

Saurabh Sawlani

Curriculum Vitae

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Education

- 2015–present **Ph.D. in Algorithms Combinatorics and Optimization.**
Georgia Institute of Technology, Atlanta, GA, GPA – 3.8/4.
Advisor: Richard Peng
Minor: Big Data Analytics
- 2013–2015 **M.S. in Computer Science and Engineering.**
Indian Institute of Technology Madras, Chennai, India, GPA – 8.6/10.
Advisor: Jayalal Sarma M.N.
Dissertation: Longest Path, Reachability and Max-poly Weighting Schemes
- 2009–2013 **B.Tech. in Electrical Engineering.**
Indian Institute of Technology Madras, Chennai, India, GPA – 7.5/10.
Minor: Mathematics

Experience

- 2015–Present **Graduate Research and Teaching Assistant.**
GEORGIA INSTITUTE OF TECHNOLOGY, Atlanta, GA.
◦ Researching dynamic algorithms for massively parallel computational models such as MapReduce
◦ Designing combinatorial graph algorithms with applications to data mining and community detection in networks
- May–July 2019 **Software Engineering Intern.**
FACEBOOK, Menlo Park, CA.
◦ Researched and designed an algorithm for large-scale network inference using traceroute data with the Traffic Targeting team
◦ Implemented a Python pipeline for data collection and periodic network reconstruction based on real-world changes
- 2013–2015 **Graduate Research and Teaching Assistant.**
INDIAN INSTITUTE OF TECHNOLOGY MADRAS, Chennai, India.
◦ Studied the computational complexity of graph reachability and longest path problems

Publications

Journal Articles

1. Timothy Chu, Yu Gao, Richard Peng, Sushant Sachdeva, Saurabh Sawlani & Junxing Wang, **Graph Sparsification, Spectral Sketches, and Faster Resistance Computation, via Short Cycle Decompositions.**
Accepted for publication in SIAM Journal on Computing.
2. Balagopal Komarath, Jayalal Sarma & Saurabh Sawlani, **Pebbling meets coloring: Reversible pebble game on trees.**
Journal of Computer and System Sciences, Volume 91, 2018.
3. Anant Dhayal, Jayalal Sarma & Saurabh Sawlani, **Min/Max-Poly Weighting Schemes and the NL versus UL Problem.**
ACM Transactions on Computation Theory, Volume 9, 2017.

Conference and Workshop Papers

1. Saurabh Sawlani & Junxing Wang, **Near-Optimal Fully Dynamic Densest Subgraph.**
52nd Annual ACM Symposium on Theory of Computing (STOC 2020).
Accepted for presentation.
2. Digvijay Boob, Yu Gao, Richard Peng, Saurabh Sawlani, Charalampos E. Tsourakakis, Di Wang & Junxing Wang, **Flowless: Extracting Densest Subgraphs Without Flow Computations.**
International World Wide Web Conference (WWW 2020).
Accepted for oral presentation.
3. Yihe Dong, Yu Gao, Richard Peng, Ilya Razenshteyn & Saurabh Sawlani, **A Study of Performance of Optimal Transport.**
SIAM Workshop on Combinatorial Scientific Computing 2020 (CSC 2020).
Accepted for oral presentation.
Accepted as poster at OTML @ NeurIPS 2019
4. Laxman Dhulipala, David Durfee, Janardhan Kulkarni, Richard Peng, Saurabh Sawlani & Xiaorui Sun, **Parallel Batch-Dynamic Graphs: Algorithms and Lower Bounds.**
31st Annual ACM-SIAM Symposium on Discrete Algorithms (SODA 2020).
5. Digvijay Boob, Saurabh Sawlani & Di Wang, **Faster Width-dependent Algorithm for Mixed Packing and Covering LPs.**
33rd Annual Conference on Neural Information Processing Systems (NeurIPS 2019).
Selected for oral presentation (top 36 out of 6743 submissions).
6. David Durfee, Kevin Lai & Saurabh Sawlani, **ℓ_1 Regression using Lewis Weights Preconditioning and Stochastic Gradient Descent.**
31st Annual Conference on Learning Theory (COLT 2018).
7. Timothy Chu, Yu Gao, Richard Peng, Sushant Sachdeva, Saurabh Sawlani & Junxing Wang, **Graph Sparsification, Spectral Sketches, and Faster Resistance Computation, via Short Cycle Decompositions.**
59th IEEE Annual Symposium on Foundations of Computer Science (FOCS 2018).
8. Matthew Fahrbach, Gary L. Miller, Richard Peng, Saurabh Sawlani, Junxing Wang & Shen Chen Xu, **Graph Sketching Against Adaptive Adversaries Applied to the Minimum Degree Algorithm.**
59th IEEE Annual Symposium on Foundations of Computer Science (FOCS 2018).
9. Gorav Jindal, Pavel Kolev, Richard Peng & Saurabh Sawlani, **Density Independent Algorithms for Sparsifying k -Step Random Walks.**
20th International Workshop on Approximation Algorithms for Combinatorial Optimization Problems (APPROX 2017).
10. Balagopal Komarath, Jayalal Sarma & Saurabh Sawlani, **Reversible Pebble Game on Trees.**
21st International Computing and Combinatorics Conference (COCOON 2015).
11. Anant Dhayal, Jayalal Sarma & Saurabh Sawlani, **Polynomial Min/Max-weighted Reachability is in Unambiguous Log-space.**
34th International Conference on Foundation of Software Technology and Theoretical Computer Science (FSTTCS 2014).
12. Prasun Kumar, Jayalal Sarma & Saurabh Sawlani, **On Directed Tree Realizations of Degree Sets.**
7th International Workshop on Algorithms and Computation (WALCOM 2013).

