

**SHI LI**  
Assistant Professor,  
Department of Computer Science and Engineering,  
University at Buffalo

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#### BIO & EDUCATION

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- 2015 - present: Assistant Professor at University at Buffalo
- 2013 - 2015: Research Assistant Professor at Toyota Technological Institute at Chicago
- 2008 - 2013: Ph.D. in Computer Science at Princeton University  
Advisor: Prof. Moses Charikar
- 2004 - 2008: B.S. in Computer Science at Tsinghua University
- 2005 - 2008: Andrew Chi-Chi Yao's Special Pilot Class at Tsinghua University

#### RESEARCH INTERESTS

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My main research area is algorithm design, a sub-area of theoretical computer science. More specifically, I design fast algorithms with provable guarantees under different computational models: offline, online, and dynamic algorithms, distributed algorithms and differential privacy. The problems I studied include both fundamental ones whose resolving can lead to advance of our algorithmic techniques, and those arising from modern applications:

- Clustering
- Facility Location
- Scheduling
- Network Routing and Design

Technique-wise, I am currently interested in the use of linear programming hierarchy in improving the approximation guarantees for combinatorial optimization problems.

#### TEACHING

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- Fall 2019: CSE632: Design and Analysis of Algorithms II: Randomized Algorithms
- Fall 2019: CSE730: Data Structures and Algorithms in Solving Programming Problems (Seminar)
- Spring 2019, Spring 2018, Fall 2016, Spring 2016 : CSE431/531: Design and Analysis of Algorithms
- Fall 2018 : CSE711: Topics in Combinatorial Optimization and Linear Programming (Seminar)
- Fall 2017: CSE 632: Design and Analysis of Algorithms II: Approximation Algorithms
- Fall 2015: CSE 712: Advanced Topics in Algorithm Design (Seminar)
- Winter 2015: EECS 336: Design and Analysis of Algorithms, Northwestern University
- Fall 2014: Co-Teaching Information and Coding Theory with Madhur Tulsiani, Toyota Technological Institute at Chicago
- Spring 2010: Teaching Assistant, Cryptography, Princeton University
- Fall 2009: Teaching Assistant, Operating Systems, Princeton University

#### CURRENT STUDENTS

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- Xiangyu Guo
- Jiayi Xian
- Yunus Esencayi

## EMPLOYMENT AND VISITING POSITIONS

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- Assistant Professor, University at Buffalo, 2015 to present
- Research Assistant Professor at Toyota Technological Institute at Chicago, 2013 to 2015
- Research Assistantship at Princeton University, 2008 to 2013  
Advisor: Prof. Moses Charikar
- Visiting Shanghai University of Finance and Economy, Summer 2018 and 2019  
Host: Pinyan Lu
- Internship at Bell Labs, Summer 2012  
Mentor: Matthew Andrews
- Internship at Toyota Technological Institute at Chicago, Summer 2011  
Mentor: Prof. Julia Chuzhoy
- Visiting Microsoft Research Asia, Beijing, China, Fall 2003  
Mentor: Prof. Xiangyang Li

## GRANTS

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- NSF CCF-1844890, CAREER: Approximate Scheduling Algorithms via Mathematical Relaxations, September 2019 - August 2024
- NSF CCF-1566356, CRII: AF: On Designing Approximation Algorithms Based on Round-or-Cut Paradigm, Mar 2016 to August 2019
- Co-PI of NSF CCF-1717134, AF: Small: Tight Topology Dependent bounds on Distributed Communication, 09/01/2017 to 08/31/2020

