

Seshadhri Comandur (C. Seshadhri)

Associate Professor, University of California, Santa Cruz

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Research Interests

Randomized Algorithms, Algorithms and Theoretical Foundations for Massive Data, Social Network Analysis

Teaching Interests

Theoretical Computer Science, Foundations of Data Science

Work experience

2018- Associate Professor, University of California, Santa Cruz
2015-2018 Assistant Professor, University of California, Santa Cruz
2014-2015 Principal Member of Technical Staff, Sandia National Laboratories, Livermore
2010-2014 Senior Member of Technical Staff, Sandia National Laboratories, Livermore
2008-2010 Postdoctoral Fellow, Principles and Methodologies Group, IBM Almaden
2007 Summer Intern, Principles and Methodologies Group, IBM Almaden
2002 Summer Intern, Tata Institute of Fundamental Research, Bombay, India

Education

2003-2008 PH.D in Computer Science, Princeton University
Advisor: Bernard Chazelle
GPA: 3.8/4
Thesis title: Sublinear Reconstruction Algorithms

1999-2003 B.TECH in Computer Science and Engineering, Indian Institute of Technology, Kanpur
GPA: 9.8/10

Honors & awards

- 2017 Co-author of *Best Paper* at the 2017 World Wide Web Conference (WWW)
- 2015 Co-author of *Best Paper* at the 2015 IEEE International Conference on Data Mining (ICDM)
- 2013 Co-author of *Best Student Paper* at the 2013 ACM SIGKDD Conference on Knowledge Discovery and Data Mining (KDD)
- 2013 Co-author of *Best Research Paper* at the 2013 SIAM Conference on Data Mining (SDM)
- 2013 *Employee Recognition Award* for Individual Technical Excellence (Awarded yearly to less than 100 employees)
- 2003 *Director's Gold Medal* in the IIT Kanpur class of 2003
Awarded one per class of 450 students to the best all-round student
- 1997 Scholarship in National Talent Search Examination (NTSE) 1997

Grants

- 2016-2017 University sub-contract on Sandia National Laboratory Directed R&D: *Accurate Characterization Of Real Networks from Inaccurate Measurements*, \$160,000
- 2010-2012 PI on Sandia National Labs Early Career R&D: *Sublinear Algorithms For Massive Data Sets*, Amount undisclosed

Conference Publications

- 2017 Roksana Baleshzar, Deeparnab Chakrabarty, Ramesh Krishnan S. Pallavoor, Sofya Raskhodnikova, and C. Seshadhri. Optimal unateness testers for real-valued functions: Adaptivity helps. In *International Colloquium on Automata, Languages and Programming (ICALP)*, 2017.
- 2017 Talya Eden, Dana Ron, and C. Seshadhri. Sublinear time estimation of degree distribution moments: The degeneracy connection. In *International Colloquium on Automata, Languages and Programming (ICALP)*, 2017.
- 2017 S. Jain and C. Seshadhri. A fast and provable method for estimating clique counts using Turán's theorem. In *World Wide Web (WWW)*, 2017.
- 2017 A. Pinar, C. Seshadhri, and V. Vishal. Escape: Efficiently counting all 5-vertex subgraphs. In *World Wide Web (WWW)*, 2017.
- 2017 A. Sharma, C. Seshadhri, and A. Goel. When hashes met wedges: A distributed algorithm for finding high similarity vectors. In *World Wide Web (WWW)*, 2017.
- 2017 T. Naumovitz, M. Saks, and C. Seshadhri. Accurate and nearly optimal sublinear approximations to ulam distance. In *Symposium on Discrete Algorithms (SODA)*, 2017.
- 2016 B. Raichel and C. Seshadhri. A mountaintop view requires minimal sorting: A faster contour tree algorithm. In *Symposium on Computational Geometry (SoCG)*, 2016.
- 2015 T. Eden, A. Levi, D. Ron, and C. Seshadhri. Approximately counting triangles in sublinear time. In *Foundations of Computer Science (FOCS)*, 2015.
- 2015 O. Simpson, C. Seshadhri, and A. McGregor. Catching the head, the tail, and everything in between: a streaming algorithm for the degree distribution. In *International Conference on Data Mining (ICDM)*, 2015.

