Stanford

Rishee Jain

Associate Professor of Civil and Environmental Engineering

CONTACT INFORMATION

- **Administrator**

  Geoffrey Tuttle - Program Administrator

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Bio

BIO

Professor Jain's research focuses on the development of data-driven and socio-technical solutions to sustainability problems facing the urban built environment. His work lies at the intersection of civil engineering, data analytics and social science. Recently, his research has focused on understanding the socio-spatial dynamics of commercial building energy usage, conducting data-driven benchmarking and sustainability planning of urban buildings and characterizing the coupled dynamics of urban systems using data science and micro-experimentation. For more information, see the active projects on his lab (Stanford Urban Informatics Lab) website.

ACADEMIC APPOINTMENTS

- Associate Professor, Civil and Environmental Engineering

HONORS AND AWARDS

- Eugene L. Grant Teaching Award, Stanford University (2023)
- CAREER Award, National Science Foundation (2019)
- Science, Engineering and Education for Sustainability (SEES) Fellow, National Science Foundation (2014)

PROFESSIONAL EDUCATION

- PhD, Columbia University , Civil Engineering
- MS, Columbia University , Civil Engineering
- BS, University of Texas at Austin , Civil, Environmental & Architectural Engineering

LINKS

- Urban Informatics Lab Website: http://www.uil.stanford.edu/

Research & Scholarship

PROJECTS

- Data-driven Sustainable Upgradation of Dharavi Informal Settlement (Mumbai, India) - Stanford University

Teaching

COURSES

2025-26

- Building Systems Design & Analysis: CEE 156, CEE 256 (Win)
- Intro to Urban Sys Engrg: CEE 243 (Aut)

2024-25

- Building Systems Design & Analysis: CEE 156, CEE 256 (Win)
- Intro to Urban Sys Engrg: CEE 243 (Aut)
- Racial Equity in Energy: CEE 130R, CEE 330 (Spr)

2023-24

- Building Systems Design & Analysis: CEE 156, CEE 256 (Win)
- Racial Equity in Energy: CEE 130R, CEE 330 (Aut)

2022-23

- Building Systems Design & Analysis: CEE 156, CEE 256 (Win)
- Intro to Urban Sys Engrg: CEE 243 (Spr)
- Racial Equity in Energy: AFRICAAM 131, CEE 130R, CEE 330 (Spr)

STANFORD ADVISEES

Doctoral Dissertation Reader (AC)

Fletcher Passow, Lavinia Pedrollo, Akshay Rao, Steinar Rasmussen, Tinger Zhu

Orals Chair

Philipp Reineke

Postdoctoral Faculty Sponsor

Jeslu Jacob

Doctoral Dissertation Advisor (AC)

Eleanor Ho, Juliet Nwagwu Ume-Ezeoke, Dipashreya Sur

Master's Program Advisor

Hunter Barth, Yingjie Chen, Antonio Feliciano, Rapha Felipe, Anya Ghose, Khadija Hanif, Ern Lek, Yan Liu, Kate Meleski, Johan Petersmann, Juan Bautista Romaniuk, Peisen Zhao

Doctoral (Program)

Ryan Auker, Eleanor Ho, Yun-Dam Ko, Jose Lemus, Juliet Nwagwu Ume-Ezeoke, Angelica Stewart, Dipashreya Sur

Postdoctoral Research Mentor

Eva Bianchi

Publications

PUBLICATIONS

- **Building energy consumption and urban form: A multi-temporal empirical investigation** *ENVIRONMENT AND PLANNING B-URBAN ANALYTICS AND CITY SCIENCE*

