



## Ram Rajagopal

Associate Professor of Civil and Environmental Engineering, Senior Fellow at the Precourt Institute for Energy and Professor, by courtesy, of Electrical Engineering

 Curriculum Vitae available Online

### CONTACT INFORMATION

- **Administrator**

Lisa Boissier - Administrator

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### Bio

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#### BIO

Ram Rajagopal is an Associate Professor of Civil and Environmental Engineering at Stanford University, where he directs the Stanford Sustainable Systems Lab (S3L), focused on large-scale monitoring, data analytics and stochastic control for infrastructure networks, in particular, power networks. His current research interests in power systems are in the integration of renewables, smart distribution systems, and demand-side data analytics.

He holds a Ph.D. in Electrical Engineering and Computer Sciences and an M.A. in Statistics, both from the University of California Berkeley, Masters in Electrical and Computer Engineering from University of Texas, Austin and Bachelors in Electrical Engineering from the Federal University of Rio de Janeiro. He is a recipient of the NSF CAREER Award, Powell Foundation Fellowship, Berkeley Regents Fellowship and the Makhoul Conjecture Challenge award. He holds more than 30 patents and several best paper awards from his work and has advised or founded various companies in the fields of sensor networks, power systems, and data analytics.

#### ACADEMIC APPOINTMENTS

- Associate Professor, Civil and Environmental Engineering
- Senior Fellow, Precourt Institute for Energy
- Associate Professor (By courtesy), Electrical Engineering
- Member, Child Health Research Institute
- Affiliate, Precourt Institute for Energy

#### ADMINISTRATIVE APPOINTMENTS

- Co-Academic Director, Stanford Global Projects Center, (2018- present)
- Director and Founding Researcher, Stanford University Bits and Watts Lab, (2016- present)

#### HONORS AND AWARDS

- NSF CAREER Award, NSF (2016)

#### LINKS

- Ram Rajagopal: <http://web.stanford.edu/~ramr/>

## Teaching

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### COURSES

#### 2018-19

- Data Analytics for Urban Systems: CEE 322 (Aut)
- Introduction to Sensing Networks for CEE: CEE 155, CEE 255 (Spr)
- Modern Power Systems Engineering: CEE 272R (Win)
- SmartGrids and Advanced Power Systems Seminar: CEE 272T, EE 292T (Aut, Win, Spr)

#### 2017-18

- Data Analytics for Urban Systems: CEE 322 (Aut)
- Introduction to Sensing Networks for CEE: CEE 155 (Spr)
- Modern Power Systems Engineering: CEE 272R (Spr)
- SmartGrids and Advanced Power Systems Seminar: CEE 272T, EE 292T (Aut, Win, Spr)

#### 2016-17

- Data Analytics for Urban Systems: CEE 322 (Aut)
- Modern Power Systems Engineering: CEE 272R (Spr)
- SmartGrids and Advanced Power Systems Seminar: CEE 272T, EE 292T (Aut, Win, Spr)

#### 2015-16

- Data Analytics for Urban Systems: CEE 322 (Aut)
- Introduction to Sensing Networks for CEE: CEE 155, CEE 255 (Win)
- Modern Power Systems Engineering: CEE 272R (Spr)
- SmartGrids and Advanced Power Systems Seminar: CEE 272T, EE 292T (Aut, Win, Spr)

### STANFORD ADVISEES

#### Orals Chair

Maria Roumpani

#### Postdoctoral Faculty Sponsor

Herman Donner, Yuting Ji, Mohammad Rasouli

#### Doctoral Dissertation Advisor (AC)

Jose Bolorinos, Siobhan Powell, Gustavo Vianna Cezar

#### Master's Program Advisor

Maya Habib, Samuel Kramer, Zhenhua Zhang

#### Doctoral (Program)

Zhecheng Wang

## Publications

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### PUBLICATIONS

- **Optimal occupancy-driven parking pricing under demand uncertainties and traveler heterogeneity: A stochastic control approach** *TRANSPORTATION RESEARCH PART B-METHODOLOGICAL*

