

# Dr. Jing Gao

Assistant Professor of Geospatial Data Science  
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## RESEARCH INTERESTS

- Human Dimensions of Global Environmental Change, Urbanization, Spatial Population
- Geospatial Data Science, Machine Learning, Data Mining, Uncertainty Quantification

## EDUCATION

Ph.D. Geography (Minor: Computer Science), University of Wisconsin – Madison, 2013  
M.S. GIS & Cartography, University of Wisconsin – Madison, 2008  
B.S. Remote Sensing & GIS, Beijing Normal University, 2005

## PROFESSIONAL APPOINTMENTS

2018-	Assistant Professor Department of Geography & Data Science Institute	University of Delaware
2019	Visiting Professor Pardee Center for International Futures	University of Denver
2017-2019	Summer Visiting Scholar Population and Environmental Change Group	Asian Demographic Research Institute
2015-2018	Research Scientist Climate and Global Dynamics Laboratory	National Center for Atmospheric Research
2014-2015	Postdoctoral Fellow National Center for Supercomputing Applications	University of Illinois at Urbana-Champaign
2013-2014	Geospatial Consultant Gibbs Land Use and Environment Lab	University of Wisconsin – Madison
2011-2013, 2007-2010	Geospatial & Statistical Researcher Department of Urban and Regional Planning & Environmental Resources Center	University of Wisconsin – Madison
2010-2011	Research Assistant in Land Change Modeling Department of Geography	University of Wisconsin – Madison
2010	Spatial Analyst & Modeler Department of Agricultural and Applied Economics	University of Wisconsin – Madison
2008-2009	Remote Sensing Specialist Center for Sustainability and Global Environment	University of Wisconsin – Madison

2007	Web Cartographer Dept of Real Estate and Urban Land Economics	University of Wisconsin – Madison
2007	Lab Manager SoLIM Lab	University of Wisconsin – Madison
2004-2005	Intern	National Key Lab of Remote Sensing Science (China)

## GRANTS AND FELLOWSHIPS

2019-2021	Principal Investigator. New Faculty Seed Grant. EPSCoR WiCCED Project
2019-2020	Principal Investigator. Data Science Seed Grant. University of Delaware
2019-2020	Co-Principal Investigator. How can Delaware Take Next Steps in Preparing for Protection and Reconstruction of DelDOT Assets in the Event of a Worst-case Scenario Hurricane? Delaware Department of Transportation (DelDOT) [1891-36]
2016-2019	Research Scientist. A Hierarchical Evaluation Framework for Assessing Climate Simulations Relevant to the Energy-Water-Land Nexus. DOE [DE-SC0016438]
2015-2018	Research Scientist. Linking Human and Earth System Models to Assess Regional Impacts and Adaption in Urban Systems and Their Hinterlands. NSF [1243095]
2015-2018	Research Scientist. Multi-Scale Processes Affecting Spatial Population Distributions. NSF [1416860]
2017	Co-Principal Investigator. Assessment of the DSM TandemX Value Added for Large-Scale Volumetric Characterization of Cities. German Aerospace Center (DLR) [DEM_URBAN0770]
2014-2015	Research Scientist. CyberGIS Software Integration for Sustained Geospatial Innovation. NSF [1047916]
2012-2013	Principal Investigator. NASA Earth and Space Science Fellowship (NESSF). NASA [NNX12AN46H]
2011-2013	Graduate Assistant. Climate Sensitivity of the National Estuarine Research Reserve System. NOAA Climate Program Office (CPO)
2012	Principal Investigator. Celebrating Women in Science & Engineering Grant. UW-Madison
2012	Principal Investigator. Whitbeck Dissertation Research Grant. UW-Madison
2011	Principal Investigator. Ruth Dickie Research Grant. Graduate Women in Science (GWIS)
2010	Graduate Assistant. Land-User Interactions and Spatial Externalities in Organic Farming (Upper Midwest, USA) and Agrobiodiversity Production (Bolivia). NSF [0729297]
2009-2010	Graduate Assistant. Evaluating the Environmental Merits of Conservation Subdivisions Using Spatial Data Analysis. USDA [0210573]
2008-2009	Graduate Assistant. Monitoring and Modeling Urbanization in China: A Mixed Methods and Multi-Scale Approach. NASA [NNH07ZDA001N-LCLUC]
2007-2009	Graduate Assistant. Using Social Indicators to Improve Adoption of Land Management Practices to Protect Water Quality in Three Midwest Watersheds. USDA [2006-51130-03701]
2003-2005	Principal Investigator. Undergraduate Research Grant. National Foundation for Science Education, China