Ho, C., Miotti, M., Jain, R. K.
2025

- **EnergyPlus as a computational engine for commercial building operational digital twins** *ENERGY AND BUILDINGS*
  Naeem, A., Ho, C., Kolderup, E., Jain, R. K., Benson, S., de Chalendar, J.
  2025; 329
- **From Innovation to Implementation: Exploring Market Opportunities for MZOCC in the Future of HVAC**
  Jacob, J., Jain, R., ACM
  ASSOC COMPUTING MACHINERY.2025: 482-486
- **Towards Semi-Automated Replication of Floor Plan Layouts for Applications in Building Thermal Performance Evaluation**
  Ume-Ezeoke, J., Gorle, C., Jain, R.
  edited by Jafari, A., Zhu, Y.
  AMER SOC CIVIL ENGINEERS.2025: 904-913
- **DARLIN: Domain-guided Augmented Retrieval for LLM-based INterpretable HVAC Control**
  Ko, Y., Jain, R. K., ACM
  ASSOC COMPUTING MACHINERY.2025: 440-443
- **Multi-scale retrofit pathways for improving building performance and energy equity across cities: A UBEM framework** *ENERGY AND BUILDINGS*
  Excell, L. E., Nutkiewicz, A., Jain, R. K.
  2024; 324
- **Predicting indoor personalized heat stress using wearable sensors and data-driven models** *JOURNAL OF BUILDING ENGINEERING*
  Nihar, K., Jain, R. K., Cheong, S.
  2024; 97
- **Design and investment strategy optimization of district cooling system during the ramp-up phase** *ENERGY AND BUILDINGS*
  Su, L., Yang, Z., Jain, R. K.
  2024; 321
- **E-Audit: A "no-touch" energy audit that integrates machine learning and simulation** *ENERGY AND BUILDINGS*
  Excell, L. E., Andrews, A., Jain, R. K.
  2024; 317
- **Utilizing wearable technology to characterize and facilitate occupant collaborations in flexible workspaces**
  Maisha, K., Frei, M., Quintana, M., Chua, Y., Jain, R., Miller, C.
  2024
- **Modeling the Decarbonization Potential of a Time-of-Use Building Energy Benchmarking Model at the Urban Scale**
  Andrews, A., Jain, R. K.
  edited by Turkan, Y., Louis, J., Leite, F., Ergan, S.
  AMER SOC CIVIL ENGINEERS.2024: 304-312
- **Exploring the Empirical Relationship between Urban Form and Building Energy Use**
  Ho, C., Miotti, M., Jain, R.
  edited by Turkan, Y., Louis, J., Leite, F., Ergan, S.
  AMER SOC CIVIL ENGINEERS.2024: 953-961
- **Mitigating Energy Efficiency Inequities Using Integrated Data-Driven and Parametric Energy Modeling**
  Excell, L. E., Nutkiewicz, A., Jain, R. K.
  edited by Turkan, Y., Louis, J., Leite, F., Ergan, S.
  AMER SOC CIVIL ENGINEERS.2024: 246-254
- **Examining the impact of energy efficiency retrofits and vegetation on energy performance of institutional buildings: An equity-driven analysis** *APPLIED ENERGY*
  Excell, L. E., Jain, R. K.
  2024; 357

