

# Harsha Gangammanavar

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## Education

**Ohio State University** **Columbus, OH**  
Ph.D. Integrated Systems Engineering, August 2013  
*Dissertation Title:* Multiple Timescale Stochastic Optimization with Application to Integrating Renewable Resources in Power Systems  
*Advisor:* Prof. Suvrajeet Sen  
*Minors:* Computer Science and Statistics

M.S. Electrical and Computer Engineering December 2009

**Visvesvaraya Technological University** **Bangalore, India**  
B.E. Electronics and Communications Engineering May 2007

## Appointments

**Southern Methodist University** **Dallas, TX**  
Operations Research and Engineering Management  
*Assistant Professor* August 2016 - present

**Clemson University** **Clemson, SC**  
Industrial Engineering  
*Postdoctoral Fellow* July 2015 - July 2016  
*Adjunct Assistant Professor* April 2017 - July 2021

**University of Southern California** **Los Angeles, CA**  
Industrial and Systems Engineering  
*Visiting Assistant Professor* August 2013 - May 2015

**Ohio State University** **Columbus, OH**  
Integrated Systems Engineering  
*Graduate Research and Teaching Assistant* January 2010 - July 2013

## Research Interests

*Methodologies:* Operations research; stochastic programming; large-scale optimization.  
*Applications:* Renewable energy integration in power systems; healthcare logistics; communication networks.

## Journal Publications

- J17. N. Sakhavand<sup>†</sup> and H. Gangammanavar, Subproblem sampling vs. scenario reduction: Efficacy comparison for stochastic programs in power systems applications, accepted for publication in *Energy Systems*, 2022.
- J16. D. Wood, S. Çetinkaya, H. Gangammanavar, L. Weiguang, and J. Wang, On the Value of a Multistage Optimization Approach for Intensity-Modulated Radiation Therapy Planning, *Physics*

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<sup>†</sup>Graduate student advisee

- in *Medicine and Biology*, 67(14), 2022.
- J15. H. Gangammanavar and M. Bansal, Stochastic Decomposition Method for Two-Stage Distributionally Robust Linear Optimization, *SIAM Journal on Optimization*, 32:3, 1901-1930, 2022.
  - J14. S. Ariyaratne<sup>†</sup>, H. Gangammanavar, and R. Sundararajan, Change Point Detection in Nonstationary Sub-Hourly Wind Time Series, *Applied Energy*, Volume 310, 118501, 2022.
  - J13. S. Atakan, H. Gangammanavar and S. Sen, Stochastic Hierarchical Planning for High Renewable Power Systems, accepted for publication in *European Journal on Operational Research*, December 2021.
  - J12. D. Troxell<sup>‡</sup>, H. Ahn, and H. Gangammanavar, A Cardinality Minimization Approach to Security-Constrained Economic Dispatch, accepted for publication in *IEEE Transactions on Power Systems*, November 2021.
  - J11. A. Alobaidi<sup>§</sup>, M. Khodayar, A. Vafamehr, H. Gangammanavar, and M. Khodayar, Security Constrained Expansion Planning of Battery Energy Storage in Distribution Network with Data Centers, in *International Journal of Electrical Power and Energy Systems*, Volume 133, 107231, December 2021.
  - J10. H. Gangammanavar and S. Sen, Stochastic Dynamic Linear Program: A Distribution-free Multistage Stochastic Programming Algorithm, *SIAM Journal on Optimization*, 31:3, 2111-2140, 2021.
  - J9. S. Yin<sup>§</sup>, J. Wang, and H. Gangammanavar, Stochastic Market Operation for Coordinated Transmission and Distribution Systems, in *IEEE Transactions on Sustainable Energy*, vol. 12, no. 4, pp. 1996-2007, October 2021.
  - J8. H. Gangammanavar, Y. Liu, and S. Sen, Stochastic decomposition for two-stage stochastic linear programs with random cost coefficients, *INFORMS Journal on Computing*, 33(1):51–71, January 2021.
  - J7. S. Wang<sup>§</sup>, S. J. Mason, and H. Gangammanavar, Stochastic optimization for flow-shop scheduling with on-site renewable energy generation using a case in the United States, *Computers and Industrial Engineering*, 149:106812, 2020.
  - J6. S. Wang<sup>§</sup>, H. Gangammanavar, S. Eksioğlu, and S. J. Mason, Statistical estimation of operating reserve requirements using rolling horizon stochastic optimization, *Annals of Operations Research*, 292(1): 371–397, 2020.
  - J5. Z. Azadi<sup>§</sup>, H. Gangammanavar, and S. Eksioğlu, Developing childhood vaccine administration and inventory replenishment policies that minimize open vial wastage. *Annals of Operations Research*, 292(1): 215–247, 2020.
  - J4. S. Wang<sup>§</sup>, H. Gangammanavar, S. D. Eksioğlu and S. J. Mason, Stochastic Optimization for Energy Management in Power Systems With Multiple Microgrids, in *IEEE Transactions on Smart Grid*, vol. 10, no. 1, pp. 1068-1079, Jan. 2019.
  - J3. H. Gangammanavar and S. Sen, Two-scale Stochastic Optimization for Controlling Distributed Storage Devices, in *IEEE Transactions on Smart Grid*, vol. 9, no. 4, pp. 2691-2702, July 2018.
  - J2. H. Gangammanavar, S. Sen and V. M. Zavala, Stochastic Optimization of Sub-Hourly Economic Dispatch With Wind Energy, in *IEEE Transactions on Power Systems*, 31(2), 949-959, March 2016.
  - J1. R. Li, H. Gangammanavar and A. Eryilmaz, Optimal Dynamic Coding and Rate-Control for Serving Deadline-Constrained Traffic over Time-Varying Channels, in *IEEE Transactions on Information Theory*, 58(10):6556-6571, 2012.

