John Gunnar Carlsson
Epstein Department of Industrial and Systems Engineering
University of Southern California
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Education

2009 Institute for Computational and Mathematical Engineering (ICME)
Stanford University
Ph.D. in Computational and Mathematical Engineering
Dissertation: "Map segmentation algorithms for geographic resource allocation problems"
Adviser: Yinyu Ye

2005 Harvard College
A.B. in Mathematics and Music with honors

Academic positions held

2017– Kellner Family Associate Professor, University of Southern California

2015–17 Assistant Professor, University of Southern California

2009–14 Assistant Professor, University of Minnesota

Research publications and pre-prints

(names in ***bold*** denote students)

2023 Carlsson, John Gunnar, Sheng Liu, Nooshin Salari, and ***Han Yu***. "Provably good region partitioning for on-time last-mile delivery." *Operations Research*, to appear.

2023 Carlsson, Erik and John Gunnar Carlsson. "Topology and local optima in computer vision." *Springer Nature Computer Science*, 3.138 (2022): 1-11.

2022 Carlsson, John Gunnar, and ***Bo Jones***. Continuous approximation formulas for location problems." *Networks* 80.4 (2022): 407-430.

2022 Carlsson, Erik, John Gunnar Carlsson, and ***Shannon Sweitzer***. "Applying topological data analysis to local search problems." *Foundations of Data Science* 4.4 (2022): 563-579.

2022 Qin, Hengle, Jun Xiao, Dongdong Ge, Linwei Xin, Jianjun Gao, Simai He, Haodong Hu, and John Gunnar Carlsson. "JD. com: Operations Research Algorithms Drive Intelligent Warehouse Robots to Work." *INFORMS Journal on Applied Analytics* 52.1 (2022): 42-55.

2020 Carlsson, John Gunnar, and ***Ye Wang***. "Distributions with Maximum Spread Subject to Wasserstein Distance Constraints." *Journal of the Operations Research Society of China* 7.1 (2019): 69-105.

2019 Carlsson, John Gunnar, ***Mehdi Behroozi*****,** and Kresimir Mihic. "Wasserstein distance and the distributionally robust TSP." *Operations Research* 66.6 (2019): 1603-1624.

2018 Carlsson, John Gunnar, and ***Siyuan Song***. "Coordinated logistics with a truck and a drone." *Management Science* 64.9 (2018): 3971-4470.

2017 Carlsson, John Gunnar, and ***Mehdi Behroozi***. "Worst-case demand distributions in vehicle routing." *European Journal of Operational Research* 256.2 (2017): 462-472.

2016 Carlsson, John Gunnar, ***Mehdi Behroozi***, ***Xiangfei Meng***, and ***Raghuveer Devulapalli***. "Household-level economies of scale in transportation." *Operations Research* 64.6 (2016): 1372-1387.

2016 Carlsson, John Gunnar, Erik Carlsson, and ***Raghuveer Devulapalli***. "Shadow prices in territory division." *Networks and Spatial Economics* 16.3 (2016): 1-39.

2016 Carlsson, John Gunnar, ***Mehdi Behroozi***, and ***Xiang Li***. "Geometric partitioning and robust ad-hoc network design." *Annals of Operations Research* 238.1 (2016): 41-68.

2015 Carlsson, John Gunnar, and ***Fan Jia***. "Continuous facility location with backbone network costs." *Transportation Science* 49.3 (2015): 433-451.

2015 Carlsson, John Gunnar, Benjamin Armbruster, ***Rahul Saladi***, and ***Haritha Bellam***. "A bottleneck matching problem with edge-crossing constraints." *International Journal of Computational Geometry and Applications* 25.4 (2015): 245-261.

2013 Carlsson, John Gunnar, and ***Fan Jia***. "Euclidean hub-and-spoke networks." *Operations Research* 61.6 (2013): 1360-1382.

2013 Carlsson, John Gunnar, and Erick Delage. "Robust partitioning for stochastic multivehicle routing." *Operations Research* 61.3 (2013): 727-744.

2013 Lum, P. Y., G. Singh, A. Lehman, T. Ishkanov, Mikael Vejdemo-Johansson, M. Alagappan, J. Carlsson, and G. Carlsson. "Extracting insights from the shape of complex data using topology." *Scientific Reports* 3 (2013).

