James D. Gaboardi

Geospatial Science & Human Security Oak Ridge National Laboratory

EDUCATION

- PhD Geography, *Florida State University*, 2019 Populated Polygons to Networks: A Population-Centric Approach to Spatial Network Allocation Advisor David C. Folch Committee Mark W. Horner, Chris K. Uejio, Michael J. Brusco
- MS Geographic Information Science, *Florida State University*, 2014
- BA Liberal Studies, University of Central Florida, 2005

RESEARCH APPOINTMENTS & ACTIVITIES

202I–	 Oak Ridge National Laboratory, <i>Geospatial Science & Human Security – Human Geography</i> Associate Research & Development Scientist – Remote Scalable, high-performance research software development & engineering Synthetic population ensemble generation & digital twin modeling Spatial network-centric human mobility analysis
2019-21	 Pennsylvania State University, Department of Geography Post Doctoral Scholar – Remote NSF Award #1825768: "Fixing" 1990-2010 Census Geography (NHGIS) Analyzing and standardizing census geographies in Python (2.x & 3.x) and SAS Building data workflows on Red Hat Enterprise Linux Server via PBS Geocoding restricted census microdata in SAS 9.4
2016-19	 Florida State University, Department of Geography Graduate Research Assistant - 50% Remote NSF Award #1132008: Spatial Sciences Census Research Node (SSCRN) Development of GIS algorithms in Python, R, & Bash Building & testing of virtual Python environments on RHEL Server 5 & 6 Special Sworn Status at the U.S.A. Census Bureau to work with restricted data
2014-19	Florida State University, <i>Department of Geography</i> Instructor of Record
2014-19	Florida State University, <i>Department of Geography</i> Lab Instructor
2014-19	Florida State University, <i>Department of Geography</i> Graduate Teaching Assistant
2014	Florida State University, <i>Florida Resources and Environmental Analysis Center</i> Graduate Intern

AFFILIATIONS

Current

2025- Center for Open Geographical Science at San Diego State University – COGS@SDSU

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2015 – Python Spatial Analysis Library – PySAL

Past

2019-21	The Peter R. Gould Center at Pennsylvania State University
2019-21	The National Historical Geographic Information System – NHGIS@IPUMS
2016-19	Spatial Sciences Census Research Node – SSRCN

PUBLICATIONS

Journal Articles

2024	Fowler, C.S., Gaboardi, J.D., Schroeder, J.P., and Van Riper, D.C. Optimized spatial information for
	1990, 2000, and 2010 U.S. census microdata. Scientific Data. II (37). DOI:
	10.1038/s41597-023-02859-9

- Feng, X., Barcelos, G., Gaboardi, J.D., Knaap, E., Rey, S.J., and Wei, R. spopt: a python package for solving spatial optimization problems in PySAL. Journal of Open Source Software. 7(74) 3330. DOI: 10.21105/joss.03330
- 2021 Rey, S.J., Anselin, L., Amaral, P., Arribas-Bel, D., Cortes, R.X., **Gaboardi, J.D.**, Knaap, E., Kang, W., Li, Z., Lumnitz, S., Oshan, T.M. Shao, H., and Wolf, L.J. *The PySAL Ecosystem: Philosophy and Implementation*. Geographical Analysis. (54) 467-487. DOI: 10.1111/gean.12276
- **Gaboardi, J.D.**, Rey, S.J., and Lumnitz, S. *spaghetti: spatial network analysis in PySAL*. Journal of Open Source Software. 6(62) 2826. DOI: 10.21105/joss.02826
- **Gaboardi, J.D.**, Folch, D.C., and Horner, M.W. *Connecting Points to Spatial Networks: Effects on Discrete Optimization Models*. Geographical Analysis. (52) 299–322. DOI: 10.1111/gean.12211
- Lumnitz, S., Arribas-Bel, D., Cortes, R.X., **Gaboardi, J.D.**, Greiss, V., Kang, W., Oshan, T.M., Wolf, L.J., and Rey, S.J. *splot - visual analytics for spatial statistics*. Journal of Open Source Software. 5(47) 1882. DOI: 10.21105/joss.01882

