.
- Untangling Planar Curves* [4], Jun 2016
32nd International Symposium on Computational Geometry (SoCG'16),
Boston, Massachusetts, USA.
Won the **best student presentation award**.
- From Proximity to Utility: A Voronoi Partition of Pareto Optima* [6], Jun 2015
31st International Symposium on Computational Geometry (SoCG'15),
Eindhoven, Netherlands.
- A Faster Algorithm to Recognize Even-Hole-Free Graphs* [7], Jan 2012
23rd Annual ACM-SIAM Symposium on Discrete Algorithms (SODA'12),
Kyoto, Japan.
- Computing the Girth of a Planar Graph in Linear Time* [8], Aug 2011
17th International Computing and Combinatorics Conference (COCOON'11),
Dallas, Texas, USA.

Teaching

Teaching Assistant

- "CS374": *Algorithms and Models of Computation*, teaching assistant. Fall 2014
Ranked as **excellent** by student evaluation.
- "CS374": *Algorithms and Models of Computation*, teaching assistant. Spring 2014
A pioneering course that was in development with less than 50 people. Later on the course launched successfully
at full scale with 400 students on average. Syllabus-wise it combines CS473 (Algorithms) and CS373 (Theory
of Computation) and is aiming at junior-level students.
- CS473: *Algorithms*, teaching assistant. Fall 2013
Ranked as **excellent** by student evaluation.

Mentoring

- Peer mentor* at the Sloan University Center of Exemplary Mentoring (UCEM) at Illinois. Fall 2017
Mentee: *Charles Carlson*
- Incoming Ph.D. student mentor* in theory & algorithms for Department of Computer Science Fall 2016
Mentee: *Ziwei Ji*

Services

Editorial Services

Cooperated editor and collector, Report from Dagstuhl Seminar 17072—Applications of Topology to the Analysis of 1-Dimensional Objects, Dagstuhl Seminar 17072: "Applications of Topology to the Analysis of 1-Dimensional Objects", Schloß Dagstuhl, Wadern, Germany.

External Reviewer for *International Symposium on Computational Geometry* (SOCG 2018); *ACM-SIAM Symposium on Discrete Algorithms* (SODA 2015, 2017, 2018); *International Symposium on Algorithms and Computation* (ISAAC 2017); *International Symposium on Graph Drawing & Network Visualization* (GD 2017, 2018); *Annual European Symposium on Algorithms* (ESA 2015, 2017); *International Colloquium on Automata, Languages, and Programming* (ICALP 2016–2018); *Annual IEEE Symposium on Foundations of Computer Science* (FOCS 2016); and *International Computing and Combinatorics Conference* (COCOON 2014).

Referee for *SIAM Journal on Computing* (SICOMP); *Journal of Discrete Algorithms* (JDA); *Discrete Mathematics and Theoretical Computer Science* (DMTCS); and *Algorithmica* (ALGO).

Departmental Services

- Interview stakeholder* for Computer Science Department Head hiring process Spring 2018
- Graduate student application reviewer* for Department of Computer Science Fall 2015
- Speaker* of CS Ph.D. orientation seminar on “CS Grad Student Panel” Fall 2015
- Speaker* of CS Graduate Student Seminar panel on “Preparing for Qualls” Fall 2014