

Kyle Jordan Fox

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Research Interests

Algorithms and data structures; geometric algorithms; combinatorial optimization; applications of geometry and optimization to topological data analysis, trajectory analysis, computer graphics, and robotics

Education

- 2008–2013 **Ph.D. in Computer Science**, University of Illinois at Urbana-Champaign, December 2013
Advisor: Jeff Erickson
Thesis: *Fast algorithms for surface embedded graphs via homology*
- 2008–2010 **M.S. in Computer Science**, University of Illinois at Urbana-Champaign, December 2010
Advisor: Jeff Erickson
Thesis: *Online scheduling on identical machines using SRPT*
- 2004–2008 **B.S. in Computer Science**, University of Illinois at Urbana-Champaign, May 2008
Graduated with highest honors

Employment

- 2014–present **Postdoctoral Associate**, Department of Computer Science, Duke University
- Spring 2014 **Postdoctoral Fellow**, Institute for Computational and Experimental Research in Mathematics, Brown University
- 2010, '11, '12 **Software Engineering Intern**, Google Inc. and Google Research
- 2009–2010 **Teaching Assistant**, Department of Computer Science, University of Illinois at Urbana-Champaign
- 2006–2009 **Developer**, University of Illinois Archives, University of Illinois at Urbana-Champaign

Awards and Honors

- Fall 2013 **Stutzke Dissertation Completion Fellowship**, University of Illinois at Urbana-Champaign
- April 2013 **C. W. Gear Outstanding Graduate Student Award**, Department of Computer Science, University of Illinois at Urbana-Champaign
- 2010–2013 **Department of Energy Office of Science Graduate Fellowship Award**, U.S. Department of Energy (one of 150 awarded out of 3200 applicants)
- December 2008 **Mellon Award for Technology Collaboration**, The Andrew W. Mellon Foundation (awarded to the University of Illinois at Urbana-Champaign Library for our work on Archon, The Simple Archival Information System)
- 2008–2009 **Andrew and Shana Laursen Fellowship**, Department of Computer Science, University of Illinois at Urbana-Champaign

- April 2008 **C. W. Gear Outstanding Undergraduate Award**, Department of Computer Science, University of Illinois at Urbana-Champaign
- November 2007 **Automatic Ph.D. Acceptance Award**, Department of Computer Science, University of Illinois at Urbana-Champaign
- April 2007 **Daniel L. Slotnick Scholarship**, Department of Computer Science, University of Illinois at Urbana-Champaign
- 2004–2008 **Chancellor’s Scholar**, University of Illinois at Urbana-Champaign
- 2004–2008 **James Scholar**, University of Illinois at Urbana-Champaign

Publications

Paper authorship is in alphabetical order when author list begins as ‘With’.

Each conference or journal paper is listed once, even if it has appeared in multiple versions.

