The AMERICAN ASSOCIATION *of* GEOGRAPHERS
Spatial Analysis and Modeling Specialty Group Newsletter
2025 http://sam-aag.org/

Table of Contents

FROM THE CHAIR

Dear SAM Specialty Group Members,

Greetings! I would like to begin my message by expressing my sincere gratitude to all those who have supported and served the Spatial Analysis and Modeling Specialty Group (SAM-SG) over the past years. Many thanks to our Board Members and participants who contributed to this edition of the SAM newsletter. We believe, on behalf of our SAM members, that the continued growth of our specialty group is due to your invaluable dedication since 1979, making SAM-SG one of the largest Specialty Groups within the AAG today.

I strongly encourage you to visit our new website at Spatial Analysis & Modeling Specialty Group (https://aag-sam.github.io/), where you can find the most updated information, along with details about the history, activities, and engagement opportunities within SAM-SG.

I would also like to extend my appreciation to Daoqin Tong (Arizona State University), the previous chair (2022–2024) of our group. Daoqin made a tremendous effort to ensure a smooth transition for our group, making numerous contributions during the challenging pandemic period, increasing our number of sponsored sessions, and overseeing all aspects of SAM-SG operations.

We also welcome our newly elected board members, Jessica Embury (San Diego State University & University of California Santa Barbara) as Student Representative, Atsushi Nara (San Diego State University, re-elected), and Peter Kedron (UC Santa Barbara). I would also like to sincerely thank Dr. Xin Feng (University of Oklahoma) and Dr. Bing Zhou (Pennsylvania State University) for their significant contributions to the SAM community as Outreach Director and Student Representative, respectively.

As the 2024 AAG Annual Conference in Detroit, MI approaches, it is exciting to share that SAM will host many events and sponsor 67 sessions during the meeting. I would like to draw your attention to several events of particular interest.

First, Dr. Elizabeth Delmelle from the Department of City and Regional Planning at the University of Pennsylvania will deliver the 2025 GA/SAM Plenary Lecture. Dr. Delmelle, an Associate Professor and Director of the Master's in Urban Spatial Analytics program, conducts research on neighborhood change, transit services, and equity more broadly. She currently

serves as Co-Editor-in-Chief for the Journal of Transport Geography and has reviewed hundreds of articles for various journals while delivering numerous insightful lectures at national and international conferences. The GA/SAM Plenary Lecture will take place on Thursday, March 27, 2024, from 4:10 PM to 5:30 PM at Huntington Place, Room 260, Level 2. Following the lecture, you are warmly invited to attend the reception.

Second, we invite you to attend the John Odland Student Competition Sessions (commonly known as the SAM Student Paper Competition) on Wednesday, March 26, 2024, from 8:30 AM to 11:30 AM at Huntington Place, Room 358, Level 3. These sessions will provide an excellent opportunity to witness cutting-edge, high-quality research across various fields of spatial analysis and modeling, presented by our SAM student members who were selected through a rigorous review process conducted by esteemed SAM scholars.
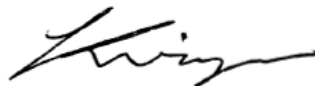
I would like to extend special appreciation to Jiannan Cai (Tongji University) for organizing the competition sessions and all the external reviewers for their time and hard work. These external reviewers are Kai Cao (East China Normal University), Xin Feng (University of Oklahoma), Yingjie Hu (University at Buffalo), Hyun Kim (University of Tennessee, Knoxville), Junghwan Kim (Virginia Tech), Jed Long (Western University), Peng Luo (Massachusetts Institute of Technology), Grant McKenzie (McGill University), Wataru Morioka (Salisbury University), Atsushi Nara (San Diego State University), Yoo Min Park (University of Connecticut), Seda Salap-Ayca (Brown University), Yan Shi (Central South University), Katarzyna Sila-Nowicka (University of Auckland), Wentao Yang (Hunan University of Science and Technology), Lei Zou (Texas A&M University).

Finally, I warmly invite you to join the SAM Business Meeting, scheduled for Friday, March 28, 2024, from 11:40 AM to 12:40 PM at Huntington Place, Room 420A, Level 4. This meeting will be particularly special as we announce the winners of the John Odland Student Paper Competition, Student Travel Award, Emerging Scholar Award, and Outstanding Service Award. We will also introduce newly elected board members and recognize the outstanding contributions of past board members.