2013 Carlsson, John Gunnar, ***Fan Jia***, and ***Ying Li***. "An approximation algorithm for the continuous k-medians problem in a convex polygon." *INFORMS Journal on Computing* 26.2 (2013): 280-289.

2013 Carlsson, John Gunnar, and Jianming Shi. "A linear relaxation algorithm for solving the sum-of-linear-ratios problem with lower dimension." *Operations Research Letters* 41.4 (2013): 381-389.

2012 Carlsson, John Gunnar, and ***Raghuveer Devulapalli***. "Dividing a territory among several facilities." *INFORMS Journal on Computing* 25.4 (2012): 730-742.

2012 Carlsson, John Gunnar. "Dividing a territory among several vehicles." *INFORMS Journal on Computing* 24.4 (2012): 565-577.

2010 Carlsson, John Gunnar, Benjamin Armbruster, and Yinyu Ye. "Finding equitable convex partitions of points in a polygon efficiently." *ACM Transactions on Algorithms (TALG)* 6.4 (2010): 72.

Refereed conference proceedings

(names in ***bold*** denote students)

2014 ***Devulapalli, Raghuveer***, ***Mikael Quist***, and John Gunnar Carlsson. "Spatial partitioning algorithms for data visualization." *Visualization and Data Analysis (VDA), 2014 IS&T/SPIE Conference on.* (pp. 90170V-1-90170V-8).

2013 Carlsson, John Gunnar, Erik Carlsson, and ***Raghuveer Devulapalli***. "Balancing workloads of service vehicles over a geographic territory." *Intelligent Robots and Systems (IROS), 2013 IEEE/RSJ International Conference on* (pp. 209-216).

Book chapters

(names in ***bold*** denote students)

2018 Carlsson, John Gunnar, and ***Mehdi Behroozi***. "Computational geometric approaches to equitable districting: a survey", to appear in Optimal Districting and Territory Design: Models, Algorithms, and Applications, Springer International Series in Operations Research & Management Science

2015 ***Devulapalli, Raghuveer***, ***Neil Peterson***, and John Gunnar Carlsson. "Data visualization using weighted Voronoi diagrams." *Geo-Intelligence and Visualization through Big Data Trends.* IGI Global, 2015: 181-204.

2007 Carlsson, John Gunnar, Dongdong Ge, Arjun Subramaniam, and Yinyu Ye. "Solving the min-max multi-depot vehicle routing problem." *Lectures on Global Optimization. Fields Institute Communications* 55 (2009): 31-46.

Sponsored research projects

2024-27 "Tactical decisions for contested logistics: performance, robustness, and resilience", ONR, $1,460,000. Co-PI with Johannes Royset. Performance period Feb 2024 – Jan 2027

2022-23 "Symbiotic Vehicle Routing", Toyota Material Handling of North America University Research Program. $205,300.

2022-23 "Applying topological data analysis to logistics systems analysis", METRANS, $100,000.

2022-23 "Continuous approximation models with temporal constraints and objectives", METRANS, $100,000.

2021-24 "Topological data analysis in optimization", ONR. $290,000.

2021-22 "New continuous approximation models for passenger and freight transportation", METRANS. $99,998.

2020-21 "Real-world applications of computational geometry in complex routing and logistical problems", DARPA Lagrange Program. $110,282.

2020 "The 'sidekick' routing paradigm for VMT reduction and improved accessibility", METRANS. $96,793.

2018–19 "Computational geometric approaches to geospatial optimization problems." DARPA (Lagrange Program), $348,737. Lead P.I. (with Joseph S. B. Mitchell, SUNY Stony Brook, Co-P.I.)

2017–19 "Real-world implementations of geographic resource allocation solutions." DoD (DURIP Program), $87,278. P.I.

2016–19 "Geometric algorithms and structures that solve hard optimization problems." NSF, $290,813. P.I.

2016–19 "Online and decentralized algorithms for 'horsefly' problems." ONR, $390,171. P.I.

2015–18 "Allocating geographic resources optimally (AGRO)." AFOSR, $372,692. P.I.