## **Travel Grants**

- 2016 Early Career Scientist Travel Grant. National Center for Atmospheric Research (NCAR)
- 2013, 2012, 2009 Trewartha Conference Travel Grant. Department of Geography, UW-Madison
- 2012 Student Summer Travel Grant. Munich Re Foundation (MRF)
- 2011 Student Conference Participation Grant. American Society of Photogrammetry and Remote Sensing (ASPRS)
- 2009 Student Summer Travel Grant, Geospatial Partners

## **HONORS AND AWARDS**

- 2014 Finalist, William L. Garrison Award for Best Dissertation in Computational Geography. Association of American Geographers (AAG)
- 2013 Mellon-Wisconsin Dissertation Writing Fellow. Mellon Foundation and UW-Madison
- 2013 2nd Place, Spatial Analysis and Modeling Specialty Group Student Paper Competition. AAG
- 2012 Outstanding GIScience Student Scholarship. 7th International Conference on GIScience
- 2012 Olmstead Award for Outstanding Publication by a Graduate Student. Department of Geography, UW-Madison
- 2012 1st Place, GIS Specialty Group Student Paper Competition. AAG
- 2009 Trewartha Research Scholarship. UW-Madison
- 2009 Damon Anderson Memorial Scholarship. Wisconsin Land Information Association (WLIA)
- 2001-2005 Outstanding Undergraduate Scholarship. Beijing Normal University
- 2002 Exceptional Leadership Award. Beijing Normal University
- 2001 College Early Entrance Entitlement. Ministry of Education, China

## **PUBLICATIONS**

### **Peer-Reviewed Journal Articles**

2019. Striessnig, E., **Gao, J.**, O'Neill, B., Jiang, L. Empirically-based spatial projections of U.S. population age structure consistent with the shared socioeconomic pathways. *Environmental Research Letters*. <https://doi.org/10.1088/1748-9326/ab4a3a>
2019. **Gao, J.**, O'Neill, B. Data-driven spatial modeling of global long-term urban land development: The SELECT model. *Environmental Modelling & Software*. <https://doi.org/10.1016/j.envsoft.2019.06.015>
2019. Rohat, G., Wilhelmi, O., Flacke, J., Monaghan, A., **Gao, J.**, Dao, H., Maarseveen, M. Characterizing the role of socioeconomic pathways in shaping future urban heat-related challenges. *Science of The Total Environment*. <https://doi.org/10.1016/j.scitotenv.2019.133941>
2018. Jones, B., Tebaldi, C., O'Neill, B., Oleson, K., **Gao, J.** Avoiding population exposure to heat-related extremes: Demographic change vs climate change. *Climatic Change*. <https://doi.org/10.1007/s10584-017-2133-7>

2017. **Gao, J.**, Burt, J.E. Per-pixel bias-variance decomposition of continuous errors in data-driven geospatial modeling: A case study in environmental remote sensing. *ISPRS Journal of Photogrammetry and Remote Sensing*. <https://doi.org/10.1016/j.isprsjprs.2017.11.001>
2016. **Gao, J.**, Burnicki, A.C., Burt, J.E. Bias-variance decomposition of errors in data-driven land cover change modeling. *Landscape Ecology*. <https://doi.org/10.1007/s10980-016-0410-x>
2016. Zhi, Y., Li, H., Wang, D., Deng, M., Wang, S., **Gao, J.**, Duan, Z., Liu, Y. Latent spatio-temporal activity structures: a new approach to inferring intra-urban functional regions via social media check-in data. *Geo-spatial Information Science*. <https://doi.org/10.1080/10095020.2016.1176723>
2012. **Gao, J.**, Burt, J.E., Zhu, A.X. Neighborhood size and spatial scale in raster-based slope calculations. *International Journal of Geographical Information Science*. <https://doi.org/10.1080/13658816.2012.657201>
2011. Prokopy, L.S., Göçmen, Z.A., **Gao, J.**, Allred, S.B., Bonnell, J.E., Genskow, K., Molloy, A., Power, R. Incorporating social context variables into paired watershed designs to test nonpoint source program effectiveness. *Journal of the American Water Resources Association*. <https://doi.org/10.1111/j.1752-1688.2010.00508.x>