## AWARDS

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- University at Buffalo Exceptional Scholars – Young Investigator Award, 2019
- SEAS Early Career Researcher of the Year Award, University at Buffalo, 2018
- **COCOON 2018 Best Paper Award:** Approximating Global Optimum for Probabilistic Truth Discovery
- CSE Early Career Teaching Award of the Year Award, University at Buffalo, 2017
- CSE Early Career Researcher of the Year Award, University at Buffalo, 2016
- **FOCS 2012 Best Paper Award:** A Polylogarithmic Approximation for Edge-Disjoint Paths with Congestion 2
- **ICALP 2011 Best Student Paper Award, Track A:** A 1.488 Approximation Algorithm for the Uncapacitated Facility Location Problem
- Wallace Memorial Fellowship, Princeton University, 2012-2013
- Gold Medal in the International Olympiad in Informatics, 2004
- Gold Medal in the Chinese National Olympiad in Informatics, 2003
- 1st place in the 30th ACM/ICPC Regional Asia, Chengdu
- National Scholarships, Tsinghua University, 2005 and 2006
- Freshmen Scholarship, Tsinghua University, 2004,
- Distinguished Thesis Award, Tsinghua University, 2008

Per convention of the theoretical computer science (TCS) community, all authors of a paper in TCS conference proceedings or journals are treated equally and sorted alphabetically.

Conference Papers:

- Xiangyu Guo, Guy Kortsarz, Bundit Laekhanukit, Shi Li, Daniel Vaz and Jiayi Xian, On Approximating Degree-Bounded Network Design Problems, APPROX 2020.
- Xiangyu Guo, Janardhan Kulkarni, Shi Li and Jiayi Xian, On the Facility Location Problem in Online and Dynamic Models, APPROX 2020.
- Di Wang, Xiangyu Guo, Chaowen Guan, Shi Li and Jinhui Xu, Estimating Stochastic Linear Combination of Non-linear Regressions, AAAI 2020.
- Janardhan Kulkarni, Shi Li, Jakub Tarnawski and Minwei Ye, Hierarchy-Based Algorithms for Minimizing Makespan under Precedence and Communication Constraints, SODA 2020.
- Yunus Esencayi, Marco Gaboardi, Shi Li and Di Wang, Differentially Private Facility Location Revisited, NeurIPS 2019.
- Fabrizio Grandoni, Bundit Laekhanukit and Shi Li,  $O(\log^2 k / \log \log k)$ -Approximation Algorithm for Directed Steiner Tree: A Tight Quasi-Polynomial-Time Algorithm, STOC 2019, **Invited to a Special Issue of SICOMP**.
- Sixu Piao, Zhongjie Ba, Lu Su, Dimitrios Koutsonikolas, Shi Li and Kui Ren, Automating CSI Measurement with UAVs: from Problem Formulation to Energy-Optimal Solution, InfoComm 2019.
- Michael Langberg, Shi Li, Sai Vikneshwar Mani Jayaraman and Atri Rudra, Topology Dependent Bounds for (Some) FAQs, PODS 2019.
- Shashwat Garg, Janardhan Kulkarni, Shi Li, Lift and Project Algorithms for Precedence Constrained Scheduling to Minimize Completion Time, SODA 2019.
- Uri Feige, Janardhan Kulkarni and Shi Li, A Polynomial Time Constant Approximation for Minimizing Total Weighted Flow-Time, SODA 2019.
- Shi Li, On Facility Location with General Lower Bounds, SODA 2019.
- Xiangyu Guo, Shi Li, Distributed  $k$ -Clustering for Data with Heavy Noise, NIPS 2018 (Spotlight).
- David Harris, Shi Li, Thomas Pensyl, Aravind Srinivasan, Khoa Trinh, Stochastic Fairness in Clustering, NIPS 2018.
- Janardhan Kulkarni, Shi Li, Flow-time Optimization When Jobs Have Dependencies, APPROX + RANDOM 2018.
- Minwei Ye, Shi Li, Jinhui Xu, Approximating Global Optimum for Probabilistic Truth Discovery, COCOON 2018, **Best Paper Award**.
- Ravishankar Krishnaswamy, Shi Li, Sai Sandeep, Constant Approximation for  $k$ -Median and  $k$ -Means with Outliers via Iterative Rounding, STOC 2018.
- Shi Li, Scheduling to Minimize Total Weighted Completion Time via Time-Indexed Linear Programming Relaxations, FOCS 2017, **Invited to a Special Issue of SICOMP**.
- Sungjin Im, Shi Li and Benjamin Moseley, Breaking  $1-1/e$  Barrier for Non-preemptive Throughput Maximization, IPCO 2017.
- Shi Li, Constant Approximation Algorithm for Non-Uniform Capacitated Multi-Item Lot-Sizing via Strong Covering Inequalities, SODA 2017.
- Arkadev Chattopadhyay, Michael Langberg, Shi Li and Atri Rudra, Tight Network Topology Dependent Bounds on Rounds of Communication, SODA 2017.

