Shi Li

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Bio & Education

Apr. 2023 -		Professor, Nanjing University
Sep. 2020 - Jan. 2023	:	Associate Professor, University at Buffalo
Sep. 2015 - Aug. 2020	:	Assistant Professor, University at Buffalo
Sep. 2013 - Aug. 2015	:	Research Assistant Professor at Toyota Technological Institute at Chicago
Sep. 2008 - Jan. 2014	:	Ph.D. in Computer Science at Princeton University
		Advisor: Prof. Moses Charikar
Sep. 2004 - Jun. 2008	:	B.S. in Computer Science at Tshinghua University
Sep. 2005 - Jun. 2008	:	Andrew Chi-Chi Yao's Special Pilot Class at Tshinghua University

Research Interests

My main research area is algorithm design, a sub-area of theoretical computer science (TCS). 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

Teaching

Teaching at Nanjing University:

Algorithm Design and Analysis	2024S
Advanced Algorithm Design	2023F

Courses taught at University at Buffalo:

CSE431/531 : Design and Analysis of Algorithms	2022F, 2022S, 2021F, 2021S, 2020S 2019S, 2018S, 2016F, 2016S
CSE632 : Design and Analysis of Algorithms II (Topics Vary)	2017F, 2019F, 2020F
Seminar : Data Structures and Algorithms in Solving Programming Problems	2022F, 2019F
Seminar : Topics in Combinatorial Optimization and Linear Programming	2018F
Seminar : Advanced Topics in Algorithm Design	2015F

Other teaching experiences:

- Winter 2015: EECS 336: Design and Analysis of Algorithms, Northwestern University
- Fall 2014: Co-taught 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

PhD Students

- Xiangyu Guo
- Jiayi Xian
- Yunus Esencayi
- Yuda Feng

Master Students

- Zihao Liang
- Jia Ye

Postdoc Students

- Ruilong Zhang

Employment and Visiting Positions

- Professor, Nanjing University, since Apr. 2023
- Associate Professor, University at Buffalo, Sep. 2020 to Jan. 2023
- Assistant Professor, University at Buffalo, Sep. 2015 to Aug. 2020
- Research Assistant Professor at Toyota Technological Institute at Chicago, Sep. 2013 to Jun. 2015
- Research Assistantship at Princeton University, Sep. 2008 to Jun. 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

- NSF CCF-1844890, CAREER: Approximate Scheduling Algorithms via Mathematical Relaxations, Sep. 2019 - Aug. 2024
- NSF CCF-1566356, CRII: AF: On Designing Approximation Algorithms Based on Round-or-Cut Paradigm, Mar. 2016 to Aug. 2019
- Co-PI of NSF CCF-1717134, AF: Small: Tight Topology Dependent bounds on Distributed Communication, Sep. 2017 to Aug. 2021

Awards

- CSE Senior Teaching Award, University at Buffalo, 2021
- CSE Senior Researcher of the Year Award, University at Buffalo, 2020
- 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

PUBLICATIONS

Per convention of the community, authors of a paper in TCS conference proceedings or journals have equal contribution and are sorted alphabetically.

Manuscripts
- S. Li, Chenyang Xu and Ruilong Zhang, Polylogarithmic Approximation for Robust s-t Path, Manuscript.
- Michael Dinitz, Guy Kortsarz and Shi Li, Degrees and Network Design: New Problems and Approximations, Manuscript.

Conference Papers:
- Nairen Cao, Vincent Cohen-Addad, Euiwoong Lee, Shi Li, Alantha Newman and Lukas Vogl, Understanding the Cluster Linear Program for Correlation Clustering, STOC 2024
- Vincent Cohen-Addad, Euiwoong Lee, Shi Li and Alantha Newman, Handling Correlated Rounding Error via Preclustering: A 1.73-approximation for Correlation Clustering, FOCS 2023
- Shi Li, Nearly-Linear Time LP Solvers and Rounding Algorithms for Scheduling Problems, ICALP 2023.
- Ravishankar Krishnaswany, Shi Li, and Varun Suriyanarayana, Online Unrelated-Machine Load Balancing and Generalized Flow with Recourse, STOC 2023.
- Improved Approximations for Unrelated Machine Scheduling, Sungjin Im and Shi Li, SODA 2023.
- Nairen Cao, Jeremy T. Fineman, Shi Li, Julian Mestre, Katina Russell and William Umboh, Nested Active-Time Scheduling, ISAAC 2022.
- Online Food Delivery to Minimize Maximum Flow Time, Xiangyu Guo, Shi Li, Kelin Luo, Yuhao Zhang, ISAAC 2022.
- Vincent Cohen-Addad, Yunus Esencayi, Chenglin Fan, Marco Gaboardi, Shi Li and Di Wang, On Facility Location Problem in Local Differential Privacy Model, AISTATS 2022.
- Shi Li and Bundit Laekhanukit, Polynomial Integrality Gap of Flow LP for Directed Steiner Tree, SODA 2022.
- Shi Li and Jiayi Xian, Online Unrelated Machine Load Balancing with Predictions Revisited, ICML 2021, long presentation.