### **Peer-Reviewed Conference Proceedings**

2019. **Gao, J.**, O'Neill, B. Spatially-explicit global urban land expansion scenarios consistent with the Shared Socioeconomic Pathways. *Scenarios Forum 2019*. Denver, Colorado: March 11-13.
2018. **Gao, J.**, O'Neill, B. Modeling spatiotemporal relationships between built-up land development and population change under the Shared Socioeconomic Pathways. *Population Association of America Annual Meeting 2018*. Denver, Colorado: April 26-28.
2012. **Gao, J.** Squared error and categorical error in data-driven land cover change modeling: A comparison using bias-variance error decomposition. *GIScience 2012*. Columbus, Ohio: September 18-21.
2011. Zhu, A.X., Qin, C., Burt, J.E., **Gao, J.**, Wang, R. Geomorphic objects and scale in digital terrain analysis for digital soil mapping. *Geomorphometry 2011*. Redlands, California: September 7-9. [Keynote]

### **Peer-Reviewed Book Chapters and Science Reports**

2017. **Gao, J.** *Downscaling Global Spatial Population Projections from 1/8-degree to 1-km Grid Cells*. NCAR Technical Note NCAR/TN-537+STR. <https://doi.org/10.5065/D60Z721H>
2016. **Gao, J.**, Gravel-Miguel, C., O'Neill, B., Barton, M. Linking human and earth system models to assess regional climate change impacts and adaption in urban systems and their hinterlands. In M. Pesaresi, M. Melchiorri, A. Siragusa, T. Kemper, Eds. *Atlas of the Human Planet: Mapping Human Presence on Earth with the Global Human Settlement Layer*. JRC Science for Policy Report. <https://doi.org/10.2788/889483>
2013. Robinson, P., Leight, A.K., Trueblood, D.D., Wood, B., Curtis, K.J., **Gao, J.**, Genskow, K., Jones, J., Veroff, D., Martino, E. *Climate Sensitivity of the National Estuarine Research Reserve System*. Report to NOAA's Climate Program Office.
2008. Zhu, A.X., Burt, J.E., Smith, M., Wang, R., **Gao, J.** The impact of neighborhood size on terrain derivatives and digital soil mapping. In Q. Zhou, B. Lees, G. Tang, Eds. *Advances in Digital Terrain Analysis*. New York: Springer-Verlag, 333-348.

### **Other Publications**

2019. **Gao, J.** Reflections on geospatial data science applications in global human-environment interaction studies. Position Paper for Spatial Data Science Symposium.
2014. Padmanabhan, A., Wang, S., **Gao, J.** CyberGIS capabilities for scalable spatial data synthesis. Position Paper for National Data Service Consortium.
2013. **Gao, J.** *Bias-variance error decomposition for data-driven geospatial modeling*. Ph.D. Dissertation, Department of Geography, University of Wisconsin – Madison
2011. Göçmen, Z.A., **Gao, J.** Assisting with ecological land planning: Introducing the Conservation Subdivision Ecological Design and Site Assessment Toolkit. *Journal of Extension*, 49(4), 4TOT8.
2008. **Gao, J.** *Neighborhood size and spatial scale in raster-based slope gradient calculation*. M.S. Thesis, Department of Geography, University of Wisconsin – Madison
2005. **Gao, J.** *A study of microwave remote sensing experimental programs for soil moisture monitoring*. B.S. Thesis, School of Geography, Beijing Normal University

## DATASETS

2017. **Gao, J.** Global Population Projection Grids Based on Shared Socioeconomic Pathways (SSPs), 1-km Downscaled Grids, v1 (2010-2100). <http://www.cgd.ucar.edu/iam/modeling/spatial-population-scenarios.html>
2017. **Gao, J.** Global Population Grids Based on Shared Socioeconomic Pathways (SSPs) (Base Year), 1/8-degree and 1-km, v1 (2000). <http://www.cgd.ucar.edu/iam/modeling/spatial-population-scenarios.html>

## TEACHING EXPERIENCE

### Instruction

University of Delaware

- Geographic Information Systems and Science (GEOG 670: fall 2018, spring 2019)
- Cartography: Art & Science of Mapping Data (GEOG 472/672: spring 2020)

University of Illinois at Urbana-Champaign

- CyberGIS Summer School on Big Data Landscapes: Data Parallelism for Raster-Based Land Cover Analysis (summer 2015)

University of Wisconsin – Madison

- Quantitative Methods in Geographical Analysis (GEOG 360: spring 2011)