- **Evaluating building decarbonization potential in U.S. cities under emissions based building performance standards and load flexibility requirements** *JOURNAL OF BUILDING ENGINEERING*
  Andrews, A., Jain, R. K.
  2023; 76
- **Quantifying the pedestrian access potential of suburban street network retrofits** *ENVIRONMENT AND PLANNING B-URBAN ANALYTICS AND CITY SCIENCE*
  Aras, R. L., Ouellette, N. T., Jain, R. K.
  2023
- **Tropical climates and the interplay between IEQ and energy consumption in buildings: A review** *BUILDING AND ENVIRONMENT*
  Verma, A., Gupta, V., Nihar, K., Jana, A., Jain, R. K., Deb, C.
  2023; 242
- **Natural ventilation versus air pollution: assessing the impact of outdoor pollution on natural ventilation potential in informal settlements in India** *ENVIRONMENTAL RESEARCH: INFRASTRUCTURE AND SUSTAINABILITY*
  Nihar, K., Nutkiewicz, A., Jain, R. K.
  2023; 3 (2)
- **TOM.D: Taking advantage of microclimate data for urban building energy modeling** *ADVANCES IN APPLIED ENERGY*
  Dougherty, T. R., Jain, R. K.
  2023; 10
- **The impact of urban form on daily mobility demand and energy use: Evidence from the United States** *APPLIED ENERGY*
  Miotti, M., Needell, Z. A., Jain, R. K.
  2023; 339
- **A barrier too far: Understanding the role of intersection crossing distance on bicycle rider behavior in Chicago** *ENVIRONMENT AND PLANNING B-URBAN ANALYTICS AND CITY SCIENCE*
  Aras, R. L., Ouellette, N. T., Jain, R. K.
  2023
- **Invisible walls: Exploration of microclimate effects on building energy consumption in New York City** *SUSTAINABLE CITIES AND SOCIETY*
  Dougherty, T. R., Jain, R. K.
  2023; 90
- **Multi-scale retrofit pathways for improving building performance and energy equity across cities: A UBEM framework**
  Excell, L. E., Nutkiewicz, A., Jain, R. K.
  edited by Rajagopalan, P., Soebarto, Akbari, H.
  RMIT PUBLISHING.2023: 1017-1026
- **Beyond Energy Efficiency: A clustering approach to embed demand flexibility into building energy benchmarking** *APPLIED ENERGY*
  Andrews, A., Jain, R. K.
  2022; 327
- **Optimizing pipe network design and central plant positioning of district heating and cooling System: A Graph-Based Multi-Objective genetic algorithm approach** *APPLIED ENERGY*
  Su, L., Nie, T., Ho, C., Yang, Z., Calvez, P., Jain, R. K., Donat, R.
  2022; 325
- **A Global Building Occupant Behavior Database.** *Scientific data*
  Dong, B., Liu, Y., Mu, W., Jiang, Z., Pandey, P., Hong, T., Olesen, B., Lawrence, T., O'Neil, Z., Andrews, C., Azar, E., Bandurski, K., Bardhan, et al
  2022; 9 (1): 369
- **Cool roofs can mitigate cooling energy demand for informal settlement dwellers** *RENEWABLE & SUSTAINABLE ENERGY REVIEWS*
  Nutkiewicz, A., Mastrucci, A., Rao, N. D., Jain, R. K.
  2022; 159
- **Exploring Use Cases for an Hourly Building Energy Benchmarking Platform**
  Andrews, A., Jain, R. K., ACM