Thank you for your membership and for the many contributions you have made to our SAM-SG community. We always welcome your feedback, suggestions, and questions regarding our SAM-SG efforts, and we look forward to meeting you in Detroit.

Best wishes,

Hyun Kim

Chair, SAM Specialty Group

Upcoming Event: 2025 AAG

As we are approaching the 2025 Annual meeting of AAG, we would like to highlight the news of the Spatial Analysis and Modeling (SAM) Specialty Group.

For 2025 AAG, individuals will have the opportunity to present and learn from the Annual Meeting in person and online.

Thank you for supporting the SAM Specialty Group community and we are looking forward to meeting you at AAG 2025.

SAM Announcements

### 2025 SAM Plenary Speaker
Dr. Elizabeth Delmelle

Dr. Elizabeth Delmelle
Associate Professor
Department of City and Regional Planning
University of Pennsylvania

We are pleased to announce that Dr. Elizabeth Delmelle is selected for the 2025 SAM Plenary Lecture. Dr. Delmelle is the director of the Master of Urban Spatial Analytics (MUSA) program in the University of Pennsylvania. Her research centers on processes of neighborhood change, urban inequality, and urban transportation. She serves as editor of the *Journal of Transport Geography*.

Congratulations, Dr. Delmelle!

2024 SAM Outstanding Service Award
Dr. May Yuan

Dr. May Yuan
Professor
School of Economic,
Political and Policy Sciences
University of Texas, Dallas
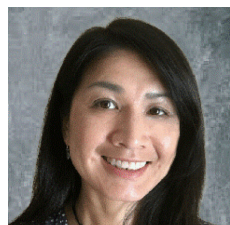
Dr. May Yuan has made significant contributions to the field of geography and geospatial science through her extensive service in academia, professional organizations, and advisory roles. She has been recognized as a Fellow of both the American Association for the Advancement of Science (AAAS) and the American Association of Geographers (AAG). Dr. Yuan has played an integral role in shaping geospatial science policy and research. She is a Member of the Scientific Advisory Committee of the Geospatial Science and Human Security Division at the Oak Ridge National Laboratory (since 2020), contributing her expertise to national geospatial security initiatives. She also served as a Member of the Environmental Information Services Working Group to NOAA, where she provided guidance on environmental data and decision-making processes. Additionally, her editorial leadership as Editor-in-Chief for the International Journal of Geographic Information Science (since 2017) highlights her dedication to advancing geographic research and scholarship.

Congratulations, Dr. Yuan!

Editor's column

Meet Dr. Yingjie Hu
2024 SAM Emerging Scholar

Dr. Yingjie Hu
Associate Professor
GeoAI Lab
Department of Geography
University at Buffalo
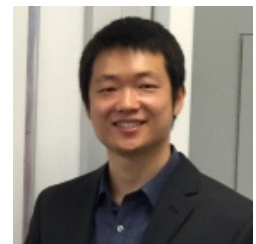
GeoAI for Disaster Management and Community Resilience

Communities under natural disasters are complex human-environment systems. Under normal conditions, people interact with natural and built environments in various ways, such as going to schools and workplaces, visiting grocery stores

and restaurants, and spending time outdoors. A natural disaster largely disrupts these interactions and can cause severe damages to people and communities. Spatial analysis and modeling (SAM) have been long playing important roles in disaster management, since geographic location is often the only key that can effectively link the diverse geographic data needed for managing disasters, such as population distribution data, land use and land cover data, transportation network data, and social media and social response data.

The advancements of geospatial artificial intelligence (GeoAI) provide new methods and tools for improving disaster management and increasing community resilience (Hu et al., 2019; Gao et al., 2023). There exist some critical information needs for disaster management, especially in the phase of disaster response. Examples of these information needs include: (1) where are the victims (who need help and where)? (2) where are the damages (which areas were damaged by the disaster and which areas seem to be okay so far)? (3) where are the potential future affected areas (which areas will likely be affected in the near term)? GeoAI can help meet such information needs by identifying victim locations, assessing disaster impacts, and predicting future affected areas based on various geospatial data.