Conference Papers

2025	Gaboardi, J.D. , Tuccillo, J.V., Isber, J., and Dunkley, J.M. <i>Producing High-fidelity Synthetic Population Ensembles at Scale</i> . 3 rd Annual Conference of the US Research Software Engineer Association (US-RSE ⁶ 25). Philadelphia, PA. October 2025. <i>In Submission</i>
2025	Fleischmann, M., Vybornova, A., Gaboardi, J.D. , Brázdová, A. and Dančejová, D. <i>Adaptive continuity-preserving simplification of street networks</i> . 33 rd Annual GIS Research UK Conference (GISRUK). DOI: 10.5281/zenodo.15229590
2025	Bearman, N., Gaboardi, J.D. , Roddy, P.J., Zhao, Q., Chen, H., and Wolf, L.J. <i>Location-allocation and public transit: An update on UCL student teacher placements.</i> 33 rd Annual GIS Research UK Conference (GISRUK). DOI: 10.5281/zenodo.15231178
2024	De, D., Thakur, G.M., McGaha, J., Brown, C., Nie, X., Thomas, T., Gaboardi, J.D. , Sparks, K., Burger, A., McBride, E.C., Kim, JS., Amichi, L., Gunaratne, C., Christopher, S.C., and Zubko, D. <i>DICER: Data Intensive Computing Environment and Runtime for Evaluating Unprecedented Scale of</i> <i>Geospatial-Temporal Human Mobility Data</i> . 25 th IEEE International Conference on Mobile Data Management (MDM), Brussels, Belgium. 139-148. DOI: 10.1109/MDM61037.2024.00037
2024	Kim, JS., Thakur, G.M., Amichi, L., Burger, A., Gunaratne, C., Tuccillo, J.V., Hauser, T., Bentley, J., Sparks, K., De, D., Brown, C., McBride, E.C., McGaha, J., Gaboardi, I.D. , Nie, X., and Christopher,

S.C. HumoNet: A Framework for Realistic Modeling and Simulation of Human Mobility Network. 25th IEEE International Conference on Mobile Data Management (MDM), Brussels, Belgium. 185-194. DOI: 10.1109/MDM61037.2024.00042

- Tuccillo, J.V., and **Gaboardi, J.D.** Spatial Microsimulation and Activity Allocation in Python: An Update on the Likeness Toolkit. Proceedings of the 22nd Python in Science Conference. 93–100 DOI: 10.25080/gerudo-f2bc6f59-00c
- 2023 Bearman, N., Xu, R., Roddy, P.J., Gaboardi, J.D., Zhao, Q., Chen, H., and Wolf, L.J. Developing capacitated p-median location-allocation in the spopt library to allow UCL student teacher placements using public transport. AGILE: GIScience Series. Volume 4, 1–7 DOI: 10.5194/agile-giss-4-20-2023
- Tuccillo, J.V., and Gaboardi, J.D. Likeness: a toolkit for connecting the social fabric of place to human dynamics. Proceedings of the 21st Python in Science Conference. 125–135 DOI: 10.25080/majora-212e5952-014

Working Papers & Pre-prints

- Fleischmann, M., Vybornova, A., Gaboardi, J.D., Brázdová, A. and Dančejová, D. Adaptive continuity-preserving simplification of street networks. arXiv::cs.CY. DOI: 10.48550/arXiv.2504.16198
- 2020 **Gaboardi, J.D.** Validating Abstract Representations of Spatial Population Data while considering Disclosure Avoidance. Center for Economic Studies, U.S. Census Bureau. DOI: 10.5281/zenodo.3677162

Reports, etc.

2025 Tuccillo, J.V., Cunningham, A.R., **Gaboardi, J.D.**, and Buck, W.J. *Initial Mobility Analysis for ORNL VA-EDH Synthetic Populations*. ORNL Report.