- 2015 G. Ballard, T. G. Kolda, A. Pinar, and C. Seshadhri. Diamond sampling for approximate maximum all-pairs dot-product (mad) search. In *International Conference on Data Mining (ICDM)*, 2015.
- 2015 M. Jha, C. Seshadhri, and A. Pinar. Path sampling: A fast and provable method for estimating 4-vertex subgraph counts. In *World Wide Web (WWW)*, 2015.
- 2015 A. Erdem Sariyuce, C. Seshadhri, A. Pinar, and U. Catalyurek. Finding the hierarchy of dense subgraphs using nucleus decompositions. In *World Wide Web (WWW)*, 2015.
- 2015 Deeparnab Chakrabarty, Kashyap Dixit, Madhav Jha, and C. Seshadhri. Property testing on product distributions: Optimal testers for bounded derivative properties. In *Proceedings of the Symposium on Discrete Algorithms (SODA)*, 2015.
- 2014 P. Lofgren, S. Banerjee, A. Goel, and C. Seshadhri. Fast-ppr: Scaling personalized pagerank estimation for large graphs. In *Knowledge Discovery and Data Mining (KDD)*, 2014.
- 2014 J. Berry, L. Fostvedt, D. Nordman, C. Phillips, C. Seshadhri, and A. Wilson. Why do simple algorithms for triangle enumeration work in the real world? In *Innovations in Theoretical Computer Science (ITCS)*, 2014.
- 2014 R. Gupta, T. Roughgarden, and C. Seshadhri. Decompositions of triangle-dense graphs. In *Innovations in Theoretical Computer Science (ITCS)*, 2014.
- 2013 D. Thompson, J. C. Bennett, C. Seshadhri, and A. Pinar. A provably-robust sampling method for generating colormaps of large data. In *Large-Scale Data Analysis and Visualization (LDAV)*, 2013.
- 2013 M. Jha, C. Seshadhri, and A. Pinar. A space efficient streaming algorithm for triangle counting using the birthday paradox. In *Knowledge Discovery and Data Mining (KDD)*, 2013.
- 2013 D. Chakrabarty and C. Seshadhri. An optimal lower bound for monotonicity testing over hypergrids. In *International Workshop on Randomization and Computation (RANDOM)*, 2013.
- 2013 D. Chakrabarty and C. Seshadhri. An $o(n)$ monotonicity tester for boolean functions over the hypercube. In *Symposium on Theory of Computing (STOC)*, 2013.
- 2013 D. Chakrabarty and C. Seshadhri. Optimal bounds for monotonicity and Lipschitz testing over hypercubes and hypergrids. In *Symposium on Theory of Computing (STOC)*, 2013.
- 2013 C. Seshadhri, A. Pinar, and T. G. Kolda. Triadic measures on graphs: The power of wedge sampling. In *SIAM Conference on Data Mining (SDM)*, 2013.
- 2013 N. Durak, T. G. Kolda, A. Pinar, and C. Seshadhri. A scalable directed graph model with reciprocal edges. In *IEEE Workshop on Network Science*, 2013.
- 2013 M. Saks and C. Seshadhri. Space efficient streaming algorithms for the distance to monotonicity and asymmetric edit distance. In *Symposium on Discrete Algorithms (SODA)*, 2013.
- 2012 D. Gleich and C. Seshadhri. Vertex neighborhoods, low conductance cuts, and good seeds for local community methods. In *Knowledge Discovery and Data Mining (KDD)*, 2012.
- 2012 K. Clarkson, W. Mulzer, and C. Seshadhri. Self-improving algorithms for coordinate-wise maxima. In *Symposium on Computational Geometry (SoCG)*, 2012.
- 2012 N. Durak, A. Pinar, T. G. Kolda, and C. Seshadhri. Degree relations of triangles in real-world networks and graph models. In *Conference on Information and Knowledge Management (CIKM)*, 2012.
- 2012 J. Ray, A. Pinar, and C. Seshadhri. Are we there yet? When to stop a Markov chain while generating random graphs. In *Workshop on Algorithms and Models for the Web Graph (WAW)*, 2012.