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- Qian, Z. (., Rajagopal, R.  
2014; 67: 144-165
- **Network Risk Limiting Dispatch: Optimal Control and Price of Uncertainty** *IEEE TRANSACTIONS ON AUTOMATIC CONTROL*  
Zhang, B., Rajagopal, R., Tse, D.  
2014; 59 (9): 2442-2456
  - **Household Energy Consumption Segmentation Using Hourly Data** *IEEE TRANSACTIONS ON SMART GRID*  
Kwac, J., Flora, J., Rajagopal, R.  
2014; 5 (1): 420-430
  - **Smart Meter Driven Segmentation: What Your Consumption Says About You** *IEEE TRANSACTIONS ON POWER SYSTEMS*  
Albert, A., Rajagopal, R.  
2013; 28 (4): 4019-4030
  - **Value of Aggregation In Smart Grids** *IEEE International Conference on Smart Grid Communications (SmartGridComm)*  
Sevlian, R., Rajagopal, R.  
IEEE.2013: 714-719
  - **Balancing marine ecosystem impact and freshwater consumption with water-use fees in California's power markets: An evaluation of possibilities and trade-offs** *Balancing marine ecosystem impact and freshwater consumption with water-use fees in California's power markets: An evaluation of possibilities and trade-offs*  
Bolorinos, J., Yu, Y., Ajami, N. K., Rajagopal, R.  
2018; 226 (C): 644-654
  - **Data-driven planning of distributed energy resources amidst socio-technical complexities** *Nature Energy*  
Jain, R. K., Qin, J., Rajagopal, R.  
2017
  - **Approximation Algorithms for Optimization of Combinatorial Dynamical Systems** *IEEE TRANSACTIONS ON AUTOMATIC CONTROL*  
Yang, I., Burden, S. A., Rajagopal, R., Sastry, S. S., Tomlin, C. J.  
2016; 61 (9): 2644-2649
  - **Data-Driven Targeting of Customers for Demand Response** *IEEE TRANSACTIONS ON SMART GRID*  
Kwac, J., Rajagopal, R.  
2016; 7 (5): 2199-2207
  - **Online Modified Greedy Algorithm for Storage Control Under Uncertainty** *IEEE TRANSACTIONS ON POWER SYSTEMS*  
Qin, J., Chow, Y., Yang, J., Rajagopal, R.  
2016; 31 (3): 1729-1743
  - **Scheduling Non-Preemptive Deferrable Loads** *IEEE TRANSACTIONS ON POWER SYSTEMS*  
O'Brien, G., Rajagopal, R.  
2016; 31 (2): 835-845
  - **Distributed Online Modified Greedy Algorithm for Networked Storage Operation Under Uncertainty** *IEEE TRANSACTIONS ON SMART GRID*  
Qin, J., Chow, Y., Yang, J., Rajagopal, R.  
2016; 7 (2): 1106-1118
  - **Parking Sensing and Information System Sensors, Deployment, and Evaluation** *TRANSPORTATION RESEARCH RECORD*  
Chen, X., Qian, Z. (., Rajagopal, R., Stiers, T., Flores, C., Kavalier, R., Williams, F.  
2016: 81-89
  - **Shapley Value Estimation for Compensation of Participants in Demand Response Programs** *IEEE TRANSACTIONS ON SMART GRID*  
O'Brien, G., El Gamal, A., Rajagopal, R.  
2015; 6 (6): 2837-2844
  - **Ranking appliance energy efficiency in households: Utilizing smart meter data and energy efficiency frontiers to estimate and identify the determinants of appliance energy efficiency in residential buildings** *ENERGY AND BUILDINGS*  
Kavousian, A., Rajagopal, R., Fischer, M.  
2015; 99: 220-230