ASSOC COMPUTING MACHINERY.2022: 303-304

- **Assessing the Impact of Outdoor Air Pollution on Natural Ventilation Potential of Informal Settlements in India**
  Nihar, K., Nutkiewicz, A., Jain, R. K.
  edited by Saelens, D., Laverge, J., Boydens, W., Helsen, L.
  INT BUILDING PERFORMANCE SIMULATION ASSOC-IBPSA.2022: 2499-2506
- **Defining the life cycle energy implications of informal settlement redevelopment**
  Nutkiewicz, A., Jain, R. K.
  edited by Saelens, D., Laverge, J., Boydens, W., Helsen, L.
  INT BUILDING PERFORMANCE SIMULATION ASSOC-IBPSA.2022: 2491-2498
- **Context-aware Urban Energy Analytics (CUE-A): A framework to model relationships between building energy use and spatial proximity of urban systems** *SUSTAINABLE CITIES AND SOCIETY*
  Shivaram, R., Yang, Z., Jain, R. K.
  2021; 72
- **Exploring the influence of urban context on building energy retrofit performance: A hybrid simulation and data-driven approach** *ADVANCES IN APPLIED ENERGY*
  Nutkiewicz, A., Choi, B., Jain, R. K.
  2021; 3
- **Data-driven optimization of building layouts for energy efficiency** *ENERGY AND BUILDINGS*
  Sonta, A., Dougherty, T. R., Jain, R. K.
  2021; 238
- **Uncertainty Matters: Bayesian Probabilistic Forecasting for Residential Smart Meter Prediction, Segmentation, and Behavioral Measurement and Verification** *ENERGIES*
  Roth, J., Chadalawada, J., Jain, R. K., Miller, C.
  2021; 14 (5)
- **Automated identification of urban substructure for comparative analysis.** *PloS one*
  Aras, R. L., Ouellette, N. T., Jain, R. K.
  2021; 16 (1): e0245067
- **Modeling aggregate human mobility patterns in cities based on the spatial distribution of local infrastructure**
  Miotti, M., Jain, R.
  edited by Bui, T. X.
  HICSS.2021: 1819-1828
- **SCHMEAR: Scalable Construction of Holistic Models for Energy Analysis from Rooftops**
  Dougherty, T. R., Huang, T., Chen, Y., Jain, R. K., Rajagopal, R., ACM
  ASSOC COMPUTING MACHINERY.2021: 111-120
- **SynCity: Using open data to create a synthetic city of hourly building energy estimates by integrating data-driven and physics-based methods** *APPLIED ENERGY*
  Roth, J., Martin, A., Miller, C., Jain, R. K.
  2020; 280
- **Harnessing smart meter data for a Multitiered Energy Management Performance Indicators (MEMPI) framework: A facility manager informed approach** *APPLIED ENERGY*
  Roth, J., Brown, H., Jain, R. K.
  2020; 276
- **Simulation-aided occupant-centric building design: A critical review of tools, methods, and applications** *ENERGY AND BUILDINGS*
  Azar, E., O'Brien, W., Carlucci, S., Hong, T., Sonta, A., Kim, J., Andargie, M. S., Abuimara, T., El Asmar, M., Jain, R. K., Ouf, M. M., Tahmasebi, F., Zhou, et al
  2020; 224
- **One approach does not fit all (smart) cities: Causal recipes for cities' use of "data and analytics"** *CITIES*
  Ruhlandt, R., Levitt, R., Jain, R., Hall, D.

2020; 104

- **Building Relationships: Using Embedded Plug Load Sensors for Occupant Network Inference** *IEEE EMBEDDED SYSTEMS LETTERS*
  Sonta, A. J., Jain, R. K.
  2020; 12 (2): 41–44
- **Examining the feasibility of using open data to benchmark building energy usage in cities: A data science and policy perspective** *ENERGY POLICY*
  Roth, J., Lim, B., Jain, R. K., Grueneich, D.
  2020; 139
- **Drivers of Data and Analytics Utilization within (Smart) Cities: A Multimethod Approach** *JOURNAL OF MANAGEMENT IN ENGINEERING*
  Ruhlandt, R., Levitt, R., Jain, R., Hall, D.
  2020; 36 (2)
- **Exploring the integration of simulation and deep learning models for urban building energy modelling and retrofit analysis**
  Nutkiewicz, A., Jain, R. K.
  edited by Corrado, Fabrizio, E., Gasparella, A., Patuzzi, F.
  INT BUILDING PERFORMANCE SIMULATION ASSOC-IBPSA.2020: 3209-3216
- **Notes Paper: Intelligent network topology based post-pandemic reintroduction policies for offices**
  Dougherty, T. R., Sonta, A., Jain, R. K., ASSOC COMPUTING MACHINERY
  ASSOC COMPUTING MACHINERY.2020: 258-261
- **Learning socio-organizational network structure in buildings with ambient sensing data** *DATA-CENTRIC ENGINEERING*
  Sonta, A., Jain, R. K.
  2020; 1
- **Energy-cyber-physical systems** *APPLIED ENERGY*
  Jin, M., Jain, R., Spanos, C., Jia, Q., Norford, L. K., Kjaergaard, M., Yan, J.
  2019; 256
- **Computational Approaches to Enable Smart and Sustainable Urban Systems** *JOURNAL OF COMPUTING IN CIVIL ENGINEERING*
  Jain, R. K., Abraham, D.
  2019; 33 (6)
- **Understanding the adoption and usage of data analytics and simulation among building energy management professionals: A nationwide survey** *BUILDING AND ENVIRONMENT*
  Srivastava, C., Yang, Z., Jain, R. K.
  2019; 157: 139–64
- **Urban Data Integration Using Proximity Relationship Learning for Design, Management, and Operations of Sustainable Urban Systems** *JOURNAL OF COMPUTING IN CIVIL ENGINEERING*
  Gupta, K., Yang, Z., Jain, R. K.
  2019; 33 (2)
- **DUE-A: Data-driven Urban Energy Analytics for understanding relationships between building energy use and urban systems**
  Yang, Z., Gupta, K., Jain, R. K.
  edited by Yan, J., Yang, H. X., Li, H., Chen
  ELSEVIER SCIENCE BV.2019: 6478–83
- **Optimizing Neighborhood-Scale Walkability**
  Sonta, A. J., Jain, R. K.
  edited by Cho, Y. K., Leite, F., Behzadan, A., Wang, C.
  AMER SOC CIVIL ENGINEERS.2019: 454–61
- **Spatial and Temporal Modeling of Urban Building Energy Consumption Using Machine Learning and Open Data**
  Roth, J., Bailey, A., Choudhary, S., Jain, R. K.
  edited by Cho, Y. K., Leite, F., Behzadan, A., Wang, C.
  AMER SOC CIVIL ENGINEERS.2019: 459–67