PATENTS & INVENTIONS

2025 *TraKit: A Comprehensive Human Mobility Science Framework*. Invention Reference Number: 202505915

RESEARCH SOFTWARE DEVELOPMENT¹

- 2024– Research Team on Urban Structure
 - neatnet^c Street geometry processing toolkit
- 2021– Likeness: A Python toolkit for connecting the social fabric of place to human dynamics
 - likeness-vitals^c Shared utility functionality for Likeness modules.
 - livelike^c Vivid Synthetic Populations
 - pymedm^c Penalized Maximum-Entropy Dasymetric Modeling (P-MEDM) in Python
 - pmedm-legacy^c Python-R Bridge to PMEDMrcpp
- 2015– PySAL: Python Spatial Analysis Library
 - spaghetti¹ Spatial Graphs: Networks, Topology, & Inference
 - spopt^c Spatial Optimization
 - momepy^c Urban Morphology Measuring Toolkit

¹lead developer as ¹ & co-author and/or co-maintainer as ^c

EDITORIAL APPOINTMENTS

Academic Journals

2025– Journal of Open Source Software Topic Editor

INVITED TALKS

Seminars²

2024	Capabilities and Applications of the UrbanPop Spatial Microsimulation Framework. <i>United States Census Bureau's GEO Seminar Series</i> . Webinar. 🛟
2023	Open-Source Software for Population Modeling and Spatial Optimization: Making Decision Support More Accessible. <i>Inha University Graduate School of Logistics: BK21 Spring 2023 Lecture Series</i> . 10.5281/zenodo.15343358
2022	Connecting Vivid Population Data to Human Dynamics. <i>Distilling Diversity: DecisionScience@ORNL</i> . Oak Ridge National Laboratory. 10.5281/zenodo.6607532
2021	Validation of Abstract Population Representations. Oak Ridge National Laboratory.

HONORS, AWARDS, & GRANTS

Honors

2019	Student Paper Competition (2 nd Place). American Association of Geographers: Spatial Analysis & Modeling Specialty Group.
2017	Dissertation Mentorship Program. Center for Economic Studies. United States Census Bureau.
2015	Outstanding PhD Student. <i>Florida State University</i> . Department of Geography. \$300.

Awards

2022	Optimisation of	of teacher trainin	g placement a	llocations u	ising spopt	. AGILE 2023	-GitHub	Repo.
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2019 Travel Award. American Association of Geographers Spatial Analysis & Modeling Specialty Group. \$250.

Grants

2018-19	Research Travel Grants. Atlanta Research Data Center. \$1,966.
2017	Sponsored Travel. NSF Census Research Network Meeting. Washington, DC.
2015-19	Conference Presentation Grants. <i>Florida State University</i> . \$4,350.

CONFERENCE ACTIVITY

Program Committees

2023 22nd Python in Science Conference.

²Non-presenting author denoted by *****.

Sessions Organized

- 2019 Automated GISci for Network-based Decisions. 2019 American Association of Geographers Annual Meeting. Washington D.C., USA.
- 2018 Automated GISci for Network-based Decisions: Session I. *2018 American Association of Geographers Annual Meeting*. New Orleans, USA.
- 2018 Automated GISci for Network-based Decisions: Session II. *2018 American Association of Geographers Annual Meeting*. New Orleans, USA.
- 2017 Automated GISci for Network-based Decisions. 2017 American Association of Geographers Annual Meeting. Boston, USA.

Sessions Chaired/Moderated

2017	GeoComputation II: Networks. North American Regional Science Council. Vancouver, BC, Canada.
2016	Location & Spatial Analysis I. North American Regional Science Council. Minneapolis, MN, USA.

Workshops & Tutorials

2022 Understanding the Structure of Cities through the Lens of Data. *Spatial Data Science Symposium*. (Virtual). GitHub Repo.

Invited Panelist

- 2018 Future of open source package of spatial analysis PySAL. *2018 American Association of Geographers Annual Meeting*. New Orleans, USA.
- 2015 Careers in Public Policy. *College of Social Sciences and Public Policy*. Florida State University. Tallahassee, USA.