- 2012 A. Pinar, C. Seshadhri, and T. G. Kolda. The similarity between Stochastic Kronecker and Chung-Lu graph models. In *SIAM Conference on Data Mining (SDM)*, 2012.
- 2011 C. Seshadhri, A. Pinar, and T. G. Kolda. An in-depth analysis of Stochastic Kronecker graphs. In *International Conference on Data Mining (ICDM)*, 2011.
- 2011 N. Saxena and C. Seshadhri. Blackbox identity testing for bounded top fanin depth-3 circuits: the field doesn't matter. In *Symposium on Theory of Computing (STOC)*, 2011.
- 2011 Satyen Kale and C. Seshadhri. Combinatorial approximation algorithms for maxcut using random walks. In *Innovations in Computer Science (ICS)*, 2011.
- 2011 C. Seshadhri and J. Vondrak. Is submodularity testable? In *Innovations in Computer Science (ICS)*, 2011.
- 2010 N. Saxena and C. Seshadhri. From Sylvester-Gallai configurations to rank bounds: Improved black-box identity test for depth-3 circuits. In *Foundations of Computer Science (FOCS)*, 2010.
- 2010 K. Clarkson, W. Mulzer, and C. Seshadhri. Self-improving algorithms for convex hulls. In *Symposium on Discrete Algorithms (SODA)*, 2010.
- 2010 M. Saks and C. Seshadhri. Estimating the longest increasing sequence in polylogarithmic time. In *Foundations of Computer Science (FOCS)*, 2010.
- 2009 N. Saxena and C. Seshadhri. An almost optimal rank bound for depth-3 identities. In *Conference on Computational Complexity (CCC)*, 2009.
- 2009 E. Hazan and C. Seshadhri. Efficient learning algorithms for changing environments. In *International Conference on Machine Learning (ICML)*, 2009.
- 2008 S. Kale, Y. Peres, and C. Seshadhri. Noise tolerance of expanders and sublinear expander reconstruction. In *Foundations of Computer Science (FOCS)*, 2008.
- 2008 S. Kale and C. Seshadhri. Testing expansion in bounded degree graphs. In *International Colloquium on Automata, Languages and Programming (ICALP)*, 2008.
- 2008 K. L. Clarkson and C. Seshadhri. Self-improving algorithms for delaunay triangulations. In *Symposium on Computational Geometry (SoCG)*, 2008.
- 2008 M. Saks and C. Seshadhri. Parallel monotonicity reconstruction. In *Symposium on Discrete Algorithms (SODA)*, 2008.
- 2006 N. Ailon, B. Chazelle, S. Comandur, and D. Liu. Self-improving algorithms. In *Symposium on Discrete Algorithms (SODA)*, 2006.
- 2006 B. Chazelle and C. Seshadhri. Online geometric reconstruction. In *Symposium on Computational Geometry (SoCG)*, 2006.
- 2005 C. Seshadhri, A. Seth, and S. Biswas. RAM simulation of BGS model of abstract state machines. In *Workshop on Abstract State Machines (ASM)*, 2005.
- 2004 N. Ailon, B. Chazelle, S. Comandur, and D. Liu. Property-preserving data reconstruction. In *International Symposium on Algorithms and Computation (ISAAC)*, 2004.
- 2004 N. Ailon, B. Chazelle, S. Comandur, and D. Liu. Estimating the distance to a monotone function. In *International Workshop on Randomization and Computation (RANDOM)*, 2004.