### Advising

MS Students: Loonibha Manandhar (2019-2021)

Undergraduates: Katie Buell-Fleming (2018-2021), Emma House (2019-2020)

Committees: Matt Walter (MS), Emma Stell (MS), Ricardo Llamas Barba (PhD)

General Research Advisor: UIUC CyberGIS Interdisciplinary Graduate Program (2014-2015); UW-Madison GIS Graduate Certificate Program (2012-2013)

## **INVITED TALKS**

2019. A data-science approach to simulating global spatiotemporal urban land expansion patterns throughout the 21st century. Michigan State University, East Lansing, Michigan
2019. Data-driven spatiotemporal modeling for human dimensions of global environmental change studies. University of Denver, Denver, Colorado
2019. Data-driven spatiotemporal modeling for human dimensions of global environmental change studies. University of Colorado, Boulder, Colorado
2018. Modeling spatiotemporal relationships between built-up land development and population change under the Shared Socioeconomic Pathways. Asian Demographic Research Institute, Shanghai, China
2017. Research in geospatial data science: uncertainty analysis & land change modeling. University of Missouri, Columbia, Missouri
2017. Research in geospatial data science: uncertainty analysis & land change modeling. Department of Geography, University of Victoria, British Columbia, Canada
2016. Uncertainty analysis for data-driven geospatial modeling with applications to land change science. Department of Geography, University of Toronto, Mississauga, Ontario, Canada
2016. Uncertainty analysis for data-driven geospatial modeling with applications to land change science. Department of Geography, University of Hawaii at Manoa, Honolulu, Hawaii
2015. Understanding the relationship between the spatiotemporal patterns of human population and built-up land: A data-driven investigation. CUNY Institute for Demographic Research, New York, New York
2015. Uncertainty analysis for data-driven geospatial modeling with applications to land change science. Department of Geography, Ohio State University, Columbus, Ohio
2013. Bias-variance error decomposition for data-driven geospatial modeling. Department of Geography, University of Oklahoma, Norman, Oklahoma
2013. Bias-variance error decomposition for data-driven geospatial modeling. National Socio-Environmental Synthesis Center, Annapolis, Maryland
2012. Error analysis for data-driven geospatial models. Global Institute of Sustainability, Arizona State University, Tempe, Arizona

## **INVITED WORKSHOPS**

2019. Spatial Data Science Symposium. Funded & organized by University of California. Santa Barbara, California. December, 2019 [discussant]
2018. Department of Energy Modeling PI Meeting. Funded & organized by DOE. Potomac, Maryland. November, 2018 [presenter & discussant]
2017. Implications of One-Belt-One-Road Strategy on Population Dynamics and Socio-Ecological Impacts. Funded by Asian Demographic Research Institute; organized by Asian Population Association. Shanghai, China. October, 2017 [presenter]
2016. Linking Earth System Dynamics and Social System Modeling. Funded by NSF, CSDMS, FE; organized by CSDMS, AIMES. Boulder, Colorado. May, 2016 [discussant]
2014. Land Cover and Land Use Change Dynamics in South and Southeast Asia. Funded by NASA; hosted by ICIMOD. Kathmandu, Nepal. November, 2014 [presenter]

## **SELECTED CONFERENCE PRESENTATIONS**

2019. A data-driven approach to coordinated long-term spatially-explicit modeling of urban and agricultural land use for climate impact assessment. Association of American Geographers Annual Meeting, Washington, DC
2018. A data-science approach to simulating spatiotemporal built-up land patterns for climate change impact assessment. 10th International Conference on Geographic Information Science, Melbourne, Australia
2017. Modeling global spatiotemporal patterns of built-up lands for climate change impact assessment. Association of American Geographers Annual Meeting, Boston, Massachusetts [invited]
2016. Understanding the relationship between the spatiotemporal patterns of human population and built-up area: A data-driven approach. Association of American Geographers Annual Meeting, San Francisco, California [invited]
2015. Simulating plausible spatial distributions of land cover mapping errors for real landscapes. Association of American Geographers Annual Meeting, Chicago, Illinois
2013. Bias-variance error decomposition for geospatial regression models. Association of American Geographers Annual Meeting, Los Angeles, California
2012. Decomposition of errors in data-driven land cover change modeling and the bias/variance dilemma. Association of American Geographers Annual Meeting, New York, New York