## Conference Proceedings

- P2. Z. Azadi<sup>§</sup>, H. Gangammanavar and S. D. Eksioğlu, Stochastic Optimization for Vaccine Vial Replenishment, in *Proceedings of the 2016 Industrial and Systems Engineering Research Conference (ISERC)*, Anaheim, CA.
- P1. H. Gangammanavar and A. Eryilmaz, Dynamic Coding and Rate-Control for Serving Deadline-Constrained Traffic over Fading Channels, in *Proceedings of IEEE International Symposium on Information Theory (ISIT)* Austin TX, pp. 1788–1792, 13-18 June 2010.

## Under Review

- R4. H. Gangammanavar, Sampling-based Decomposition Algorithms for Multistage Stochastic Programming, 2022 (submitted).
- R3. M. Ahn, H. Gangammanavar, and D. Troxell<sup>‡</sup>, Tractable Continuous Approximations for Constraint Selection via Cardinality Minimization, 2022 (submitted).
- R2. N. Sakhavand, V. Chen, H. Gangammanavar, and J. Rosenberger, Design of Experiments for the Stochastic Unit Commitment with Economic Dispatch Models, 2022 (submitted).
- R1. S. Tabrizian<sup>†</sup>, H. Gangammanavar, and H. Üster, An Adaptive Cluster Sampling-based Solution Method for Two-stage Stochastic Linear Programs, 2020 (under revision).