Journal and Conference Papers

- [1] Minimum cycle and homology bases of surface embedded graphs. With Glencora Borradaile, Erin Wolf Chambers, and Amir Nayyeri. *Journal of Computational Geometry*, 8(2):58–79, 2017, special issue of invited papers from the 32nd International Symposium on Computational Geometry. *Proceedings of the 32nd International Symposium on Computational Geometry (SoCG)*, 23:1–23:15, 2016.
- [2] Faster algorithms for the geometric transportation problem. With Pankaj K. Agarwal, Debmalya Panigrahi, Kasturi R. Varadarajan, and Allen Xiao. *Proceedings of the 33rd International Symposium on Computational Geometry (SoCG)*, 2017, to appear.
- [3] A simple efficient approximation algorithm for dynamic time warping. Rex Ying, Jiangwei Pan, **Kyle Fox**, and Pankaj K. Agarwal. *Proceedings of the 24th ACM SIGSPATIAL International Conference on Advances in Geographic Information Systems (ACM SIGSPATIAL)*, Article No. 21, 2016.
- [4] Massively parallel algorithms for computing TIN DEMs and contour trees for large terrains. Abhinandan Nath, **Kyle Fox**, Pankaj K. Agarwal, and Kamesh Munagala. *Proceedings of the 24th ACM SIGSPATIAL International Conference on Advances in Geographic Information Systems (ACM SIGSPATIAL)*, Article No. 25, 2016.
- [5] Integrating and sampling cuts in bounded treewidth graphs. With Ivona Bezáková and Erin W. Chambers. *Advances in the Mathematical Sciences: Research from the 2015 Association for Women in Mathematics Symposium*, 401–415, 2016.
- [6] Parallel algorithms for constructing range and nearest-neighbor searching data structures. With Pankaj K. Agarwal, Kamesh Munagala, and Abhinandan Nath. *Proceedings of the 35th Annual Symposium on Principles of Database Systems (PODS)*, 429–440, 2016.
- [7] Approximating dynamic time warping and edit distance for a pair of point sequences. With Pankaj K. Agarwal, Jiangwei Pan, and Rex Ying. *Proceedings of the 32nd International Symposium on Computational Geometry (SoCG)*, 6:1–6:16, 2016.
- [8] An efficient algorithm for computing high quality paths amid polygonal obstacles. With Pankaj K. Agarwal and Oren Salzman. *Proceedings of the 27th ACM-SIAM Symposium on Discrete Algorithms (SODA)*, 1179–1192, 2016.
- [9] Computing the Gromov-Hausdorff distance for metric trees. With Pankaj K. Agarwal, Abhinandan Nath, Anastasios Sidiropoulos, and Yusu Wang. *Proceedings of the 26th International Symposium on Algorithms and Computation (ISAAC)*, 529–540, 2015.
- [10] A polynomial-time bicriteria approximation scheme for planar bisection. With Philip N. Klein and Shay Mozes. *Proceedings of the 47th Annual ACM Symposium on Theory of Computing (STOC)*, 841–850, 2015.

- [11] Counting and sampling minimum cuts in genus g graphs. With Erin W. Chambers and Amir Nayyeri. *Discrete & Computational Geometry*, 52(3):450–475, 2014, special issue of invited papers from the 29th Annual Symposium on Computational Geometry. *Proceedings of the 29th Annual Symposium on Computational Geometry (SoCG)*, 249–258, 2013.
- [12] Spanning paths in Fibonacci-sum graphs. With William B. Kinnersley, Daniel McDonald, Nathan Orlow, and Gregory J. Puleo. *The Fibonacci Quarterly*, 52(1):46–49, 2014.
- [13] Packet forwarding algorithms in a line network. With Antonios Antoniadis, Neal Barcelo, Daniel Cole, Benjamin Moseley, Michael Nugent, and Kirk Pruhs. *Proceedings of the 11th Annual Latin American Theoretical Informatics (LATIN)*, 610–621, 2014.
- [14] Online non-clairvoyant scheduling to simultaneously minimize all convex functions. With Sungjin Im, Janardhan Kulkarni, and Benjamin Moseley. *Proceedings of the International Workshop on Approximation Algorithms for Combinatorial Optimization Problems (APPROX)*, 142–157, 2013.
- [15] Weighted flowtime on capacitated machines. With Madhukar Korupolu. *Proceedings of the 24th Annual ACM-SIAM Symposium on Discrete Algorithms (SODA)*, 129–143, 2013.
- [16] Shortest non-trivial cycles in directed and undirected surface graphs. *Proceedings of the 24th Annual ACM-SIAM Symposium on Discrete Algorithms (SODA)*, 352–364, 2013.
- [17] Energy efficient scheduling of parallelizable jobs. With Sungjin Im and Benjamin Moseley. *Proceedings of the 24th Annual ACM-SIAM Symposium on Discrete Algorithms (SODA)*, 948–957, 2013.
- [18] Global minimum cuts in surface embedded graphs. With Jeff Erickson and Amir Nayyeri. *Proceedings of the 23rd Annual ACM-SIAM Symposium on Discrete Algorithms (SODA)*, 1309–1318, 2012.
- [19] Upper bounds for maximally greedy binary search trees. *Proceedings of the Algorithms and Data Structures Symposium (WADS)*, 411–422, 2011.
- [20] Online scheduling on identical machines using SRPT. *Proceedings of the 22nd Annual ACM-SIAM Symposium on Discrete Algorithms (SODA)*, 120–128, 2011.
Revised as my Masters thesis for the Department of Computer Science, University of Illinois at Urbana-Champaign.
- [21] Scott Schwartz, Chris Prom, **Kyle Fox**, Paul Sorensen. Archon: facilitating global access to collections in small archives. *Proceedings of the 14th Annual IFLA General Conference and Council (WLIC)*, 2008.
- [22] Chris Prom, Chris Rishel, Scott Schwartz, **Kyle Fox**. A unified platform for archival description and access. *Proceedings of the ACM/IEEE Joint Conference on Digital Libraries (JCDL)*, 157-166, 2007.
- [23] Scott Schwartz, Chris Prom, Chris Rishel, **Kyle Fox**. Archon: a unified information storage and retrieval system for lone archivists, special collections librarians and curators. *Partnership: The Canadian Journal of Library and Information Practice and Research*, 1-17, 2007.