The roles of GeoAI in disaster management can be further seen in Figure 1. On the left side of the figure, we have different types of geospatial data for supporting disaster management, such as satellite and aerial image data, weather and climate data, anonymized mobile phone location data, and social media data. These data can become the input of GeoAI methods including various machine learning and deep learning models guided by geographic knowledge and spatial principles. Importantly,

we also need geospatial experts who know how to use these methods properly. We also need cyberinfrastructures to run these methods, especially when the data to be processed are big. We may then be able to contribute to different aspects of disaster management, such as finding victims, assessing damages, predicting future affected areas, and improving information quality (e.g., increasing the spatial resolution of a dataset using GeoAI). Ultimately, we want to contribute to disaster science and support decisions by understanding the potential disparate impacts of disasters and their socioeconomic and demographic factors. We may also want to better allocate disaster management resources and achieve environmental justice.

Scholars in our community have already made nice contributions on leveraging GeoAI for disaster management and community resilience. Hu et al., (2023) and Zhou et al., (2022) have leveraged deep learning models, such as the Generative Pre-trained Transformer (GPT) and Bidirectional Encoder Representations from Transformers (BERT) models, for identifying victims from social media messages. Yu et al., (2024) developed a deep residual learning network to refine air quality data for assessing the 2023 Canadian wildfire smoke impact in Northeastern US. Peng et al., (2020) proposed a self-supervised learning framework using bitemporal multispectral satellite imagery for urban flood mapping. Also looking into flood mapping, Li et al., (2023) assessed the ability of a new GeoAI foundation model from NASA and IBM for mapping floods across different geographic areas. There are other existing and ongoing research that leverages GeoAI for
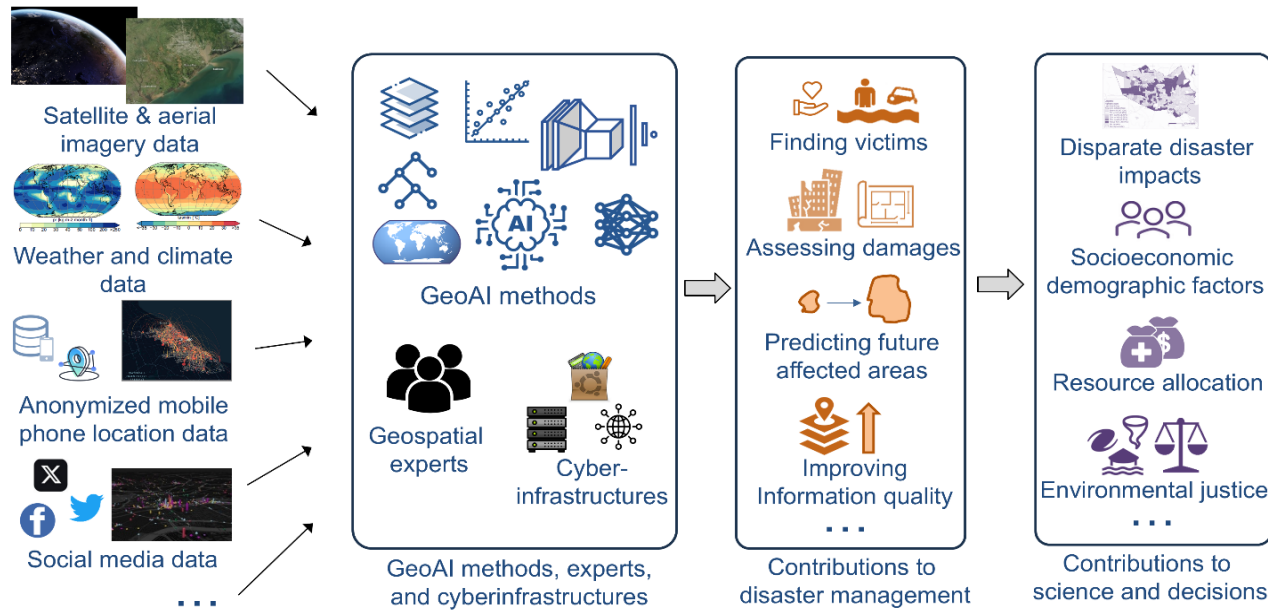
Figure 1. Roles of GeoAI in disaster management and community resilience.

advancing disaster research as well. victims from social media messages.