## Grants

- G1. *New Abstractions and Randomized Algorithms for Multiscale Stochastic Optimization*, Role: Lead PI; Department of Energy - Office of Science, #DE-SC0023361, \$2,040,256 (my portion \$532,151); October 2022 - September 2025.
- G2. *Stochastic Programming Decomposition Models and Algorithms for Discrete-event Dynamic Systems*, Role: Sole PI; Office of Naval Research, #N00014-22-1-2603, \$387,826, 2022-2025.
- G3. *“Data Assimilation for Radiation Therapy Planning via Optimization: Adaptive Deterministic Models”*, Role: PI (with S. Çetinkaya), SMU Lyle School Research Seed Funding, \$30,500.00, March - December 2020.
- G4. *“Multi-temporal Flexibility Services in Transactive Energy Architecture”*, Role: Co-PI (with M. Khodayar), SMU Lyle School Research Seed Funding, \$23,760.00, March - December 2018.
- G5. *“A Data-Driven Support System for Coordinated Operation of Electricity and Natural Gas Infrastructure”*, Role: PI (with M. Khodayar), SMU Lyle School Research Seed Funding, \$25,080.00, March - December 2017.
- G6. *“Statistical Optimality, Algorithms and Resilience in Time-Staged Stochastic Systems”*, Role: Co-PI (with S. Sen (PI)), Air Force Office of Scientific Research, #FA9550-15-1-0267, \$450,000, August 2015 - December 2018.

## Honors

- Honorable mention at Undergraduate Operations Research Prize (for UG student D. Troxell; joint work with M. Ahn), INFORMS Annual Meeting, Anaheim, Oct. 2021;
- Fellow of the Dedman College Interdisciplinary Institute 2017-18, Southern Methodist University;
- Honorable mention at Minority Issues Forum poster competition (for Z. Azadi\*; joint work with S. Eksioğlu), INFORMS Annual Meeting, Nashville, Nov. 2016;

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<sup>‡</sup>Undergraduate student advisee

<sup>§</sup>Member of students Dissertation Committee

- Postdoctoral Fellowship, Clemson University, 2015-16;
- Travel grant recipient, PhD Winter School on Managing Uncertainty in Energy Infrastructure Investment, Oppdal, Norway, 2011;
- Travel grant recipient, Illinois Wireless Summer School, University of Illinois at Urbana-Champaign 2009.

### Courses taught

At Southern Methodist University\*

- EMIS 3360 Operations Research (UG): Spring 2017 (26), 2018 (20), 2019 (24), 2022 (19); Fall 2021 (25);
- EMIS 8360 Operations Research Models (G): Fall 2016 (26), 2017 (13), 2018 (15), 2020 (4), Spring 2020 (10), 2021 (2);
- EMIS 8371 Linear Programming (G): Fall 2018 (6), 2019 (9); Spring 2022 (10);
- EMIS 8384 Stochastic Programming (G): Spring 2018 (13), Spring 2020 (6);

At University of Southern California

- ISE 310 Facilities and Logistics (UG): Spring 2015;
- ISE 330 Introduction to Operations Research: Deterministic Models (UG): Spring 2015, 2014; Fall 2014, 2013;
- ISE 499 Special Topics: Integrative Systems Engineering (UG): Spring 2015, 2014;
- ISE 536 Linear Programming and Extensions (G): Fall 2014.

### Ph.D. Supervision

- Sakitha Ariyaratne, PhD Candidate  
OREM, SMU.
- Niloofar Fadavi, PhD Student  
OREM, SMU.
- Mahsa Sheikhihafshajani, PhD Student  
OREM, SMU (co-advised with Sila Çetinkaya).
- Siavash Tabrizian, PhD, December 2021  
OREM, SMU (co-advised with Halit Uster)  
Thesis: "Sampling-based Algorithms for Two-stage Stochastic Programs and Applications".

### Masters Supervision

- Nahal Sakhavand, MS  
EMIS, Southern Methodist University. Graduated: Summer 2018.

### Undergraduate Mentoring

- David Troxell, BS-MS  
OREM, Southern Methodist University. Graduated: Spring 2021.

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\*Parenthetical terms indicate course enrollment size.