- **Wind Aggregation Via Risky Power Markets** *IEEE TRANSACTIONS ON POWER SYSTEMS*  
Zhao, Y., Qin, J., Rajagopal, R., Goldsmith, A., Poor, H. V.  
2015; 30 (3): 1571-1581
- **Competition and Coalition Formation of Renewable Power Producers** *IEEE TRANSACTIONS ON POWER SYSTEMS*  
Zhang, B., Johari, R., Rajagopal, R.  
2015; 30 (3): 1624-1632
- **Optimal dynamic pricing for morning commute parking** *TRANSPORTMETRICA A-TRANSPORT SCIENCE*  
Qian, Z. (., Rajagopal, R.  
2015; 11 (4): 291-316
- **Structural health monitoring of progressive damage** *EARTHQUAKE ENGINEERING & STRUCTURAL DYNAMICS*  
Mollineaux, M., Rajagopal, R.  
2015; 44 (4): 583-600
- **Thermal Profiling of Residential Energy Use** *IEEE TRANSACTIONS ON POWER SYSTEMS*  
Albert, A., Rajagopal, R.  
2015; 30 (2): 602-611
- **The impacts of electricity dispatch protocols on the emission reductions due to wind power and carbon tax.** *Environmental science & technology*  
Yu, Y., Rajagopal, R.  
2015; 49 (4): 2568-2576
- **Where Ds My Parking Spot? Online and Offline Prediction of Time-Varying Parking Occupancy** *TRANSPORTATION RESEARCH RECORD*  
Tamrazian, A., Qian, Z. (., Rajagopal, R.  
2015: 77-85
- **SnowFort: An Open Source Wireless Sensor Network for Data Analytics in Infrastructure and Environmental Monitoring** *IEEE SENSORS JOURNAL*  
Liao, Y., Mollineaux, M., Hsu, R., Bartlett, R., Singla, A., Raja, A., Bajwa, R., Rajagopal, R.  
2014; 14 (12)
- **Cost-of-Service Segmentation of Energy Consumers** *IEEE TRANSACTIONS ON POWER SYSTEMS*  
Albert, A., Rajagopal, R.  
2014; 29 (6): 2795-2803
- **Optimal dynamic parking pricing for morning commute considering expected cruising time** *TRANSPORTATION RESEARCH PART C-EMERGING TECHNOLOGIES*  
Qian, Z. (., Rajagopal, R.  
2014; 48: 468-490
- **RSSI-Fingerprinting-Based Mobile Phone Localization With Route Constraints** *IEEE TRANSACTIONS ON VEHICULAR TECHNOLOGY*  
Ergen, S. C., Tetikol, H. S., Kontik, M., Sevlian, R., Rajagopal, R., Varaiya, P.  
2014; 63 (1): 423-428
- **A Model For The Effect of Aggregation on Short Term Load Forecasting** *IEEE PES General Meeting*  
Sevlian, R. A., Rajagopal, R.  
IEEE.2014
- **Do Wind Power Producers have Market Power and Exercise It?** *IEEE PES General Meeting*  
Yu, Y., Zhang, B., Rajagopal, R.  
IEEE.2014
- **Aggregation for Load Servicing** *IEEE PES General Meeting*  
Patel, S., Sevlian, R., Zhang, B., Rajagopal, R.  
IEEE.2014
- **Data-Driven Benchmarking of Building Energy Efficiency Utilizing Statistical Frontier Models** *JOURNAL OF COMPUTING IN CIVIL ENGINEERING*  
Kavousian, A., Rajagopal, R.  
2014; 28 (1): 79-88