Presentations

2025	Producing High-fidelity Synthetic Population Ensembles at Scale. 3 rd Annual Conference of the US Research Software Engineer Association (US-RSE'25). Philadelphia, PA. October 2025. <u>In Submission</u> .
2025	Synthetic Population Ensembles for Small Area Estimation. 3 rd Annual Conference of the US Research Software Engineer Association (US-RSE'25). Philadelphia, PA. October 2025. <u>In Submission</u> . •
2025	Using Temporal Information from Human Mobility Data to Detect Anchor Points. 26 th IEEE International Conference on Mobile Data Management (MDM) — CrowdSenCity Workshop. Irvine, CA, USA. :
2025	Using Synthetic Populations to Model Travel Burdens among US Veterans Health Administration Patients. 2025 ACS Data Users Conference. Washington, D.C., USA (Virtual). 🛟
2025	Adaptive continuity-preserving simplification of street networks. 33 rd Annual GIS Research UK Conference. Bristol, UK. 10.5281/zenodo.15229590 🎲
2025	Location-allocation and public transit: An update on UCL student teacher placements. 33 rd Annual GIS Research UK Conference. Bristol, UK. 10.5281/zenodo.15231178 •••
2024	DICER: Data Intensive Computing Environment and Runtime for Evaluating Unprecedented Scale of Geospatial-Temporal Human Mobility Data. 25 th IEEE International Conference on Mobile Data Management (MDM). Brussels, Belgium. 10.1109/MDM61037.2024.00037 .
2024	HumoNet: A Framework for Realistic Modeling and Simulation of Human Mobility Network. 25 th IEEE International Conference on Mobile Data Management (MDM). Brussels, Belgium. 10.1109/MDM61037.2024.00042 :
2024	Examining Food Access Disparities using Spatial Microsimulation. <i>Population Association of America</i> 2024 Annual Meeting. Columbus, OH, USA. 10.5281/zenodo.11060894 .

2023	Developing capacitated <i>p</i> -median location-allocation in the spopt library to allow UCL student teacher placements using public transport. 26 th AGILE Conference on Geographic Information Science "Spatial Data for Design". Delft, the Netherlands (Virtual). ••
2023	Bridging population, activity space, and social interactivity with the Likeness software stack. 2023 ACS Data Users Conference. Washington, D.C., USA (Virtual). 10.5281/zenodo.10011877 :
2023	Spatial Microsimulation and Activity Allocation for Examining COVID-19 Vaccine Access Profiles. 2023 American Association of Geographers Annual Meeting. Denver, CO, USA (Virtual). 10.5281/zenodo.7768809
2023	Demographic characterization of human dynamics models with time-use and travel surveys. <i>2023</i> <i>American Association of Geographers Annual Meeting</i> . Denver, CO, USA. 10.5281/zenodo.7853704 :
2022	Examining COVID-19 Vaccine Access Profiles through Spatial Microsimulation and Activity Allocation. <i>North American Regional Science Council</i> . Montreal, Canada. 10.5281/zenodo.7335794 .
2022	Likeness: a Python toolkit for connecting the social fabric of place to human dynamics. <i>GeoPython</i> . Basel, Switzerland (Virtual). 10.5281/zenodo.6685086
2022	Simulating Travel to Points of Interest for Demographically-rich Synthetic Populations. 2022 American Association of Geographers Annual Meeting. (Virtual). 10.5281/zenodo.6335783
2019	Validation of Abstract Population Representations. <i>Atlanta Research Data Center Annual Research Conference at Vanderbilt University (ARDC)</i> . Nashville, TN, USA. 10.5281/zenodo.4287456
2019	A Polygon-Based Approach to Spatial Network Allocation. <i>2019 American Association of Geographers Annual Meeting</i> . Washington, D.C., USA.
2018	A Polygon-Based Approach to Spatial Network Allocation. <i>North American Regional Science Council.</i> San Antonio, TX, USA.
2018	A Polygon-Based Approach to Spatial Network Allocation. <i>2018 American Association of Geographers Annual Meeting</i> . New Orleans, LA, USA.
2017	Connecting Points to Spatial Networks: Effects on Discrete Spatial Network Optimization Models. <i>North American Regional Science Council</i> . Vancouver, BC, Canada.
2017	An Out-of-Core Computational Approach to the Transportation Problem. 2017 American Association of Geographers Annual Meeting. Boston, MA, USA.
2016	The Effects of Centroid Connector Density on the <i>p</i> -median and <i>p</i> -center Discrete Spatial Network Optimization Models. <i>North American Regional Science Council</i> . Minneapolis, MN, USA.
2016	Automating Multiple Single-Objective Spatial Optimization Models for Efficiency and Reproducibility. 2016 American Association of Geographers Annual Meeting. San Francisco, CA, USA.
2015	Network-Based Model Building for Discrete Location Allocation in Python: Integrating PySAL and Gurobi. <i>Seven Hills User Group Annual Conference</i> . Tallahassee, FL, USA.
2015	Network-Based Model Building for Discrete Location Allocation in Python: Integrating PySAL and Gurobi. <i>North American Regional Science Council</i> . Portland, OR, USA.
2015	The Effects of Centroid Connector Density on Spatial Network Optimization Models. <i>American Association of Geographers</i> . Chicago, IL, USA.
2014	The Effects of Centroid Connector Density on Spatial Network Optimization Models. <i>Seven Hills User Group Annual Conference</i> . Tallahassee, FL, USA.
Posters	