- **Energy modeling of urban informal settlement redevelopment: Exploring design parameters for optimal thermal comfort in Dharavi, Mumbai, India** *APPLIED ENERGY*
  Nutkiewicz, A., Jain, R. K., Bardhan, R.
  2018; 231: 433–45
- **Data-driven Urban Energy Simulation (DUE-S): A framework for integrating engineering simulation and machine learning methods in a multi-scale urban energy modeling workflow**
  Nutkiewicz, A., Yang, Z., Jain, R. K.
  ELSEVIER SCI LTD.2018: 1176–89
- **Understanding building occupant activities at scale: An integrated knowledge-based and data-driven approach**
  Sonta, A. J., Simmons, P. E., Jain, R. K.
  ELSEVIER SCI LTD.2018: 1–13
- **A review of occupant energy feedback research: Opportunities for methodological fusion at the intersection of experimentation, analytics, surveys and simulation** *APPLIED ENERGY*
  Khosrowpour, A., Jain, R. K., Taylor, J. E., Peschiera, G., Chen, J., Gulbinas, R.
  2018; 218: 304–16
- **DUE-B: Data-driven urban energy benchmarking of buildings using recursive partitioning and stochastic frontier analysis** *ENERGY AND BUILDINGS*
  Yang, Z., Roth, J., Jain, R. K.
  2018; 163: 58–69
- **Data-Driven, Multi-metric, and Time-Varying (DMT) Building Energy Benchmarking Using Smart Meter Data**
  Roth, J., Jain, R. K.
  edited by Smith, I. F., Domer, B.
  SPRINGER INTERNATIONAL PUBLISHING AG.2018: 568–93
- **Inferring Occupant Ties Automated Inference of Occupant Network Structure in Commercial Buildings**
  Sonta, A. J., Jain, R. K.
  edited by Ramachandran, G. S., Batra, N.
  ASSOC COMPUTING MACHINERY.2018: 126–29
- **OESPG: Computational Framework for Multidimensional Analysis of Occupant Energy Use Data in Commercial Buildings** *JOURNAL OF COMPUTING IN CIVIL ENGINEERING*
  Sonta, A. J., Jain, R. K., Gulbinas, R., Moura, J. M., Taylor, J. E.
  2017; 31 (4)
- **Data-driven planning of distributed energy resources amidst socio-technical complexities** *Nature Energy*
  Jain, R. K., Qin, J., Rajagopal, R.
  2017
- **Data-driven Urban Energy Simulation (DUE-S): Integrating machine learning into an urban building energy simulation workflow**
  Nutkiewicz, A., Yang, Z., Jain, R. K.
  edited by Yan, J., Wu, J., Li, H.
  ELSEVIER SCIENCE BV.2017: 2114–19
- **Intestinal Enteroendocrine Lineage Cells Possess Homeostatic and Injury-Inducible Stem Cell Activity** *Cell Stem Cell*
  Yan, K., Gevaert, O., Zheng, G., Anchang, B., Probert, C., et al
  2017; 21 (1): 78 - 90.e6
- **A Data Integration Framework for Urban Systems Analysis Based on Geo-Relationship Learning**
  Yang, Z., Gupta, K., Gupta, A., Jain, R. K.
  edited by Lin, K. Y., ElGohary, N., Tang, P.
  AMER SOC CIVIL ENGINEERS.2017: 467–74
- **Towards Automated Inference of Occupant Behavioral Dynamics Using Plug-Load Energy Data**
  Sonta, A. J., Simmons, P. E., Jain, R. K.
  edited by Lin, K. Y., ElGohary, N., Tang, P.

