The AMERICAN ASSOCIATION *of* GEOGRAPHERS
Spatial Analysis and Modeling Specialty Group Newsletter
2022 http://sam-aag.org/

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FROM THE CHAIR

Dear SAM Members,

I hope that you had a great winter break and a good start of the new year. It is exciting that the 2022 AAG Annual meeting is just around corner. The SAM Specialty Group hosts and sponsors a number of events, although some sessions have been canceled after the Annual meeting turned to an entirely virtual event. I would like to highlight the following two events at the meeting.

First, **John Odland Award competition** (annual SAM student paper competition) is scheduled on 2/25/2022 (Friday). Two sessions are organized with selected 10 papers and are scheduled at 12:40pm – 2:00pm and 2:00pm – 3:20pm (Eastern Daylight Time). Please attend the sessions and support our student members. I thank Taylor Oshan (University of Maryland) for organizing the competition and also the John Odland Review Committee for taking their time and efforts in evaluating 25 entries this year.

Second, **the SAM Business meeting** is scheduled at 5:20pm on 2/26/2022 (Saturday). You are cordially invited to attend the business meeting. Our newly elected vice chair and two board members will be announced at the meeting. Also, John Old Award winners will be announced at the business meeting.

As mentioned above, the SAM board will have new members as the 3-year terms of Wei Kang and Hyun Kim end this year. The SAM board appreciates their great contributions to the SAM community for the last three years. Also, I will complete my tenure as SAM chair this year and Daoqin Tong will become the next chair. I would like to take this opportunity to thank SAM members for the opportunity to serve the specialty group.

I will look forward to meeting you virtually at the sessions and events. If you have any suggestions and comments to better serve the SAM community, please do not hesitate to share them with SAM board members.

Best wishes,

Yongwan Chun
Chair, Spatial Analysis and Modeling Specialty Group
Professor, The University of Texas at Dallas

FROM THE NEW CHAIR

Dear SAM Members,

I hope you are doing well. It has been a great honor to serve as the new chair of SAM, one of the AAG's largest specialty groups. In the past few years, as a board member and vice chair I have been very fortunate to work with a group of extraordinary people.

Under Yongwan Chun's leadership, we have been meeting regularly to discuss SAM-related events and activities. Despite the challenges brought about by the pandemic, we have been sponsoring sessions at the AAG annual conference, supporting students for presenting their work, and recognizing excellence of SAM members.

Recently, we have started the discussion on the potential collaboration between SAM and the Quantitative Methods Research Group (QMRG) of the Royal Geographical Society. I look forward to continuing the discussion and planning exciting events in the near future.

Yongwan and Wei's terms will expire soon. I would like to take the opportunity to thank Yongwan for his dedication and leadership, which has bene critical for the growth of our community. I would also thank board member, Wei Kang, who has made significant contributes to emerging scholar selection and new board member election among many other endeavors. I also thank all SAM members for your continued support as we navigate the complexities of COVID-19 and wish you all the best.

Sincerely,

Daoqin Tong
Associate Professor
School of Geographical Sciences & Urban Planning

Upcoming Event: 2022 AAG

As we are approaching the 2022 Annual meeting of AAG, we would like to highlight the news of the Spatial Analysis and Modeling (SAM) Specialty Group.

Because of COVID-19, the 2022 AAG conference is converted as a virtual format 2022 AAG (Friday, Feb. 25 – Tuesday, March 1). AAG converts any in-person or hybrid sessions or abstracts to virtual sessions. If you are already presenting virtually or organizing a virtual session, nothing will change for your presentation. See more detail at: *AAG 2022 NYC - AAG Web Portal.*

Thank you for supporting the SAM Specialty Group community and we are looking forward to meeting you at AAG 2022.

SAM Announcements

2022 SAM Plenary Speaker
Dr. Jennifer Miller

We are pleased to announce that Dr. Jennifer Miller is selected for the 2022 SAM Plenary Speaker. Dr. Miller is a Professor in the Department of Geography & the Environment, University of Texas, Austin (See more detail at her web-site UT College of Liberal Arts).

Dr. Miller is a leading scholar in GIS, spatial statistics, and biogeography. Her specific research focus is in the application area of species distribution modeling (SDM), and much of her previous work has addressed explicitly spatial issues associated with SDM, such as incorporating spatial autocorrelation and representing spatial accuracy and uncertainty. Current research investigates the effects that spatial structure, scale and sampling strategies have on SDM using simulated data; using SDM to investigate the effects of climate change; and using spatial simulation to analyze (animal) species movement and interaction.