Current Submissions, Preprints, and Works in Progress

- [24] Approximation algorithms for subtrajectory clustering. With Pankaj K. Agarwal, Kamesh Munagala, Abhinandan Nath, and Jiangwei Pan. Unpublished manuscript.
- [25] Maintaining Reeb graphs of time varying height functions over 2-manifolds. With Pankaj K. Agarwal and Abhinandan Nath. Unpublished manuscript.

Other Publications

- [26] Global minimum cuts in surface-embedded graphs. With Erin W. Chambers, Jeff Erickson, and Amir Nayyeri. Ming-Yang Kao, editor, *Encyclopedia of Algorithms*, 852–856, Springer New York, 2016.

- [27] *Fast Algorithms for Surface Embedded Graphs via Homology*. Ph.D. dissertation, Department of Computer Science, University of Illinois at Urbana-Champaign, December 2013.
- [28] Collector for Glencora Borradaile, Philip N. Klein, Dániel Marx, and Claire Mathieu. Algorithms for Optimization Problems in Planar Graphs (Dagstuhl Seminar 13421). *Dagstuhl Reports* 3(10):36–57, 2013.
- [29] Faster shortest non-contractible cycles in directed surface graphs. *Computational Geometry: Young Researcher Forum*, 35-36, 2012.

Invited Talks

- 2017 “Faster algorithms for the geometric transportation problem” [2]; Schloß Dagstuhl, Wadern, Germany.
 “Algorithms for geometric data analysis” [7, 3, 2]; Colorado State University; New Jersey Institute of Technology; Texas A&M University; University of Minnesota; The University of Texas at Dallas; Virginia Tech.
- 2016 “A polynomial-time bicriteria approximation scheme for planar bisection” [10]; Schloß Dagstuhl, Wadern, Germany.
 “Geometry and topology meet graph algorithms” [7, 10]; College of William and Mary; Duke University; Purdue University; University of California, Merced; University of Louisiana at Lafayette; Yahoo Labs.
- 2015 “An efficient algorithm for computing high-quality paths amid polygonal obstacles” [8]; Duke University.
 “Partition problems and exploiting graph structure” [10, 11]; Rochester Institute of Technology.
- 2014 “Minimum cuts in surface embedded graphs” [18, 11]; Duke University; Institute for Computational and Experimental Research in Mathematics, Brown University; Massachusetts Institute of Technology; The Ohio State University.
 “Extending classical scheduling models with a focus on modern technologies” [15, 17]; Google Inc.
 “On maximum s, t -flow in surface embedded graphs” [27]; Oregon State University.
- 2012 “Computing shortest non-trivial cycles in directed surface graphs” [16]; Washington University in St. Louis.