## Professional Society Service

- *Organization Committee Member:*
  - Organizing committee member and co-chair of contributed sessions tracks at INFORMS Annual Meeting 2023;
  - Program committee member (Energy System Track) at IISE Annual Conference and Expo 2022;
  - NSF Operations Engineering Workshop, SMU, March 2019.
- *Conference Session Chair:*
  - INFORMS Annual Meetings 2022 (Indianapolis), 2021 (Anaheim), 2019 (Seattle), INFORMS 2018 (Phoenix), 2014 (San Francisco).
- *Referee:* *INFORMS Operations Research, Journal on Computing, and Journal on Optimization; SIAM Journal on Optimization; Computational Optimization and Applications; IISE Transactions; Optimization Letters; Energy Systems; Omega: International Journal of Management Science; IEEE Transaction on Power Systems, Transactions on Smart Grid, and Transactions on Sustainable Energy; Electric Power Systems Research; IET Generation, Transmission and Distribution.*
- *Panelist:* National Science Foundation, 2017.
- *Committee Member:* George Nicholson Student Paper Competition, INFORMS 2020, 2021; INFORMS-ENRE Student Paper Competition, INFORMS, 2018.
- *Faculty Advisor:* SMU INFORMS Student Chapter, 2018-Present.
- *Vice-President:* Ohio State University INFORMS Student Chapter, 2011-2012.

## Professional Society Membership

- Institute for Operations Research and Management Science (INFORMS): Optimization Society; Computing Society; and Energy, Natural Resources, and Environment Society.
- Society of Industrial and Applied Mathematics (SIAM).
- Mathematical Optimization Society (MOS).

## Graduate Committee Service

- Bin Huang, ECE-Ph.D., Southern Methodist University (ongoing)
- Toby Huskinson, OREM-Ph.D., Southern Methodist University (ongoing)
- Chengyu Ke, OREM-Ph.D., Southern Methodist University (ongoing)
- Yanling Lin, ECE-Ph.D., Southern Methodist University (ongoing)
- You Lin, ECE-Ph.D., Southern Methodist University (ongoing)
- Xinyun Lu, ECE-Ph.D., Southern Methodist University (ongoing)
- Tao Wu, ECE-Ph.D., Southern Methodist University (ongoing)
- Yazeed Alkhrijah, ECE-Ph.D., Southern Methodist University (ongoing)
- Abdulraheem Alobaidi, ECE-Ph.D., Southern Methodist University (2022)
- Emily McIntosh, OREM-Praxis Proposal, Southern Methodist University (2022)
- Justin B. Brown, OREM-Ph.D., Southern Methodist University, (2021).
- Hedieh Ashrafi, OREM-Ph.D., Southern Methodist University (2021)

- Shengfei Yin, ECE-Ph.D., Southern Methodist University (2021)
- Shasha Wang, IE-Ph.D., Clemson University (2020)
- Mohammed Abdul Qadeer (Praxis Proposal), Southern Methodist University (2020)
- Mahdi Khodayar, ECE-Ph.D., Southern Methodist University (2020)
- Xinan Wang, ECE, Southern Methodist University (2020)
- Ying Zhang, ECE, Southern Methodist University (2020)
- Naderehsadat Mansouri, EMIS-Ph.D., Southern Methodist University (2019)
- Peng Yang, EMIS-Praxis Proposal, Southern Methodist University (2019)
- Amin Ziaefar, EMIS-Ph.D., Southern Methodist University (2019)
- Site Wang, IE-Ph.D., Clemson University (2018).

### **Administrative Service**

- Member and chair, OREM Graduate Committee, 2022 - present;
- OREM Department Seminar Organizer, 2020-present.
- Member and chair, Course Coordination Committee on OR Methods, 2019 – 2022;
- OREM department representative on Lyle Academic Affairs Committee, 2021 – 2022;
- Member, Accreditation and Academic Programs, 2020 – 2021;
- Member, Faculty search committee, 2018-19, 2019-20, 2021-22;
- Instructor, Summer Bit Blast, workshop organized by the Center for Research Computing (SMU), July 2022;
- Judge, Dallas Regional Science and Engineering Fair, 2020 and 2021;
- Judge, Lyle Research Day, 2016, 2017, 2018, and 2019.