2015–16 "Quantifying the impact of next-generation modes of delivery." METRANS UTC, $34,033. P.I.

2014–16 "Local and global phenomena in dynamic resource allocation." ONR, $123,475. P.I.

2013–14 "Dynamic and decentralized geographic resource allocation." ONR, $120,865. P.I.

2012–15 "Strategically allocating resources in a geographic environment (SARGE)." DARPA, $292,800. P.I.

2012–15 "Segmenting a map to allocate resources in a territory (SMART)." NSF, $179,500. P.I.

2012–13 "Online and decentralized algorithms for map segmentation problems." ONR, $111,562. P.I.

2011–12 "Region partitioning algorithms for geographic resource allocation." UMN Grant-in-Aid program, $31,153. P.I.

2011 "A fast, auction-based algorithm for paratransit vehicle assignment." UMN Center for Transportation Studies, $9,339. P.I.

Honors and awards

2022 Toyota Material Handling of North America University Research Fellow

2021 INFORMS Edelman Laureate

2021 The Engineers' Council Outstanding Engineering Achievement Merit Award

2019 Northrop Grumman Teaching Award

2017 Kellner Family Early Career Chair

2017 National Academy of Engineering Frontiers of Engineering Invitee

2016 *Popular Science* magazine's *Brilliant 10*, "The man who re-routes the world using geometry"

2015 AFOSR Young Investigator Prize

2013 INFORMS Computing Society (ICS) Prize

2013 INFORMS Junior Faculty Interest Group (JFIG) Paper Competition Finalist

2012 DARPA Young Faculty Award

2010 First Prize, INFORMS Interactive Session Competition

2008 Departmental Teaching Award, Institute for Computational and Mathematical Engineering (ICME), Stanford University

Awards won by students

2017 TSL Dissertation Prize: Mehdi Behroozi

2017 Finalist, Dantzig Dissertation Award: Mehdi Behroozi

2017 Third Prize, IISE Pritsker Doctoral Dissertation Award: Mehdi Behroozi

2016 Second Prize, INFORMS Nicholson Prize: Mehdi Behroozi, Xiangfei Meng, Raghuveer Devulapalli, for the paper "Household-level economies of scale in transportation"

2016 Honorable mention, INFORMS SOLA Dissertation Prize: Fan Jia

2016 Second Prize, IIE Doctoral Colloquium Poster Competition: Mehdi Behroozi

2012 Third Prize, INFORMS Interactictive Session Competition: Raghuveer Devulapalli:

Invited talks

2023 "A new bound for the Euclidean travelling salesman constant." UBC, Operations and Logistics Seminar, September 15

2022 "Computational geometric approaches to logistics systems analysis." MIT, Data Science Lab Seminar, May 11

2022 "Computational geometric approaches to logistics systems analysis." UT Austin McCombs School of Business, IROM Seminar, September 16

2021 "Continuous approximation models for some modern logistical problems." Shanghai University, Management Science Seminar, May 10

2021 "Continuous approximation models for some modern logistical problems." Southern Methodist University, EMIS Seminar, February 12

2021 "Continuous approximation models for some modern logistical problems." University of Maryland, Institute for Systems Research Virtual Seminar, February 5

2021 "Continuous approximation models for some modern logistical problems." Stanford University, Institute for Computational and Mathematical Engineering, February 1

2020 "Continuous approximation models for some modern logistical problems." Sharif University, Industrial Engineering Webinar, November 25

2020 "Continuous approximation models for some modern logistical problems." McGill University, Operations Management Seminar, February 20

2018 "Continuous approximation models for some modern logistical problems." Northwestern University, IEMS Seminar, May 14

2017 "New problems in modern logistical systems." University of Toronto, Rotman Business School OM Seminar, April 7

2016 "Applying computational geometry to modern transportation problems." Stanford University Institute for Computational and Mathematical Engineering, External Partners Meeting, November 11

2016 "Your first few years." Doctoral Colloquium, IISE Annual Conference, Anaheim, May 21

2016 "The generalized TSP and trip chaining." Plenary talk, IWSSSCM3 Conference, Hong Kong, January 7

2015 "New continuous approximation models for transportation." Departmental Colloquium Seminar, Georgia Tech Department of Industrial and Systems Engineering, December 2