In the coming years, GeoAI will likely continue its important roles in disaster management and community resilience. Meanwhile, various challenges lie in this direction, such as efficiently improving the quality of our training data to address model issues (e.g., model biases) and understanding the hurdles faced by disaster managers in deploying GeoAI methods in practice. Despite these and other challenges, research and proper use of GeoAI have the potential to help our communities become more resilient to future disasters.

References

Gao, S., Hu, Y., & Li, W. (2023). *Handbook of geospatial artificial intelligence*. CRC Press.

Hu, Y., Gao, S., Lunga, D., Li, W., Newsam, S., & Bhaduri, B. (2019). GeoAI at ACM SIGSPATIAL: progress, challenges, and future directions. *SIGSPATIAL Special*, *11*(2), 5–15.

Hu, Y., Mai, G., Cundy, C., Choi, K., Lao, N., Liu, W., Lakhanpal, G., Zhou, R. Z., & Joseph, K. (2023). Geo-knowledge-guided GPT models improve the extraction of location descriptions from disaster-related social media messages. *International Journal of Geographical Information Science*, *37*(11), 2289–2318.

Li, W., Lee, H., Wang, S., Hsu, C.-Y., & Arundel, S. T. (2023). Assessment of a new GeoAI foundation model for flood inundation mapping. *Proceedings of the 6th ACM SIGSPATIAL International Workshop on AI for Geographic Knowledge Discovery*, 102–109. https://doi.org/10.1145/3615886.3627747

Peng, B., Huang, Q., Vongkusolkit, J., Gao, S., Wright, D. B., Fang, Z. N., & Qiang, Y. (2020). Urban flood mapping with bitemporal multispectral imagery via a self-supervised learning framework. *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing*, *14*, 2001–2016.

Yu, M., Zhang, S., Ning, H., Li, Z., & Zhang, K. (2024). Assessing the 2023 Canadian wildfire smoke impact in Northeastern US: Air quality, exposure and environmental justice. *Science of The Total Environment*, *926*, 171853.

Zhou, B., Zou, L., Mostafavi, A., Lin, B., Yang, M., Gharaibeh, N., Cai, H., Abedin, J., & Mandal, D. (2022). VictimFinder: Harvesting rescue requests in disaster response from social media with BERT. *Computers, Environment and Urban Systems*, *95*, 101824.

Meet John Odland Student Paper Competition Winner (2024)

Haoyu Wang
Ph.D. candidate
University of Texas at Austin
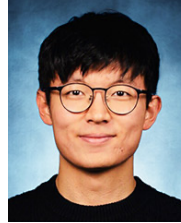
My name is Haoyu Wang (Andrew), and I am a Ph.D. candidate in the Department of Geography and the Environment at the University of Texas at Austin. My research focuses on forensic geographic attribution using species distribution modeling (SDM) to analyze microscopic trace materials such as pollen. In forensic investigations, location history reconstruction is a critical step in linking people and objects to specific places. Trace materials like pollen, which are environmentally ubiquitous and adhere to surfaces, offer valuable geographic information. However, existing forensic methods often rely on case-specific expert knowledge rather than systematic, data-driven approaches. My research aims to bridge this gap by developing an SDM-based geolocation framework that improves search space reduction in forensic analyses.

I was honored to receive first place in the 2024 John Odland student paper competition for my paper titled "Using Species Distribution Modeling for Geoforensic Analyses," which will be a part of my dissertation. This paper introduces an innovative method for using SDM to analyze pollen in forensic investigations, enabling the reconstruction of location history with greater accuracy. The core idea of the study is that pollen collected by mobile objects—such as bees—can serve as a proxy for reconstructing geographic locations. By modeling the distribution of pollen species found on bees, we developed an approach to predict their past locations, providing a quantitative and scalable method for forensic geographic attribution.