- Xiangyu Guo, Janardhan Kulkarni, Shi Li and Jiayi Xian, Consistent k-Median: Simpler, Better and Robust, AISTATS 2021.

- Shi Li, Towards PTAS for Precedence Constrained Scheduling via Combinatorial Algorithms, SODA 2021.

- Di Wang, Xiangyu Guo, Shi Li, and Jinhui Xu, Robust High Dimensional Expectation Maximization Algorithm via Trimmed Hard Thresholding, ACML 2020.

- 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 Asgsignment 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:
- Fabrizio Grandoni, Bundit Laekhanukit, Shi Li, $O(\log^2 k / \log \log k)$-Approximation Algorithm for Directed Steiner Tree: A Tight Quasi-Polynomial-Time Algorithm. SIAM Journal on Computing, 2023.

- Xiangyu Guo, Shi Li, Kelin Luo, and Yuhao Zhang, Minimizing the Maximum Flow Time in the Online Food Delivery Problem. Algorithmica, 2023.

- Xiangyu Guo, Guy Kortsarz, Bundit Laekhanukit, Shi Li, Daniel Vaz and Jiayi Xian, On Approximating Degree-Bounded Network Design Problems, Algorithmica.

- Chandra Chekuri and Shi Li, A note on the hardness of approximating the k-way Hypergraph Cut problem, Theory of Computing, 16, 14:1-14:8.

- 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, Jinhui Xu and Minwei Ye, Approximating global optimum for probabilistic truth discovery, Algorithmica 82, 3091-3116.

- Shi Li. Constant Approximation Algorithm for Non-Uniform Capacitated Multi-Item Lot-Sizing via Strong Covering Inequalities, Mathematics of Operations Research, 45(3), 797-1192.

- Shi Li, Scheduling to Minimize Total Weighted Completion Time via Time-Indexed Linear Programming Relaxations, SIAM Journal on Computing, 49(4), 409-440.

- Sungjin Im, Shi Li and Benjamin Moseley. Breaking $1 - 1/e$ Barrier for Non-preemptive Throughput Maximization, SIAM Journal on Discrete Mathematics, 34(3), 1649–1669.

- Julia Chuzhoy and Shi Li, 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, On the Computational Complexity of Minimum-Concave-Cost Flow in a Two-Dimensional Grid. SIAM Journal on Optimization, 26(4), 2059-2079.

- Shi Li, On Uniform Capacitated k-Median beyond the Natural LP Relaxation. Transactions on Algorithms, 13(2), 22:1-22:18.

- Shi Li and Ola Svensson, 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, A Constant Factor Approximation Algorithm for Fault-Tolerant k-Median. Transactions on Algorithms, 12(3), 36:1-36:19.

- Shi Li and Gabriel Tucci, Traffic Congestion in Expanders and (p, δ)-Hyperbolic Spaces. Internet Mathematics, 11(2), 134-142.

- Shi Li, 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, Multicast Capacity of Wireless Ad Hoc Networks Under Gaussian Channel Model. Transactions on Networking, 18(4), 1145-1157.

INVITED TALKS

- Handling Correlated Rounding Error via Preclustering: A 1.73-approximation for Correlation Clustering
    - Banff workshop on Approximation and Hardness of Approximation Algorithms.

- Tight Online Rounding Algorithm for Unrelated Machine Load Balancing with Predictions
    - FOCS 2023 invited talk, November, 2023, Santa Cruz, California, USA
    - FAW 2021 keynote speaker (virtual)

- Online Unrelated-Machine Load Balancing and Generalized Flow with Recourse
    - Central South University, August, 2023
    - Tutte , University of Waterloo, Department of Combinatorics and Optimization, June, 2023.
    - Canadian Mathematics Society 2022, Toronto
    - Shanghai University of Finance and Economics, March 2023

- Constant approximation for clustering with outliers.
    - INFORMS 2020, virtual

- $O(\log^2 k / \log \log k)$-approximation for Directed Steiner Tree
    - Shanghai University of Finance and Economy, July, 2019

- Approximation on Scheduling under Precedence Constraints,
    - China Theory Week, keynote Speaker, IIIS, Tsinghua University, 2018

- Centralized and Distributed Algorithms for Clustering with Outliers
  - Northwestern Clustering Workshop, April, 2022, virtual
  - 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

SERVICES

- Program Committee Member of APPROX + RANDOM 2017, SWAT 2018, MAPSP 2019, ISAAC 2019, NeurIPS 2019, AAAI 2020, TAMC 2020, ESA 2020, SODA 2021, ICALP 2021 and APPROX + RANDOM 2021, STOC 2022, SODA 2023, IJTCS-FAW 2023
- Editorial Board Member of the ACM Transactions on Algorithms
- Guest Editor of a Special Issue of Journal of Scheduling
- Co-Organizer of SOCG 2021
- Local Committee Member of FWCG 2015