Journal Publications

- 2017 C. Seshadhri, Ali Pinar, Nurcan Durak, and Tamara G. Kolda. Directed closure measures for networks with reciprocity. *J. Complex Networks*, 2017.
- 2017 Deeparnab Chakrabarty, Kashyap Dixit, Madhav Jha, and C. Seshadhri. Property testing on product distributions: Optimal testers for bounded derivative properties. *ACM Trans. Algorithms*, 2017.
- 2017 Michael E. Saks and C. Seshadhri. Estimating the longest increasing sequence in polylogarithmic time. *SIAM J. Comput.*, 2017.
- 2016 C. Seshadhri, A. Smith, Y. Vorobeychik, J. Mayo, and R. Armstrong. Characterizing short-term stability for boolean networks over any distribution of transfer functions. *Physical Review E*, 2016.
- 2016 J. Bennett, A. Bhagatwala, J. Chen, A. Pinar, M. Salloum, and C. Seshadhri. Trigger detection for adaptive scientific workflows using percentile sampling. *SIAM Journal on Scientific Computing (SISC)*, 2016.
- 2016 C. Seshadhri, A. Pinar, N. Durak, and T. G. Kolda. Directed closure measures for networks with reciprocity. *Journal of Complex Networks*, 2016.
- 2015 J. Berry, L. Fostvedt, D. Nordman, C. Phillips, C. Seshadhri, and A. Wilson. Why do simple algorithms for triangle enumeration work in the real world? *Internet Mathematics*, 2015.
- 2014 T. G. Kolda, A. Pinar, T. Plantenga, C. Seshadhri, and C. Task. Counting triangles in massive graphs with mapreduce. *SIAM Journal on Scientific Computing*, 2014.
- 2014 T. G. Kolda, A. Pinar, T. Plantenga, and C. Seshadhri. A scalable generative graph model with community structure. *SIAM Journal on Scientific Computing*, 2014.
- 2014 D. Chakrabarty and C. Seshadhri. An $o(n)$ monotonicity tester for boolean functions over the hypercube. *SIAM Journal on Computing*, 2014.
- 2013 N. Saxena and C. Seshadhri. From Sylvester-Gallai configurations to rank bounds: Improved black-box identity test for depth-3 circuits. *Journal of the ACM*, 2013.
- 2013 C. Seshadhri, A. Pinar, and T. G. Kolda. An in-depth analysis of Stochastic Kronecker graphs. *Journal of the ACM*, 2013.
- 2013 S. Kale, Y. Peres, and C. Seshadhri. Noise tolerance of expanders and sublinear expansion reconstruction. *SIAM Journal on Computing*, 2013.
- 2012 C. Seshadhri and J. Vondrak. Is submodularity testable? *Algorithmica*, 2014.
- 2012 N. Saxena and C. Seshadhri. Blackbox identity testing for bounded top-fanin depth-3 circuits: The field doesn't matter. *SIAM Journal on Computing*, 2012.
- 2012 C. Seshadhri, Tamara G. Kolda, and Ali Pinar. Community structure and scale-free collections of Erdős-Rényi graphs. *Physical Review E*, 2012.
- 2012 A. Czumaj, O. Goldreich, D. Ron, C. Seshadhri, A. Shapira, and C. Sohler. Finding cycles and trees in sublinear time. *Random Structures and Algorithms*, 2012.
- 2011 C. Seshadhri, Y. Vorobeychik, J. Mayo, R. Armstrong, and J. Ruthruff. Influence and dynamic behavior in random boolean networks. *Physical Review Letters*, 2011.
- 2011 B. Chazelle and C. Seshadhri. Online geometric reconstruction. *Journal of the ACM*, 2011.
- 2011 N. Ailon, B. Chazelle, K. Clarkson, D. Liu, W. Mulzer, and C. Seshadhri. Self-improving algorithms. *SIAM Journal on Computing*, 2011.

- 2011 S. Kale and C. Seshadhri. Testing expansion in bounded degree graphs. *SIAM Journal on Computing*, 2011.
- 2010 M. Saks and C. Seshadhri. Local monotonicity reconstruction. *SIAM Journal on Computing*, 2010.
- 2008 N. Ailon, B. Chazelle, S. Comandur, and D. Liu. Property-preserving data reconstruction. *Algorithmica*, 2008.
- 2007 N. Ailon, B. Chazelle, S. Comandur, and D. Liu. Estimating the distance to a monotone function. *Random Structures and Algorithms*, 2007.

Consulting

- 2015-2017 Research Consultant for Twitter
- 2015- Advisor for ONU Technology (graphs algorithms startup funded by DARPA)
- 2015 Research Consultant for Sandia National Laboratories

Professional Service

Program committee member for following conferences:

- Innovations in Theoretical Computer Science (ITCS) 2018
- Web Search and Data Mining (WSDM) 2018
- Algorithm Engineering and Experiments (ALENEX) 2017
- Knowledge Discovery and Data Mining (KDD) 2017
- SIAM Workshop on Combinatorial Scientific Computing (SIAM CSC) 2016
- SIAM Network Science Workshop (SIAMNS) 2015
- Innovations in Theoretical Computer Science (ITCS) 2015
- Symposium on Discrete Algorithms (SODA) 2014
- Foundations of Software Technology and Theoretical Computer Science (FST&TCS) 2013
- IEEE Workshop on Network Science for Communication Networks (NetSciCom) 2013
- Foundations of Computer Science (FOCS) 2012

Reviewer for following conferences and journals:

Journal of the ACM · SIAM Journal on Computing · Algorithmica · Europhysics Letters · Very Large Databases Journal · Knowledge Discovery and Data Mining (KDD) · World Wide Web Conference (WWW) · Symposium on Theory of Computing (STOC) · Foundations of Computer Science (FOCS) · Symposium on Discrete Algorithms (SODA) · RANDOM · International Colloquium on Automata, Languages, and Programming (ICALP) · European Symposium on Algorithms (ESA)

Workshops Organized

- 2016 Minisymposium on The Mathematics Behind Big Data Analysis, at the SIAM Conference on Discrete Math
- 2016 Workshop on Incomplete Network Data, Sandia National Laboratories, Livermore
- 2014 Workshop on Streaming Graph Algorithms, Sandia National Laboratories, Albuquerque

Students and Postdocs

University of California, Santa Cruz

2015- Shweta Jain, graduate student
2015- Andrew Stolman, graduate student
2016- Hadley Black, graduate student

Sandia National Laboratories, Livermore

2014 Olivia Simpson, summer intern
2013-2014 Madhav Jha, von Neumann postdoc
2013 Benjamin Raichel, summer intern
2013 Kashyap Dixit, summer intern
2012 Madhav Jha, summer intern

Teaching

2017 *Sublinear Algorithms for Monotonicity Testing*, University of California, Santa Cruz
2017 *Introduction to Data Structures*, University of California, Santa Cruz
2016 *Algorithms and Abstract Data Types*, University of California, Santa Cruz
2016 *Computational Models and Complexity*, University of California, Santa Cruz
2015 *Computability and Computational Complexity*, University of California, Santa Cruz
2015 *Pattern Counting in Large Graphs*, University of California, Santa Cruz

University and Public Service

2015-2017 Graduate Admissions Committee Member, Department of Computer Science

Invited talks

May 2017 Bay Area Theory Day: *Counting subgraphs without the whole graph*
July 2016 Google Tech Talk: *Sampling paths in graphs: A simple technique for not so simple problems*
June 2016 SIAM Conference on Discrete Math: *Sampling paths in graphs: A simple technique for not so simple problems*
Dec 2013 Mini-workshop on Sublinear Time Algorithms, National Institute of Informatics, Tokyo: *Monotonicity testing and alternating paths*
Nov 2013 Workshop on Unifying Theory and Practice, Simons Institute, Berkeley: *The trials and tribulations of tractably tabulating triangles*
Sept 2013 CS Theory seminar, Chennai Mathematical Institute, Chennai: *Monotonicity testing and directed isoperimetry*
July 2013 Spotlights session, AAAI Conference on Artificial Intelligence, Seattle: *Triadic measures on graphs: the power of wedge sampling*
June 2013 Property testing workshop, Haifa: *Monotonicity testing and alternating paths*

- May 2013 TCS+ seminar: *Monotonicity testing, alternating paths, directed isoperimetry, and strawberries*
- May 2013 CS Theory seminar, University of Berkeley, Berkeley: *Optimal bounds for monotonicity and Lipschitz testing over hypercubes and hypergrids*
- May 2011 Bertinoro workshop on sublinear algorithms, Bertinoro: *Estimating the longest increasing sequence in polylogarithmic time*
- July 2010 CS Theory seminar, Microsoft Research, Bangalore: *Estimating the longest increasing sequence in polylogarithmic time*
- Nov 2009 CS Theory seminar, Hausdorff Center for Mathematics, Bonn: *Self-improving algorithms for convex hulls*
- Sept 2008 China Theory Week, Tsinghua University: *Self-improving algorithms for Delaunay triangulations*
- July 2008 Dagstuhl workshop on sublinear algorithms, Schloss Dagstuhl: *Local monotonicity reconstruction*
- Feb 2008 CS Theory seminar, University of Toronto: *Adaptive algorithms for online optimization problems*
- Feb 2008 Theory seminar, Google, NY: *Adaptive algorithms for online optimization problems*
- Aug 2007 CS Theory seminar, IBM Almaden: *Self-improving algorithms*
- Mar 2007 CS Theory seminar, IBM T. J. Watson: *Online reconstruction*
- Oct 2006 DIMACS Mixer Series, Rutgers University: *Online geometric reconstruction*
- Sept 2004 CS Theory seminar, Princeton University: *Estimating distance to monotonicity*