Preprints

1. Renzhi Wu, Sanya Chaba, Saurabh Sawlani, Xu Chu, & Saravanan Thirumuruganathan, **AutoER: Automated Entity Resolution using Generative Modelling**. *arXiv:1908.06049*.

Honors and Awards

- 2013 Secured an All-India Rank of 47 in the Graduate Aptitude Test in Engineering (GATE) in Computer Science, among 200,000+ applicants.
- 2013 Secured an All-India Rank of 6 in the Joint Entrance Screening Test (JEST) in Theoretical Computer Science.
- 2007–2015 Awarded the National Talent Search Examination (NTSE) Scholarship by the National Council for Educational Research and Training, India
- 2009–2013 Recipient of the Merit-cum-Means Scholarship by Indian Institute of Technology Madras, Chennai, India
- 2009 Secured an All-India Rank of 273 in the IIT - Joint Entrance Examination 2009, among 400,000+ applicants
- 2009 Secured an All-India Rank of 786 in the All India Engineering Entrance Examination, among ~1M applicants

Implementation Projects

- Sep'19–Present **Restaurant Design Inspiration Tool**.
Language: Python.
 - Used a pre-trained neural network to classify food pictures in the Yelp dataset.
 - Developed a tool to allow for queries of popular food items, decor, etc. in a particular location using MongoDB.
- Aug'19–Nov'19 **Fast Optimal Transport**.
Language: MATLAB.
 - Compared performances of matrix scaling based numerical methods for the optimal transport problem with combinatorial flow-based methods.
 - Studied the relation between approximation factor and regularization parameter.
- Aug'18–May'19 **Automatic Entity Resolution**.
Language: Python.
 - Implemented an unsupervised learning algorithm for data deduplication using generative modeling.
 - Produced comparable performance to state-of-the-art supervised methods over datasets from various domains.
- Jan–May'19 **Global Minimum Cut**.
Language: C++.
 - Implemented a multiple-contraction version of the Stoer-Wagner algorithm.
 - Achieved ~35x speedup when compared to the benchmark iGraph library.
- Aug–Dec'18 **Fast triangle counting**.
Language: C++.
 - Implemented a combinatorial degree-based partitioning algorithm to count triangles in a graph.
- Jan–May'18 **Randomized correlation clustering**.
Language: Julia.
 - Implemented a randomized vertex-contraction algorithm for graph clustering.

- Aug–Dec’17 **Fast effective resistance computations.**
Language: Julia.
- Implemented algorithms for fast effective resistance computation using existing linear system solvers.
 - Implemented Schur-complement based approximate algorithms.

Programming Languages and Tools

Python, C++, MATLAB, Julia, L^AT_EX

Talks

- Jan 30, 2020 **Finding densest subgraphs without flow computations.**
IISc-SIAM student lecture, IISc, Bengaluru.
- Jan 6, 2020 **Parallel Batch-dynamic Graphs: Algorithms and Lower Bounds.**
SODA 2020, Salt Lake City.
- Dec 13, 2018 **Dynamic Graph Algorithms for Massively Parallel Computation.**
Theory-meet seminar, IIT Madras, Chennai.
- Sep 14, 2018 **Dynamic Connectivity in constant rounds of MPC.**
ACO Student Seminar, Georgia Tech, Atlanta.
- Aug 18, 2017 **Density Independent Algorithms for Sparsifying k -Step Random Walks.**
APPROX 2017, University of California Berkeley, Berkeley.
- Nov 17, 2014 **Weighting Schemes and the NL vs. UL Problem.**
Theory-meet seminar, IIT Madras, Chennai.

Teaching

Teaching Assistantships

- Spring 2019 Intro to Grad Algorithms, *Georgia Tech*
- Fall 2018 Automata and Complexity Theory, *Georgia Tech*
- Fall 2016 Computability and Algorithms, *Georgia Tech*
- Fall 2014 Mathematical Concepts for Computer Science, *IIT Madras*
- Spring 2014 Languages, Machines and Computation, *IIT Madras*
- Fall 2013 Advanced Theory of Computation, *IIT Madras*

Service

- 2017–2018 Organizer, ACO Student Seminar at Georgia Tech
- 2018–present Conference Reviewer - SODA 2019, SODA 2020, STOC 2020

Graduate Coursework

- A Theoretician’s Toolkit
- Advanced Combinatorial Optimization
- Advanced Graph Theory
- Advanced Linear Algebra
- Algebra I
- Big Data Systems and Analytics
- Computational Complexity
- Data Management and ML
- Design & Analysis of Algorithms
- Graph Theory
- Linear Inequalities
- Markov Chain Monte Carlo
- Massive Graph Analytics
- Probabilistic Combinatorics
- Spectral Algorithms