Dr. Miller's work on integrating spatial analytic concepts and techniques into animal movement pattern analysis and species distribution modeling is highly influential, both within the field of Geography but also in the broader interdisciplinary field of animal movement ecology. She pioneered the incorporation of fundamental spatial concepts such as dependence, heterogeneity, scale, accuracy and uncertainty into animal movement analysis and species distribution. More recently, she is helping to pioneer the emerging field of movement science, integrating animal, human and physical phenomena into a unified and convergent discipline.

Congratulations, Dr. Miller!

Note: Due to the COVID-19 and the change of modality of the 2022 AAG, Dr. Miller's Plenary lecture is postponed to the 2023 AAG meeting. The title of the lecture will be announced near the 2023 AAG meeting.

2022 SAM Emerging Scholar Award
Dr. Somayeh Dodge

The 2022 SAM Emerging Scholar Award goes to Dr. Somayeh Dodge (Department of Geography, University of Santa Barbara; See more detail at her web-site at https://www.geog.ucsb.edu/people/faculty/somayeh-dodge).

Dr. Dodge serves as an Assistant Professor of Spatial Data Science and runs the MOVE Lab in the Department of Geography at the University of California, Santa Barbara. She received her Ph.D. in Geography with a specialization in Geographic Information Science (GIScience) from the University of Zurich, Switzerland in 2011.

Somayeh's research focuses on developing data analytics, knowledge discovery, modeling, and visualization techniques to study movement in human and natural systems. Her research applies spatial data science and computational approaches to advance the knowledge and understanding of how movement patterns are formed in dynamic ecological and social systems. She has published in a number of high-ranked international journals such as *Methods in Ecology and Evolution, International Journal of Geographic Information Science, Philosophical Transactions of the Royal Society B, Movement Ecology, Computers, Environment and Urban Systems (CEUS), Geographical Analysis, and Information Visualization. Somayeh currently serves as the Co-Editor in Chief of the Journal of Spatial Information Science, and on the editorial board of multiple journals including Geographical Analysis, CEUS, Journal of Location Based Services, and The Professional Geographer.* Dr. Dodge was recently

awarded an NSF CAREER grant and has secured over $900,000 in research support. The nomination highlights her accomplishments as below:

> *"Dr. Dodge is exceptionally productive, and her research includes many multidisciplinary collaborative projects. Evidence of her research impact is the rapid increase in citations of her already published work as well as success in securing research support… Her contributions include the integration of quantitative methods with visualization to understand animal behavior, human migration and ecological processes, among other substantive interests… Her research productivity reflects that of a distinguished emerging scholar, addressing important topics, providing leadership in the discipline, her work appears in top outlets, and is of sustained quality and increasing activity each year. Beyond this, recognition for the significance of the research is growing at an increasing rate… Her work in GIS and geovisualization places her as a leader in movement GIScience, but also more broadly in spatial analysis and modeling."*

Congratulations, Dr. Dodge!

2022 SAM Outstanding Service Award

We appreciate Dr. An's service efforts for the AAG SAM Group. The 2022 SAM Outstanding Service Award goes to Dr. Li An, former chair of the AAG SAM Group. Dr. Li has been an active SAM member for more than 15 years. Currently, Dr. Li An is Professor at the Department of Geography, San Diego State University (SDSU) and Founding Director of Complex Human-Environment Systems (CHES) Center jointly sponsored by San Diego State University (USA) and Peking University (China). Li received his B.S from Peking University (Urban and regional planning) in 1989, M.S. from Chinese Academy of Sciences (Systems Ecology; 1992) and Michigan State University (Statistics; 2002), and Ph.D. from Michigan State University (Systems modeling; 2003). He is a Fellow of The American Association for the Advancement of Science (AAAS, elected in 2020), a lifetime distinction awarded to leading scientists across the world. Recently he was notified that he was elected to be a Fellow of the Association of American Geographers (to be announced in December 2021), selected by AAG Fellows Selection Committee and the AAG Council.