### **OTHER CONFERENCE ACTIVITIES**

2019. [discussant] Downscaled Future Scenarios of Population & Economic Activity. GEO Human Planet Forum, Palisades, New York
2019. [co-chair] Symposium on Frontiers in Geospatial Data Science. Association of American Geographers Annual Meeting, Washington, DC
- [session organizer & chair] Synergizing Geospatial Data Science with Domain Applications: Climate Science
  - [panel organizer & chair] Uncertainty and Bias in Geospatial Data Science

### **ADDITIONAL TRAINING**

2019. Professional Certificate on Management Essentials. University of Delaware, Newark, Delaware
2018. Workshop for Early Career Geoscience Faculty: Teaching, Research, and Managing Your Career. Funded by NSF, NAGT. College Park, Maryland
2016. Advanced Bayesian Statistics. National Center for Atmospheric Research, Boulder, Colorado
2016. Community Land Model (CLM) Tutorial. National Center for Atmospheric Research, Boulder, Colorado
2015. Postdoctoral Certificate in Professional Development for Academics. University of Illinois at Urbana-Champaign, Urbana, Illinois
2014. Big Data Research Workshop. National Center for Supercomputing Applications, Urbana, Illinois
2014. Scientific High-Performance Computing Workshop. University of Illinois at Urbana-Champaign, Urbana, Illinois
2012. Summer Academy on Social Vulnerability and Resilience. United Nations University – Institute for Environment and Human Security (UNU-EHS) and Munich Re Foundation (MRF), Hohenkammer, Germany
2009. Vespucci Summer Institute on Geographic Information Science. Geospatial Partners, Fiesole, Italy
2005. Research Skills Training Program. National Key Lab of Remote Sensing Science, Beijing, China

## **SERVICE**

### **To the Profession**

**Research Proposal Review:** NSF (SBE, GEO, Graduate Research Fellowship, CAREER), Graduate Women in Science (Research Fellowships)

**Manuscript Review:** International Journal of Geographical Information Science, Journal of Machine Learning Research, Geoscientific Model Development, Science of the Total Environment, Remote Sensing, Geoinformatics, International Conference on GIScience, International Encyclopedia of Geography, International Conference on CyberGIS and Geodesign, Geographic Information Science & Technology Body of Knowledge

**Book Proposal Review:** Wiley-Blackwell

### **Professional Organizations:**

- Student Board Member, Spatial Analysis and Modeling Specialty Group, Association of American Geographers, 2013-2014

### **To the University**

University of Delaware

- Invited Speaker, Seminar Series in Applied Mathematics, 2019
- Invited Speaker, GIS Coffee Hour, 2019
- Member, Advisory Committee for 4+1 Program in GIScience and Environmental Data Analytics, 2018-2019
- Host & Organizer, Distinguished Lecture in Geospatial Data Science, 2018-2019
- Member, Search Committee for Faculty in Coupled Human-Natural Systems Modeling, 2018-2019

University of Illinois at Urbana-Champaign

- Managing Lead of the CyberGIS Center GIScience Consulting Service, 2014-2015

University of Wisconsin – Madison, Department of Geography

- Graduate Representative on the GIScience Faculty Search Committee, 2012-2013
- Graduate Representative on the Future Direction Committee, 2011-2013
- Graduate Student Mentor, 2010-2011
- Graduate Student Mentor Program Coordinator, 2009-2010
- Coordinator, GIScience Discussion Group, 2008-2009
- Coordinator, Geography Department Student Symposium, 2008-2009
- GIS Certificate Program Representative, 2007-2008

Beijing Normal University

- Student Mentor for Freshmen, 2002-2003
- Student Coordinator, Centennial Homecoming Program, 2002

### **To the Community**

Presenter, Delaware Coast Day, 2018

Science Presenter to Colorado State Legislators, Colorado Science Day, 2018

Coordinator, Women in Geography (WIG), UW-Madison, 2007-2010

Vice President, PRED Group [a student organization for environmental awareness], 2002-2003

Interpreter, Beijing Earth Day Festival, 2002

Outreach Department Chair, PRED Group, 2001-2002



## **PROFESSIONAL MEMBERSHIPS**

Association of American Geographers (AAG) (2011-present)

Population Association of America (PAA) (2017-present)

American Geophysical Union (AGU) (2012-present)

Earth Science Women's Network (ESWN) (2012-present)

American Society for Photogrammetry and Remote Sensing (ASPRS) (2011-2015)

Graduate Women in Science (GWIS) (2009-2013)

Wisconsin Land Information Association (WLIA) (2009-2011)