- **Towards optimal allocation of computer resources: Trade-offs between uncertainty quantification, discretization and model reduction** *ENVIRONMENTAL MODELLING & SOFTWARE*  
Leube, P. C., de Barros, F. P., Nowak, W., Rajagopal, R.  
2013; 50: 97-107
- **Sequential structural damage diagnosis algorithm using a change point detection method** *JOURNAL OF SOUND AND VIBRATION*  
Noh, H., Rajagopal, R., Kiremidjian, A. S.  
2013; 332 (24): 6419-6433
- **Detection and Statistics of Wind Power Ramps** *IEEE TRANSACTIONS ON POWER SYSTEMS*  
Sevlian, R., Rajagopal, R.  
2013; 28 (4): 3610-3620
- **Determinants of residential electricity consumption: Using smart meter data to examine the effect of climate, building characteristics, appliance stock, and occupants' behavior** *ENERGY*  
Kavousian, A., Rajagopal, R., Fischer, M.  
2013; 55: 184-194
- **Risk-limiting dispatch for integrating renewable power** *INTERNATIONAL JOURNAL OF ELECTRICAL POWER & ENERGY SYSTEMS*  
Rajagopal, R., Bitar, E., Varaiya, P., Wu, F.  
2013; 44 (1): 615-628
- **Risky Power Forward Contracts for Wind Aggregation** *51st Annual Allerton Conference on Communication, Control, and Computing*  
Zhao, Y., Qin, J., Rajagopal, R., Goldsmith, A., Poor, H. V.  
IEEE.2013: 54–61
- **Building dynamic thermal profiles of energy consumption for individuals and neighborhoods** *IEEE International Conference on Big Data (Big Data)*  
Albert, A., Rajagopal, R.  
IEEE.2013
- **Demand Response Targeting Using Big Data Analytics** *IEEE International Conference on Big Data (Big Data)*  
Kwac, J., Rajagopal, R.  
IEEE.2013
- **Dynamic Programming Solution to Distributed Storage Operation and Design** *General Meeting of the IEEE-Power-and-Energy-Society (PES)*  
Qin, J., Rajagopal, R.  
IEEE.2013
- **Financial Transmission Rights Perform Well in Power Markets with High Penetration of Wind Energy?** *General Meeting of the IEEE-Power-and-Energy-Society (PES)*  
Yu, Y., Rajagopal, R.  
IEEE.2013
- **Outage Detection in Power Distribution Networks with Optimally-Deployed Power Flow Sensors** *General Meeting of the IEEE-Power-and-Energy-Society (PES)*  
Zhao, Y., Sevlian, R., Rajagopal, R., Goldsmith, A., Poor, H. V.  
IEEE.2013
- **Storage in Risk Limiting Dispatch: Control and Approximation** *American Control Conference (ACC)*  
Qin, J., Su, H., Rajagopal, R.  
IEEE.2013: 4202–4208
- **A Method for Automatically Scheduling Notified Deferrable Loads** *American Control Conference (ACC)*  
O'Brien, G., Rajagopal, R.  
IEEE.2013: 5080–5085
- **Utility Customer Segmentation Based on Smart Meter Data: Empirical Study** *IEEE International Conference on Smart Grid Communications (SmartGridComm)*  
Kwac, J., Tan, C., Sintov, N., Flora, J., Rajagopal, R.  
IEEE.2013: 720–725