Dr. Li worked as chair of the SAM Specialty Group in 2013-2015. During the years, he set up a permanent SAM website (http://sam-aag.org/), which is the current official webpage of our Specialty Group. Also, Dr. Li launched the Outstanding Service Award in 2013-2014, which becomes one of our premium awards of the SAM Specialty Group. His services as editorial board members in prestigious journals related to the SAM are underscored, which includes an editorial board member of *the Annals of the AAG*, the flagship journal in geography (2013-2018), *International Journal of Geospatial and Environmental Research* (2013-present), and *Journal of Artificial Societies and Social Simulation* (2020-present), and *Ecological Modelling* (2013-present). His research also has promoted the visibility of the SAM research in many disciplines. His two ABM related papers (i.e., An et al. 2005 and An 2012) have been cited 357 and 761 times, respectively, based on Google Scholar since publication (as of November 18, 2021). Li has given keynote addresses or lectures that helped researchers throughout the world.

Congratulations, Dr. An!

2022 SAM Travel Awards

We congratulate the winners of 2020 SAM Travel Awards. This year, we are supporting 11 students listed below, who are the members of SAM.

- Binbin Lin (Texas A&M)
- Changzhen Wang (LSU)
- Gyoorie Kim (Univ. of Toronto, Mississauga)
- Jingyi Xiao (UCSB)
- Jiuying Han (Univ. of Utah)
- Leonardo Calzada (Rutgers University)
- Providence Adu (University of North Carolina Charlotte)
- Seonga Cho (UCSB)
- Weiying Lin (Texas A&M)
- Yu Lan (UNC-Charlotte)
- Yue Lin (Ohio State University)

- Yunlei Liang (Univ. of Wisconsin – Madison)
- Zijian Wan (UCSB)

2022 John Odland Award Competition

This year, we have received 25 submissions for the 2022 John Odland Award Competition. Thank you so much for your participation. Among them, their applications were rigorously reviewed by twelve SAM competition judges and finally 10 papers were selected to advance the final round of the competition, which will be held on 2/25/2022 via two 2022 John Odland Award Competition sessions (12:40 PM, Virtual 18 and 2 PM, Virtual 26).

We congratulate 10 selected finalists below. The winners will be announced via SAM webpage and our AAG-SAM SG community.

- Changwha Oh (Univ. of Tennessee)
- Jianwei Huang (Univ. of Hong Kong)
- Jing Xu (UCSB)
- Jonathan Tollefson (Brown Univ.)
- Lenka Hasova, (Univ. of Bristol)
- Mehak Sachdeva (ASU)
- Meiliu Wu (Univ. of Wisconsin, Madison)
- Qiang Pu (SUNY-Buffalo)
- Xiaifan Liang (GIT)
- Yaxuan Zhang (Univ. of Minnesota)

SAM officer elections

- As two of SAM Board members end their terms in 2022, this year elected two new members who will serve on the positions for the next three years (2022-2025). Among seven nominations for the positions, Dr. Atsushi Nara (Associate Professor in the Department of Geography at San Diego State University) and Dr. Xin Feng (Assistant Professor in the Department of Geography and Environment Sustainability at the University of Oklahoma) were elected.
- For the position of Vice Chair, Dr. Hyun Kim (Associate Professor in the Department of Geography, University of Tennessee) was elected. He has been a SAM board member last three years (2019-2022) and will serve as Vice Chair for coming two years (2022-2024).

Editor's column

Meet SAM Emerging Scholar (2020)

Dr. Ran Wei
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I am currently an Associate Professor in the School of Public Policy and a founding member of the Center for Geospatial Sciences at the University of California, Riverside (UCR). Prior to UCR, I was an Assistant Professor in the Department of Geography at the University of Utah. I received my PhD in Geography from Arizona State University in 2013. My research has focused on GISciences, spatial analysis and optimization, with the aim of supporting policy and decision making in transportation, public health, environment sustainability, community resilience, crime, and policing issues.

One of my primary research areas is developing and applying spatial optimization approaches to more effectively and efficiently allocate public and private resources in various urban and environmental planning contexts. For instance, we have developed new multi-objective spatio-temporal optimization models to identify the optimal deployment for battery electric buses (BEB) and associated charging stations in order to address the trade-off between environmental equity for the disadvantaged population and capital investment [1]. In addition, I developed a new efficient algorithm to address the computational challenges associated with regionalization, a fundamental spatial analytical method that aggregates spatial units (e.g., tracts) into a set of contiguous regions for strategic purposes, including school districting, habitat areas, etc. [2]

A second stream of my research examines spatial data creation, uncertainty issues as well as implications for use in spatial analysis[3] focuses on evaluating the impacts of uncertainty in American Community Survey (ACS) data on regionalization. I proposed a new regionalization method, the uncertain-max-p-regions problem that explicitly incorporates attribute uncertainty and allows its impacts to be evaluated with a degree of statistical certainty.