AMER SOC CIVIL ENGINEERS.2017: 290–97

- **Poster Abstract: Towards City-Scale Building Energy Performance Benchmarking**
  Yang, Z., Roth, J., Jain, R. K., ACM
  ASSOC COMPUTING MACHINERY.2016: 241–42
- **Data-Driven Benchmarking of Building Energy Performance at the City Scale**
  Yang, Z., Roth, J., Jain, R. K., ACM
  ASSOC COMPUTING MACHINERY.2016
- **Poster abstract: A data-driven design framework for urban slum housing - Case of Mumbai**
  Debnath, R., Bardhan, R., Jain, R. K., ACM
  ASSOC COMPUTING MACHINERY.2016: 239–40
- **Modeling the determinants of large-scale building water use: Implications for data-driven urban sustainability policy** *SUSTAINABLE CITIES AND SOCIETY*
  Kontokosta, C. E., Jain, R. K.
  2015; 18: 44-55
- **BizWatts: A modular socio-technical energy management system for empowering commercial building occupants to conserve energy** *APPLIED ENERGY*
  Gulbinas, R., Jain, R. K., Taylor, J. E.
  2014; 136: 1076-1084
- **The impact of combined water and energy consumption eco-feedback on conservation** *ENERGY AND BUILDINGS*
  Jeong, S. H., Gulbinas, R., Jain, R. K., Taylor, J. E.
  2014; 80: 114-119
- **Big Data plus Big Cities: Graph Signals of Urban Air Pollution** *IEEE SIGNAL PROCESSING MAGAZINE*
  Jain, R. K., Moura, J. M., Kontokosta, C. E.
  2014; 31 (5): 130-136
- **Forecasting energy consumption of multi-family residential buildings using support vector regression: Investigating the impact of temporal and spatial monitoring granularity on performance accuracy** *APPLIED ENERGY*
  Jain, R. K., Smith, K. M., Culligan, P. J., Taylor, J. E.
  2014; 123: 168-178
- **Network Ecoinformatics: Development of a Social Ecofeedback System to Drive Energy Efficiency in Residential Buildings** *JOURNAL OF COMPUTING IN CIVIL ENGINEERING*
  Gulbinas, R., Jain, R. K., Taylor, J. E., Peschiera, G., Golparvar-Fard, M.
  2014; 28 (1): 89-98
- **Can social influence drive energy savings? Detecting the impact of social influence on the energy consumption behavior of networked users exposed to normative eco-feedback** *ENERGY AND BUILDINGS*
  Jain, R. K., Gulbinas, R., Taylor, J. E., Culligan, P. J.
  2013; 66: 119-127
- **Investigating the impact eco-feedback information representation has on building occupant energy consumption behavior and savings** *ENERGY AND BUILDINGS*
  Jain, R. K., Taylor, J. E., Culligan, P. J.
  2013; 64: 408-414
- **Block Configuration Modeling: A novel simulation model to emulate building occupant peer networks and their impact on building energy consumption** *APPLIED ENERGY*
  Chen, J., Jain, R. K., Taylor, J. E.
  2013; 105: 358-368
- **Assessing eco-feedback interface usage and design to drive energy efficiency in buildings** *ENERGY AND BUILDINGS*
  Jain, R. K., Taylor, J. E., Peschiera, G.
  2012; 48: 8-17