2024Examining Food Access Disparities using Spatial Microsimulation. Population Association of America
2022 Annual Meeting, Columbus, Ohio, USA. DOI: 10.5281/zenodo.11060894 •••

2023	Spatial Microsimulation and Activity Allocation in Python: An Update on the Likeness Toolkit. 22 nd Scientific Computing with Python. Austin, TX, USA. DOI: 10.25080/gerudo-f2bc6f59-01a
2022	New Insights into the Tightly Coupled Social Fabric of the Built Environment. <i>American Geophysical Union</i> . Chicago, IL, USA. 🛟
2022	Likeness: a toolkit for connecting the social fabric of place to human dynamics. <i>2rst Scientific Computing with Python</i> . Austin, TX, USA. DOI: 10.25080/majora-212e5952-02d
2022	Optimized Spatial Census Information Linked Across Time (OSCILAT): Improving the spatial accuracy of 1990, 2000, and 2010 census microdata. <i>Population Association of America 2022 Annual Meeting</i> . Atlanta, GA (Virtual), USA. DOI: 10.5281/zenodo.6596527

SERVICE

Academic Journal Peer Review

Environment and Planning B: Urban Analytics and City Science Gates Open Research Foundation Geographical Analysis Journal of Geographical Systems Journal of Open Source Software International Journal of Applied Earth Observation and Geoinformation International Journal of Geographical Information Science Networks and Spatial Economics Social Science Japan Journal Spatial Economic Analysis Sustainability Transportation Research Record

Academic Press Peer Review

Chapman & Hall (CRC Press)

Open Reviews

2024	Gaboardi, J.D. Peer Review Report For: Simulated data for census-scale entity resolution research without privacy restrictions: a large-scale dataset generated by individual-based modeling [version 1; peer review: 1 approved, 1 approved with reservations, 1 not approved]. Gates Open Research. 8:36. DOI: 10.21956/gatesopenres.16769.r37051
2022	Kucharski, R., Fleischmann, M., and Gaboardi, J.D. Peer Review Report For: <i>DRSP-Sim: A Simulator for Ride-Sharing with Pooling: Joint Matching, Pricing, Route Planning, and Dispatching.</i> Journal of Open Source Software. Rejected. Review: openjournals/joss-reviews#3761
2022	Gaboardi, J.D. , Mary, B., and Fleischmann, M. Peer Review Report For: <i>TessPy: a python package for geographical tessellation</i> . Journal of Open Source Software. 7(76) 4620. DOI: doi.org/10.21105/joss.04620. Review: openjournals/joss-reviews#4620
2021	Gaboardi, J.D. , Graser, A., and Fleischmann, M. Peer Review Report For: <i>TransBigData: A Python package for transportation spatio-temporal big data processing, analysis and visualization</i> . Journal of Open Source Software. 7(71) 4021. DOI: doi.org/10.21105/joss.04021. Review: openjournals/joss-reviews#4021

Mentorship

2023	Google Summer of Code: Rongbo Xu. [PySAL - spopt Development] P-Median Model with Near-Far Cost Allocation: Guided by Tobler's Law. Mentors: Wolf, L.J. Gaboardi, J.D., Rey, S.J., Zhao, Q., and Barcelos, G.
2022	Google Summer of Code: Gabriel Agostini. <i>[pysal] Morphological Street Network Simplification</i> . Mentors: Fleischmann, M., Gaboardi, J.D. , and Veytia, A.M.
2022	Google Summer of Code: Greg Maya. <i>Street Network Simplification: A combined approach</i> . Mentors: Fleischmann, M., Gaboardi, J.D. , and Veytia, A.M.
2022	Google Summer of Code: Erin Olson. <i>Facility Location Modeling (spopt) Package Development</i> . Mentors: Wolf, L.J., Gaboardi, J.D. , and Zhao, Q.
2021	Google Summer of Code: Germano Barcelos dos Santos. <i>PySAL – Open Source Facility Location Modeling (spopt)</i> . Mentors: Wolf, L.J., Zhao, Q., and Gaboardi, J.D.