The third stream of my research has been on the development and use of spatial statistical methods to explore the spatio-temporal patterns of health and transportation data. For example, [4] I developed an approach for analyzing the spatial and temporal dynamics of violence and its association with alcohol outlets by embedding the evolution of assault events and outlet density within a spatially heterogeneous Markov chain framework. My recent work in electric vehicle charging demand estimation integrates spatial effects into machine learning algorithms and use two new realistic data sources to train and validate the model [5].

In the coming years I plan to extend my research in these three major areas. I plan to investigate the impacts of spatial data uncertainty in spatial pattern discovery approaches and developing new approaches that are more robust to data uncertainty. A second stream of future research will be on the development of spatial optimization approaches for neighborhood delineation, transportation planning, and medical resource allocation. Finally, I plan to further my research on spatial statistical analysis by developing scalable and efficient spatio-temporal cluster detection approaches that allow irregular shapes in space and time.

References

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[5] 2021 Z. Yi, X. Liu, R. Wei, X. Chen and J. Dai. "Electric vehicle charging demand forecasting using deep learning model", *Journal of Intelligent Transportation Systems*, DOI: 10.1080/15472450.2021.1966627.

Meet John Odland Student Paper Competition Winner (2020)

Ziqi Li (Ziqi.Li@glasgow.ac.uk)

I would like to thank SAM for giving me this opportunity to introduce myself and my research. My name is Ziqi Li, and I am a Lecturer in the School of Geographical and Earth Sciences at the University of Glasgow, UK. I received my PhD in Geography under the supervision of Prof. Stewart Fotheringham from Arizona State University. My research focuses on the methodological development of spatially explicit statistical and machine learning models. I am also broadly interested in the application of advanced spatial analysis and modelling in the fields of public health, urban analytics, political geography, and environmental studies.

I have been a member of our SAM group from the very beginning of my PhD journey and have benefited greatly from this vibrant community. I participated in the SAM student paper competition in 2020 and was honored to win first place amongst the other excellent presenters. My presented paper is entitled '*Measuring bandwidth uncertainty in multiscale geographically weighted regression using Akaike weights*' which is part of my dissertation and further published in the *Annals of AAG*. This work extends ideas from Burnham and Anderson's book on model selection and multi-model inference to investigate bandwidth uncertainty in the geographically weighted regression framework. Understanding bandwidth uncertainty allows us to infer whether a spatial process is local or global and enables us to assess the statistical significance of any differences in spatial scales across processes. While the focus of this work is on GWR models, it is also relevant in the context of many other spatial methods in which results are conditional on predefined parameters (e.g., specifications of spatial weights) that may give rise to uncertainty in their selection.

The above research is part of my ongoing efforts, which aim to develop tools to better understand spatial phenomena and the underlying processes. Specifically, one direction that I am taking is to make traditional statistical models more flexible and accurate by relaxing their assumptions to allow the modelling of more complex effects. Another direction is to enhance the spatial explicitness and interpretability of

machine learning and artificial intelligence models. In this essay, I will focus on the latter in the hope that it will provide readers with some new perspectives. In GeoAI, most existing research has focused on developing more spatially aware machine learning models to better suit spatial problems; however, interpretability has received less attention.

Geographical studies often necessitate interpretability as geographers seek to understand the underlying generating processes of the observed data rather than perform pure prediction tasks. One of my current projects is investigating how we can improve the spatial interpretability of ML/AI and whether we can extract spatial effects from these models. Recently developed local interpretable machine learning methods (such as LIME and SHAP) offer possibilities because they can compute feature attributions for each data point. These developments provide a means to investigate spatial issues such as how the importance of features varies spatially and what the contribution of location is to model predictions. This is fascinating because if machine learning can be interpretable in a similar way to statistical models, we can take full advantage of the flexibility and automaticity of machine learning models to identify more complex spatial relationships in the data. However, existing interpretable methods are not specifically developed for models of spatial data. Therefore, there is a need to develop spatial-explicit interpretable methods to be coupled with spatial-explicit machine learning models.

To conclude this short essay, I think what distinguishes us as geographers and other analysts is our spatial perception and interpretation of problems. Spatial statistical models and machine learning models have their own strengths, and the future is likely to see more integration of the two approaches to provide more accurate and interpretable models to help us better understand geographical problems.