- **Oriented Wireless Sensing for Structural Health Monitoring** *9th International Workshop on Structural Health Monitoring (IWSHM)*  
Mollineaux, M., Rajagopal, R., Kiremidjian, A., Balafas, K.  
DESTECH PUBLICATIONS, INC.2013: 73–80
- **Risk Limiting Dispatch with Ramping Constraints** *IEEE International Conference on Smart Grid Communications (SmartGridComm)*  
Qin, J., Zhang, B., Rajagopal, R.  
IEEE.2013: 791–796
- **Data-Driven Forecasting Algorithms for Building Energy Consumption** *Conference on Sensors and Smart Structures Technologies for Civil, Mechanical, and Aerospace Systems*  
Noh, H. Y., Rajagopal, R.  
SPIE-INT SOC OPTICAL ENGINEERING.2013
- **Sequential detection of progressive damage** *Conference on Sensors and Smart Structures Technologies for Civil, Mechanical, and Aerospace Systems*  
Mollineaux, M., Rajagopal, R.  
SPIE-INT SOC OPTICAL ENGINEERING.2013
- **Risk Limiting Dispatch in Congested Networks** *50th Annual Allerton Conference on Communication, Control, and Computing (Allerton)*  
Rajagopal, R., Tse, D., Zhang, B.  
IEEE.2013: 1900–1907
- **Bringing Wind Energy to Market** *IEEE TRANSACTIONS ON POWER SYSTEMS*  
Bitar, E. Y., Rajagopal, R., Khargonekar, P. P., Poolla, K., Varaiya, P.  
2012; 27 (3): 1225-1235
- **Damage diagnosis algorithm using a sequential change point detection method with an unknown distribution for damage** *Conference on Sensors and Smart Structures Technologies for Civil, Mechanical, and Aerospace Systems*  
Noh, H. Y., Rajagopal, R., Kiremidjian, A. S.  
SPIE-INT SOC OPTICAL ENGINEERING.2012
- **Risk Limiting Dispatch of Wind Power** *American Control Conference (ACC)*  
Rajagopal, R., Bitar, E., Wu, F., Varaiya, P.  
IEEE COMPUTER SOC.2012: 4417–4422
- **Risk Limiting Dispatch** *General Meeting of the IEEE-Power-and-Energy-Society*  
Entriiken, R., Varaiya, P., Wu, F., Bialek, J., Dent, C., Tuohy, A., Rajagopal, R.  
IEEE.2012
- **Optimal Electric Energy Storage Operation** *General Meeting of the IEEE-Power-and-Energy-Society*  
Qin, J., Sevlian, R., Varodayan, D., Rajagopal, R.  
IEEE.2012
- **Wind Power Ramps: Detection and Statistics** *General Meeting of the IEEE-Power-and-Energy-Society*  
Sevlian, R., Rajagopal, R.  
IEEE.2012
- **Simultaneous Optimization of Sensor Placements and Balanced Schedules** *IEEE TRANSACTIONS ON AUTOMATIC CONTROL*  
Krause, A., Rajagopal, R., Gupta, A., Guestrin, C.  
2011; 56 (10): 2390-2405
- **Damage Diagnosis Algorithm for Civil Structures Using a Sequential Change Point Detection Method and Time-Series Analysis** *8th International Workshop on Structural Health Monitoring*  
Noh, H. Y., Rajagopal, R., Kiremidjian, A. S.  
DESTECH PUBLICATIONS, INC.2011: 55–62
- **The Role of Co-located Storage for Wind Power Producers in Conventional Electricity Markets** *American Control Conference (ACC)*  
Bitar, E., Rajagopal, R., Khargonekar, P., Poolla, K.  
IEEE.2011: 3886–3891
- **Arterial Travel Time Estimation Based On Vehicle Re-Identification Using Magnetic Sensors: Performance Analysis** *14th International IEEE Conference on Intelligent Transportation Systems (ITSC)*

Sanchez, R. O., Flores, C., Horowitz, R., Rajagopal, R., Varaiya, P.  
IEEE.2011: 997-1002

- **Real-Time Measurement of Link Vehicle Count and Travel Time in a Road Network** *IEEE TRANSACTIONS ON INTELLIGENT TRANSPORTATION SYSTEMS*  
Kwong, K., Kavalier, R., Rajagopal, R., Varaiya, P.  
2010; 11 (4): 814-825
- **Arterial travel time estimation based on vehicle re-identification using wireless magnetic sensors** *TRANSPORTATION RESEARCH PART C-EMERGING TECHNOLOGIES*  
Kwong, K., Kavalier, R., Rajagopal, R., Varaiya, P.  
2009; 17 (6): 586-606
- **Distributed Online simultaneous fault detection for multiple sensors** *2008 INTERNATIONAL CONFERENCE ON INFORMATION PROCESSING IN SENSOR NETWORKS, PROCEEDINGS*  
Rajagopal, R., Nguyen, X., Ergen, S. C., Varaiya, P.  
2008: 133-144
- **Universal quantile estimation with feedback in the communication-constrained setting** *2006 IEEE INTERNATIONAL SYMPOSIUM ON INFORMATION THEORY, VOLS 1-6, PROCEEDINGS*  
Rajagopal, R., Wainwright, M. J., Varaiya, P.  
2006: 836-840
- **Peak locations in all-pass signals the Makhoul Conjecture Challenge** *2001 IEEE INTERNATIONAL CONFERENCE ON ACOUSTICS, SPEECH, AND SIGNAL PROCESSING, VOLS I-VI, PROCEEDINGS*  
Rajagopal, R., Wenzel, L.  
2001: 3961-3964