To evaluate the effectiveness of this approach, we applied SDM-based geolocation modeling to both controlled simulations and real-world forensic cases. First, using bees as mobile objects, we tested whether the distribution of pollen species they carried could be used to infer their movement history. The results showed that SDM was effective in reducing the search space at both subcontinental and near-global scales. In addition to the bee-based study, we applied the same methodology to three solved criminal cases involving forensic pollen analysis and one case in which pollen was used to determine the long-term residence of an unidentified decedent. Our approach successfully reduced search space and improved geographic attribution accuracy, demonstrating the utility of SDM in forensic applications. This research contributes to forensic science in several ways. First, it establishes a systematic, repeatable method for using SDM to analyze forensic trace materials, reducing reliance on subjective interpretation. It integrates ecological and forensic data, advancing both fields by demonstrating how species distribution modeling can be leveraged beyond traditional ecological applications. It provides law enforcement and forensic researchers with a powerful geospatial tool for optimizing search strategies and identifying potential locations linked to evidence.

I have been a member of the SAM specialty group since 2021. The SAM community has offered invaluable seminars, workshops, and networking opportunities that have greatly helped my research and professional development. I am grateful to the SAM community for offering the opportunities for graduate students to demonstrate their work.

SAM-Sponsored Sessions at 2025 AAG Meeting

The SAM SG is sponsoring the sessions below. Click the link for your access to the detailed information of sessions.

John Odland SAM student paper competition I

John Odland SAM student paper competition II

Spatial Analysis and Modeling (SAM) / Geographical Analysis Plenary

Spatial Analysis and Modeling Specialty Group Business Meeting

Open Science in Geography I - Tools and Approaches

Open Science in Geography II - Remote Sensing

Open Science in Geography III - Directions in Research and Education

Symposium on Human Dynamics Research: Exploring the Synergy Between Human Dynamics and GeoAI I

Symposium on Human Dynamics Research: Advances in Dynamic Environmental Exposure, Mobility Patterns, and Health Outcomes I

Symposium on Human Dynamics Research: Advances in Dynamic Environmental Exposure, Mobility Patterns, and Health Outcomes II

Symposium on Human Dynamics Research: Advances in Dynamic Environmental Exposure, Mobility Patterns, and Health Outcomes III

Symposium on Human Dynamics Research: Urban Environmental Intelligence and Human-Climate Interactions (1)

Symposium on Human Dynamics Research: Urban Environmental Intelligence and Human-Climate Interactions (2)

Symposium on Spatial AI & Data Science for Sustainability: Spatial AI and Data Science for Sustainability Solutions

Symposium on Spatial AI & Data Science for Sustainability: Geospatial Platform for Sustainability Research and Education

Symposium on Spatial AI & Data Science for Sustainability: GeoAI and Large Language Models: Tools, Techniques, and Sustainable Applications

Symposium on Spatial AI & Data Science for Sustainability: Artificial intelligence and complex human-environment systems: Mutual linkages and benefits

Symposium on Spatial AI & Data Science for Sustainability: Geospatial Artificial Intelligence, Remote Sensing, and Deep Learning

Symposium on Spatial AI & Data Science for Sustainability: Advances in multitemporal remote sensing for terrestrial ecosystems

Symposium on Spatial AI & Data Science for Sustainability: Deep Learning Approaches for Multi-Source Data Processing and Analysis

Symposium on Spatial AI & Data Science for Sustainability: Harnessing Geospatial Big Data for Urban Studies

Symposium on Spatial AI & Data Science for Sustainability: Convergence Curriculum for Spatial AI and Data Science

Symposium on Spatial AI & Data Science for Sustainability: Challenges and Opportunities of Spatial Accessibility

Digital Twins: A New Paradigm of Digital Transformation to Fill the Last Gap of Making Your Research Count

GeoAI and Deep Learning Symposium: Spatially Explicit Machine Learning and Artificial Intelligence I

GeoAI and Deep Learning Symposium: Spatially Explicit Machine Learning and Artificial Intelligence II

GeoAI and Deep Learning Symposium: Generative AI - Opportunities and Challenges for GIScience Research

GeoAI and Deep Learning Symposium: Human-Centered Geospatial Data Science I

GeoAI and Deep Learning Symposium: Human-Centered Geospatial Data Science II

Urban Health Dynamics: Exploring Spatial Patterns and Environmental Influences - I