University

Graduate Representative	22 nd Congress of Graduate Students. Florida State University.
Graduate Representative	Faculty Senate Library Committee. Florida State University.
Liaison	Geography & Environmental Studies Student Assoc. Florida State University.
Member	University Libraries Grad. Advisory Board. Florida State University.
Member	University Libraries Grad. Advisory Council. Florida State University.

Other

Member	Code of Conduct Committee. PySAL.
Member	Steering Council. PySAL.
Secretary	Florida Surveying & Mapping Society. Northwest Florida Chapter.

COURSES TAUGHT

Florida State University

Instructor of Record	Spatial Data Analysis
Instructor of Record	Introduction to GIS
Instructor of Record	World Regional Geography
Lab Instructor	Introduction to GIS
Teaching Assistant	Map Analysis
Teaching Assistant	Florida GIS Applications
Teaching Assistant	Physical Geography

ACADEMIC & PROFESSIONAL ASSOCIATIONS

Current

American Association of Geographers United States Research Software Engineer Association

Past

Florida Surveying & Mapping Society Mathematical Optimization Society Population Association of America Regional Science Association International Seven Hills Regional User Group

CREDENTIALS

U.S. Federal Government

U.S. Census Bureau Special Sworn Status

CORE SOFTWARE COMPETENCIES

Research Software Engineering

Programming Languages	Python, Bash, R
Scientific Python Stack	NumPy, SciPy, Pandas, Matplotlib, Shapely, JupyterLab, GeoPandas, Dask, NetworkX, OSMnx, PuLP, pytest
Version Control Systems	git, GitHub, GitLab
Virtualization & Scaling	Docker, Prefect
Geographic Information UI	QGIS, TransCAD
Typesetting & Text	译T _E X, Markdown, reStructuredText

GRADUATE COURSEWORK

Facility Location & Spatial Optimization	Facility Location in Operations Research
High Performance Spatial Computing	Spatial Algorithms on Restricted-use Data
Network Analysis in Python	GIS Programming with Python
Advanced Network Analysis in Python	Spatial Optimization & Racial Segregation
Spatial Modeling in GIS	Transport Geography
Network Allocation	Spatial Databases
Smart Cities	GIS in Social Science
Social Vulnerability to Natural Hazards	Responsible Research & Ethical Conduct
Land Surveying Methods	Remote Sensing
Geographic Research Methods	Geographic Thought
Urban & Regional Information Systems	Advanced GIS
Quantitative Geography	Intro GIS
Professional Development in Geography	Writing in the Sciences

OTHER PROFESSIONAL EXPERIENCE

2015 GIS Consultant – *Marquis Software*. Tallahassee, FL, USA.

2014 Technical Rover – *Leon County Supervisor of Elections*. Tallahassee, FL, USA.

2014 GIS Technician – *Citizens Property Insurance*. Tallahassee, FL, USA.

2009-12 Eiken Specialist – *STEP*. Tokyo, Japan.

2008 Marketing Communications Specialist – Oracle. Tokyo, Japan.

PERSONAL INFORMATION

Service

Organizer *Room to Read/Beers for Books*. Tokyo, Japan. Volunteer *Hillcrest School for Exceptional Children*. Ocala, FL, USA. Volunteer *Imbodehuus St. Gallen*. St. Gallen, Switzerland.

Languages

EnglishNativeGermanElementaryItalianElementaryJapaneseJLPT N3SpanishElementary

Citizenship & Residency Born

Ocala, Florida, USA

Citizenship

USA

Resided

USA	Florida & Georgia
Italia (Italy)	Sicilia (Sicily)
日本(Japan)	神奈川県 (Kanagawa) & 特別23区 (Tokyo)
Schwiiz (Switzerland)	St. Gallen & Thurgau

Last Updated – July 2025