Teaching

Research Mentoring at Duke University

- 2016–present Fred Zhang—currently a junior at Duke University
 2015–2016 Rex Ying—currently a Ph.D. student at Stanford University

Guest Lectures at Duke University

- Spring 2017 COMPSCI 290: Undergrad Topics in Computer Science (Algorithmic Foundations of Data Science) (twice)
 Spring 2016 COMPSCI 330: Undergrad Design and Analysis of Algorithms
 Fall 2015 COMPSCI 330: Undergrad Design and Analysis of Algorithms
 Spring 2015 COMPSCI 290: Undergrad Topics in Computer Science (Complexity Theory) (twice)
 Fall 2014 COMPSCI 330: Undergrad Design and Analysis of Algorithms
 Fall 2014 COMPSCI 532: Graduate Design and Analysis of Algorithms

Guest Lecture at Brown University

Spring 2014 CS 250: Optimization Algorithms for Planar Graphs

Instruction for the Illini Swing Society

Spring 2013 Balboa

Fall 2012 Beginning Swing

Spring 2012 Beginning Lindy Hop

Fall 2011 Charleston

Spring 2011 Beginning Swing

Guest Lecture at the University of Illinois at Urbana-Champaign

Spring 2010 CS 473: Undergraduate Algorithms

Teaching Assistant at the University of Illinois at Urbana-Champaign

Spring 2010 CS 473: Undergraduate Algorithms

Fall 2009 CS 473: Undergraduate Algorithms

Reviewing and Refereeing

- Referee for *ACM Transactions on Algorithms*; *Ars Combinatoria*; *Information Processing Letters*; *Journal of Combinatorial Optimization*; *Journal of Computational Geometry*; *Journal of Scheduling*; *SIAM Journal on Discrete Mathematics*; *Theoretical Computer Science*
- External reviewer for ACM-SIAM Symposium on Discrete Algorithms [SODA] (2013–2017); ACM SIGSPATIAL International Conference on Advances in Geographic Information Systems [ACM SIGSPATIAL] (2015–2016); ACM Symposium on Theory of Computing [STOC] (2016–2017); Algorithms and Data Structures Symposium [WADS] (2013, 2017); Annual Symposium on Principles of Database Systems [PODS] (2016); European Symposium on Algorithms [ESA] (2013, 2016); IARCS Annual Conference on Foundations of Software Technology and Theoretical Computer Science [FSTTCS] (2015); IEEE Symposium on Foundations of Computer Science [FOCS] (2014–2015); IFIP International Conference on Topics in Theoretical Computer Science [TTCS] (2015); International Colloquium on Automata, Languages, and Programming [ICALP] (2017); International Symposium on Graph Drawing [GD] (2014); International Workshop on the Algorithmic Foundations of Robotics [WAFR] (2016); and Symposium on Computational Geometry [SoCG] (2014–2016)

University Service

Duke University

2016 Coordinator for Algorithms Seminar Lecture Series

2015 Assisted in organizing Algorithms Seminar Lecture Series

Graduate

2012–2013 Computer Science Grad Study Committee Grad Council Representative

2011–2013 Webmaster for the Illini Swing Society

2010–2013 Voluntarily read graduate student applications for the Department of Computer Science Fellowship, Assistantship, and Admissions Committee

2010–2013 Computer Science Graduate Student Academic Council Member

2010–2011 Computer Science Grad Study Committee Grad Council Representative

2010 Leader for the Computer Science TA Career Path Workshop Group

2009–2010 Secretary of the Computer Science Graduate Student Organization

Undergraduate

2006–2008 Tour Manager for the Varsity Men's Glee Club

2005–2006 Webmaster for the Varsity Men's Glee Club

Programming

Proficient in C, C++, Java, Python, HTML, PHP, L^AT_EX
Familiar with Matlab, SQL, and Bash