- Sungjin Im and Shi Li, Better Unrelated Machine Scheduling for Weighted Completion Time via Random Offsets from Non-Uniform Distributions, FOCS 2016.
- Gokalp Demirci and Shi Li, Constant Approximation for Capacitated  $k$ -Median with  $(1 + \epsilon)$ -Capacity Violation, ICALP 2016.
- Julia Chuzhoy, David Kim and Shi Li, Improved Approximation for Node-Disjoint Paths in Planar Graphs, STOC 2016.
- Shi Li, Approximating Capacitated  $k$ -Median with  $(1 + \epsilon)k$  Open Facilities, SODA 2016.
- Deeparnab Chakrabarty, Sanjeev Khanna, and Shi Li, On  $(1, \epsilon)$ -Restricted Assignment Makespan Minimization, SODA 2015.
- Sungjin Im, Benjamin Moseley, Shi Li and Eric Torng, A Dynamic Programming Framework for Non-Preemptive Scheduling Problems on Multiple Machines, SODA 2015.
- Shi Li, On Uniform Capacitated  $k$ -Median beyond the Natural LP Relaxation, SODA 2015, **Invited to a Special Issue of Transactions on Algorithms**.
- Nikhil Bansal, Moses Charikar, Ravishankar Krishnaswamy and Shi Li, Better Algorithms and Hardness for Broadcast Scheduling via a Discrepancy Approach, SODA 2014.
- Mohammadtaghi Hajiaghayi, Wei Hu, Jian Li, Shi Li and Barna Saha, A Constant Factor Approximation Algorithm for Fault-Tolerant  $k$ -Median, SODA 2014.
- Deeparnab Chakrabarty, Ravishankar Krishnaswamy, Shi Li and Srivatsan Narayanan, Capacitated Network Design on Undirected Graphs, APPROX + RANDOM 2013.
- Shi Li and Ola Svensson, Approximating  $k$ -Median via Pseudo-Approximation, STOC 2013, **Invited to a Special Issue of SICOMP**.
- Julia Chuzhoy and Shi Li, A Polylogarithmic Approximation for Edge-Disjoint-Paths with Congestion 2, FOCS 2012, **Best Paper Award, Invited to Journal of ACM**.
- Moses Charikar and Shi Li, A Dependent LP-Rounding Approach for the  $k$ -Median Problem, ICALP 2012.
- Parinya Chalermsook, Julia Chuzhoy Alina Ene, and Shi Li, Approximation Algorithms and Hardness of Integral Concurrent Flow, STOC 2012.
- Shi Li, A 1.488-Approximation Algorithm for the Uncapacitated Facility Location Problem, ICALP 2011, **Best Student Paper Award**.
- Moses Charikar, Tom Leighton, Shi Li and Ankur Moitra, Vertex Sparsifiers and Abstract Rounding Algorithms, FOCS 2010.
- Shi Li, Xiang-Yang Li and YunHao Liu, Capacity of Large Scale Wireless Networks under Gaussian Channel Model, Mobicom 2008.

#### Journal Papers:

- Chandra Chekuri and Shi Li, A note on the hardness of approximating the  $k$ -way Hypergraph Cut problem. Theory of Computing.
- David Harris, Shi Li, Thomas Pensyl, Aravind Srinivasan and Khoa Trinh, Approximation algorithms for stochastic clustering. Journal of Machine Learning Research, 20(153), 1-33.
- Shi Li. Constant Approximation Algorithm for Non-Uniform Capacitated Multi-Item Lot-Sizing via Strong Covering Inequalities, Mathematics of Operations Research, accepted.
- Shi Li, Scheduling to Minimize Total Weighted Completion Time via Time-Indexed Linear Programming Relaxations, **Special Issue of SICOMP**, submitted.
- Sungjin Im, Shi Li and Benjamin Moseley. Breaking  $1 - 1/e$  Barrier for Non-preemptive Throughput Maximization, SIAM Journal on Discrete Mathematics.
- Julia Chuzhoy and Shi Li (Dec 2016). A Polylogarithmic Approximation Algorithm for Edge-Disjoint Paths with Congestion 2. Journal of ACM, 63(5), 45:1-45:51.