2014 "Allocating geographic resources optimally." Departmental Seminar, University of Southern California Department of Industrial and Systems Engineering, February 24

2014 "Allocating geographic resources optimally." Departmental Seminar, University of Washington Department of Industrial and Systems Engineering, February 18

2014 "Allocating geographic resources optimally." Departmental Seminar, Columbia University Department of Industrial Engineering and Operations Research, February 13

2014 "Allocating geographic resources optimally." Operations/Management Science Workshop, Chicago Booth School of Business, January 21

2013 "Allocating geographic resources optimally." Departmental Seminar, Naval Postgraduate School Department of Operations Research, October 31

2013 "Big data in business management and development." Center for Professional Development, Stanford University, August 29

2013 "Geographic resource allocation and continuous location theory." Departmental Seminar, Department of Technology and Information Management, UC Santa Cruz, April 22

2013 "Geographic partitioning and continuous location problems." Scientific and Statistical Computing Seminar, University of Chicago, February 7

2012 "Equitable region partitioning among several agents." Departmental Seminar, Center for Control, Dynamical Systems, and Computation (CCDC), September 17

2012 "Dividing a territory among several facilities." Interdisciplinary Transportation Student Organization (ITSO) Seminar, University of Minnesota, March 20

2011 "Dividing a territory among several agents." Departmental Seminar, Institute for Computational and Mathematical Engineering, Stanford University, August 3

2011 "Practical applications of subadditive Euclidean functional theory." Departmental Seminar, Department of Mathematics, Lehigh University, April 13

2011 "Algorithms for optimally dividing a territory." Departmental Seminar, Department of Operations Management, Sauder School of Business, University of British Columbia, March 7

Service

Associate Editor, *Operations Research*

Associate Editor, *Management Science*

Associate Editor, *Transportation Science*

Referee for *Operations Research*, *Management Science*, *M&SOM, INFORMS Journal on Optimization*, *Transportation Research Part B*, *Transportation Science*, *Algorithmica*, *European Journal of Operational Research*, *Computers and Operations Research*, *IEEE Transactions on Robotics*, *Journal of Dynamic Systems, Measurement, and Control*, and *IEEE Transactions on Intelligent Transportation Systems*

Affiliations

American Indian Science and Engineering Society (AISES), INFORMS, SIAM

Doctoral students

2023 Shannon Sweitzer-Siojo
Dissertation: "Applications of topological data analysis to operational research problems"
Scientist, NSWC Corona

2023 Han Yu
Dissertation: "Computational geometric partitioning for vehicle routing"
Engineer, American Airlines

2023 Ying Peng
Dissertation: "Continuous approximation formulas for cumulative routing optimization problems"
Engineer, Hewlett-Packard

2022 Haochen Jia
Dissertation: "A continuous approximation model for the parallel drone scheduling traveling salesman problem"
Engineer, AutoNavi

2022 Bo Jones
Dissertation: "The warehouse traveling salesman problem and its applications"
Postdoctoral Associate, Rice University

2021 MohammadJavad Azizi
Dissertation: "Continuous approximation for selection routing problems"
Engineer, Google

2019 Jiachuan Chen
Dissertation: "The warehouse traveling salesman problem and its applications"
Engineer, Facebook

2018 Xiangfei Meng
Dissertation: "Asymptotic analysis of the generalized traveling salesman problem and its application"
Engineer, Snap Inc.

2018 Siyuan Song
Dissertation: "Package delivery with trucks and UAVs"
Engineer, Facebook

2018 Ye Wang
Dissertation: "Applications of Wasserstein distance in distributionally robust optimization"
Engineer, Facebook

2016 Mehdi Behroozi
Dissertation: "Robust solutions for geographic resource allocation problems"
Assistant Professor, Department of Mechanical and Industrial Engineering, Northeastern University

2015 Fan Jia
Dissertation: "On continuous connected facility location problems"
Systems Engineer, AVIC Xi'an Flight Automatic Control Research Institute

2014 Raghuveer Devulapalli
Dissertation: "Geometric partitioning algorithms for fair division of geographic resources"
Research Staff, Computational Lithography Group, Intel Inc.