Urban Health Dynamics: Exploring Spatial Patterns and Environmental Influences – II

GIScience and Hazards I

GIScience and Hazards - II

Spatial Optimization and Analysis

Advancing a Geographic Approach for Conservation Science I

Advancing a Geographic Approach for Conservation Science II

Recent Advances in Computational Movement Analysis, Session 1 (of 2)

Recent Advances in Computational Movement Analysis, Session 2

The Interesting Data and Methods Session I

The Interesting Data and Methods Session II

The Interesting Data and Methods Session III

The Interesting Data and Methods Session IV

Spatial epidemiologic methods in reducing disparities in health and HIV

Integrative future-oriented approaches for transformative socio-environmental change

Geospatial Data Science to Enhance Community Resilience to Urban Environmental Hazards

Metrics and Beyond: Exploring the Structural Drivers of Health & SDOH

Symposium on Geospatial Approaches to Pressing Grand Challenges: Global Pandemics, Climate Change, and Food Security - Opening Keynote

Symposium on Geospatial Approaches to Pressing Grand Challenges: Global Pandemics, Climate Change, and Food Security - International Geospatial Health Research Network (IGHRN)

Symposium on Geospatial Approaches to Pressing Grand Challenges: Global Pandemic, Climate Change, and Food Security - Spatial Analysis for Social Good

Symposium on Geospatial Approaches to Pressing Grand Challenges: Global Pandemics, Climate Change, and Food Security- Geospatial Artificial Intelligence (GeoAI) for Urban Challenges

Symposium on Geospatial Approaches to Pressing Grand Challenges: Global Pandemics, Climate Change, and Food Security - Closing Plenary

AAG 2025 Symposium on Spatial AI & Data Science for Sustainability: Grand Challenges of Spatial AI and Data Science

GeoAI and Deep Learning Symposium: Representing geographic locations in AI models: Methods and Applications

GeoAI and Deep Learning Symposium: Spatial Data Science and GeoAI Ethics: Bridging Research and Education

GeoAI and Deep Learning Symposium: GeoAI for Spatial Analytics and Modeling

Spatial Analysis and the Urban Systems of Cities

Citizen Participation in Urban e-Planning

Panel: Open Science in Geography

Technology and Innovation for Human and Community Health in Urban Management I

Technology and Innovation for Human and Community Health in Urban Management II
Navigating the Urban Heat Crisis: Science, Solutions, and Social Equity

Navigating the Urban Heat Crisis 2: Science, Solutions, and Social Equity

Reassessing Coastal Risk, Vulnerability, and Hazards in the Great Lakes Region

Human Mobility, Vulnerable Population, and Homelessness Studies: Exploring Spatiotemporal Changes, Socio-Environmental Impacts, and GeoAI Applications I

Human Mobility, Vulnerable Population, and Homelessness Studies: Exploring Spatiotemporal Changes, Socio-Environmental Impacts, and GeoAI Applications II

Human Mobility, Vulnerable Population, and Homelessness Studies: Exploring Spatiotemporal Changes, Socio-Environmental Impacts, and GeoAI Applications III

About Spatial Analysis and Modeling (SAM) Specialty Group

Our mission is to foster and maintain interaction, cooperation and community among individuals interested in the analysis of geo-referenced data, modeling of spatio-temporal processes and the use of analytical and computational techniques in solving geographic problems. The specialty group promotes the scientific study of physical, environmental and socioeconomic geography and the development, use and teaching of analytical cartography, GIS, remote sensing, spatial statistical, mathematical and computational techniques for spatial analysis. For more information, see the SAM-SG homepage (https://aag-sam.github.io/).

Membership Dues
Regular: $6
Student: $1

Submissions
This newsletter reaches many readers and is, therefore, an excellent venue for getting the word out on community news, departmental happenings, research findings, media appearances, and the like. It is also a good place to post calls for proposals, awards, grants, fellowships, and jobs. We also invite you to submit commentaries or features of broad interest to specialty group members.

The newsletter relies on volunteers to submit articles, so please take a moment to send along relevant items when they are solicited.

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