- Shabbir Ahmed, Qie He, Shi Li and George Nemhauser (Feb 2016). On the Computational Complexity of Minimum-Concave-Cost Flow in a Two-Dimensional Grid. *SIAM Journal on Optimization*, 26(4), 2059-2079.
- Shi Li (Jan 2017). On Uniform Capacitated  $k$ -Median beyond the Natural LP Relaxation. *Transactions on Algorithms*, 13(2), 22:1-22:18.
- Shi Li and Ola Svensson (Apr 2016). Approximating  $k$ -Median via Pseudo-Approximation. *SIAM Journal on Computing*, 45(2), 530-547.
- Mohammadtaghi Hajiaghayi, Wei Hu, Jian Li, Shi Li and Barna Saha (June 2016). A Constant Factor Approximation Algorithm for Fault-Tolerant  $k$ -Median. *Transactions on Algorithms*, 12(3), 36:1-36:19.
- Shi Li and Gabriel Tucci (Feb 2015). Traffic Congestion in Expanders and  $(p, \delta)$ -Hyperbolic Spaces. *Internet Mathematics*, 11(2), 134-142.
- Shi Li (Jan 2013). A 1.488-Approximation Algorithm for the Uncapacitated Facility Location Problem. *Information and Computation*, 222, 45-58.
- Xiang-Yang Li, Shi Li, Yunhao Liu and Shaojie Tang (Aug 2010). Multicast Capacity of Wireless Ad Hoc Networks Under Gaussian Channel Model. *Transactions on Networking*, 18(4), 1145-1157.

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#### INVITED TALKS

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- $O(\log^2 k / \log \log k)$ -approximation for Directed Steiner Tree
  - Shanghai University of Finance and Economy, July, 2019
- Approximation on Scheduling under Precedence Constraints,
  - China Theory Week, keynote Speaker, IIS, Tsinghua University, 2018
- Centralized and Distributed Algorithms for Clustering with Outliers
  - University of Science and Technology of China, July, 2018
  - Shanghai University of Finance and Economy, August, 2018
  - Central South University, August, 2018
- Scheduling to Minimize Total Weighted Completion Time via Time-Indexed Linear Programming Relaxations,
  - Simons Workshop, Berkeley, September, 2017
- On Uniform Capacitated  $k$ -Median Beyond Natural LP Relaxation
  - ISMP, Pittsburgh, July 2015
- Better Algorithms and Hardness for Broadcast Scheduling via a Discrepancy Approach
  - Midwest Theory Day, Purdue University, May 2014
- A Polylogarithmic Approximation for Edge-Disjoint Paths with Congestion 2
  - CCI Meeting, Princeton University, Feb 2013
- Approximating  $k$ -Median via Pseudo-Approximation
  - DIMACS Seminar Talk, Rutgers University, Aug 2013
  - Theory Talk, IBM Research Watson, Apr 2013
  - Theory Seminar Talk, Cornell University, Mar 2013

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#### SERVICES

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- Editorial Board Member of the *ACM Transactions on Algorithms*
- Guest Editor of a Special Issue of *Journal of Scheduling*
- Co-Organizer of SOCG 2021 (upcoming)

- Program Committee Member of NeurIPS 2019, AAAI 2020, TAMC 2020, ESA 2020 (upcoming) and SODA 2021 (upcoming)
- Program Committee Member of APPROX + RANDOM 2017, SWAT 2018, MAPSP 2019, ISAAC 2019
- Local Committee Member of FWCG 2015