### **Invited Seminars**

- Decision Sciences Area Seminar, Indian Institute of Management, Bangalore, December 2021.
- Industrial Engineering, University of Houston, March 2021.
- Industrial, Manufacturing, and Systems Engineering, University of Texas at Arlington, December 2018.
- Center for Applicable Mathematics, Tata Institute of Fundamental Research, Bangalore, July 2018.
- Department of Mechanical Engineering, University of Texas at Dallas, June 2018.
- Dedman College Interdisciplinary Institute (DCII), Operations Research and Statistics Cluster towards Integrative Analytics, SMU, February 2017.
- Department of Engineering Management, Information, and Systems, Southern Methodist University, February 2016.
- Industrial Engineering Technical Innovation Seminar Series, Clemson University, November 2016.
- Ming Hsieh Department of Electrical Engineering, University of Southern California, October 2014.
- Daniel J Epstein Department of Industrial and Systems Engineering, University of Southern California, October 2014.

## Conference Presentations

- *Sequential sampling-based solution algorithms for distributionally robust optimization*,
  - International Conference on Continuous Optimization, Lehigh, PA, July 2022.
  - International Conference on Stochastic Programming, Trondheim, July 2019.
- *A sampling-based branch-and-cut algorithm for two-stage stochastic mixed-integer programming*,
  - INFORMS Annual Meeting, Anaheim, 2021.
- *Stochastic decomposition for two-stage stochastic linear programs with random cost coefficients*,
  - INFORMS Annual Meeting, Phoenix, Nov. 2018.
- *Stochastic programming framework for coordinated operation of power systems with multiple microgrids*,
  - International Symposium on Mathematical Programming, Bordeaux, July 2018.
  - INFORMS Optimization Society Conference, Denver, March 2018.
- *Sequential sampling-based optimization for power systems application*, INFORMS Annual Meeting, Nashville, Nov. 2016.
- *Convergence proofs of SDDP and multistage stochastic decomposition* with S. Sen, International Conference on Stochastic Programming, Buzios, Brazil, June 2016.
- *Stochastic dynamic linear programming: A sequential sampling algorithm* with S. Sen,
  - INFORMS Optimization Society Conference, Greenville, SC, March 2020.
  - 21st Conference of the International Federation of Operational Research Societies, Quebec City, Canada, July 2017,
  - SIAM Conference on Optimization, Vancouver, Canada, May 2017,
  - International Conference on Stochastic Programming, Buzios, Brazil, June 2016.
- *Multiple timescale stochastic optimization for integrating renewable resources* with S. Sen:
  - INFORMS Annual Meeting, San Francisco, Nov. 2014
  - Workshop on Optimization Under Uncertainty: Energy, Transportation and Natural Resources, University of California-Davis, Nov. 2014
  - Smartgrid Challenges, University of Arizona, Tucson, Mar. 2013.
- *Stochastic optimization of sub-hourly economic dispatch with wind generation*
  - INFORMS Annual Meeting, San Francisco, Nov. 2014
  - INFORMS Annual Meeting, Minneapolis, Oct. 2013.
- *Dynamic coding and rate-control for serving deadline-constrained traffic over fading channels*, with A. Eryilmaz, IEEE International Symposium on Information Theory (ISIT), Austin, Jun. 2010.

## Workshops Attended

- “Deep Learning”, 25th Annual Teaching Effectiveness Symposium, Center for Teaching Excellence, Southern Methodist University, August 2017.
- New Faculty Colloquium, INFORMS Annual Meeting 2016, Nashville, October 2016.
- “A Conversation between Artificial Intelligence, Operations Research and Control Theory on Stochastic Optimization”, NSF Workshop at Rutgers University, 2012.
- “Managing Uncertainty in Energy Infrastructure Investments”, Ph.D. Winter School, Oppdal, Norway, 2011 (recipient of workshop travel grant).
- Ph.D. Workshop at 12th International Conference on Stochastic Programming, Halifax, NS, Canada, 2010.
- Illinois Wireless Summer School, University of Illinois, Urbana-Champaign, IL, 2010 (recipient of summer school travel grant).