Meet John Odland Student Paper Competition Winner (2021)

Junghwan Kim, Ph.D., M.U.P.
Postdoctoral Fellow
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I am currently a postdoctoral fellow at the Center for Geographic Analysis (CGA) of the Institute for Quantitative Social Science (IQSS) at Harvard University. I earned my doctoral degree from the Department of Geography and GIScience at the University of Illinois at Urbana-Champaign (Advisor: Dr. Mei-Po Kwan) in 2021 and my master's degree in Urban and Regional Planning from the same university in 2018. I am an environmental health researcher focusing on people's mobility and environmental exposures in cities by utilizing geographic information science (GIScience) methods, such as spatiotemporal modeling. Recently, my research has focused on investigating the following three topics.

First, I examined the neighborhood effect averaging problem (NEAP), which is a serious methodological problem in environmental exposure studies(**Figure 1**).

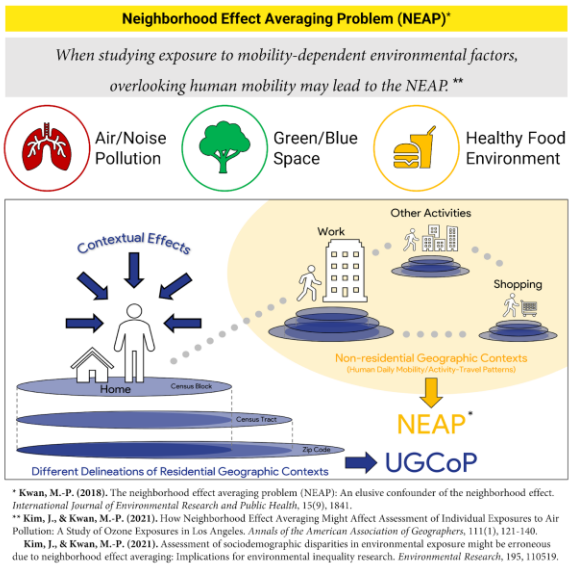

Figure 1. A conceptual illustration of the Neighborhood Effect Averaging Problem (NEAP)

The NEAP occurs when researchers ignore the complex role of human mobility in assessing people's exposure to environmental factors. By employing a person-based space-time modeling approach and the activity-travel diary data of 3,790 individuals collected in Los Angeles, California, I found that people's daily mobility patterns are significantly related to their actual ground-level ozone exposure levels. I also observed that ignoring people's mobility can lead to inaccurate evaluations of social and racial disparities in such exposures. These results are significant as they suggest that public policymakers should consider human mobility to avoid inaccurate environmental inequality

assessments and inefficient allocations of public policy resources [1][2][3].

Second, I evaluated privacy protection methods for confidential geospatial data, which is widely used by geographers. I suggested that researchers should exercise special care when visualizing confidential locations of socially vulnerable populations (e.g., HIV/AIDS patients) to protect them from unintended consequences (e.g., crime and stigmatization). I also proposed geospatial data visualization guidelines to minimize ethical concerns and the risk of privacy breaches. These results significantly contribute to research reproducibility, which is a cornerstone of scientific research[4][5].

Third, while I was working on my doctoral dissertation, an unprecedented global public health crisis – the COVID-19 pandemic – occurred. I wanted to join the global research efforts fighting against this crisis by applying my research skillsets. I investigated the effects of the COVID-19 pandemic on people's mobility by utilizing big geospatial data (e.g., anonymized mobile phone location data) and longitudinal models. I also conducted a comparative study on people's geoprivacy concerns and the acceptability of COVID-19 policies that harness confidential geospatial data. The results provide several important public health policy implications for controlling the pandemic [6][7].

For my future research, I have two research goals. First, I aim at advancing our fundamental understanding of the complex role of human mobility in people's exposure to various environmental factors (e.g., air pollution and traffic congestion) and health-promoting environments (e.g., green spaces) by using quantitative geographical methods. Second, based on the results of my research, I seek to develop environmental policy and planning recommendations to promote the health and well-being of populations worldwide, including people living in low- and middle-income countries, and to mitigate inequality in people's exposure to harmful environmental factors and health-promoting environments.

References

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SAM-SPONSORED SESSIONS AT 2022 AAG MEETING

Although AAG converts all sessions virtual, the SAM SG is sponsoring the sessions below. Click the link for your access to the detailed information of sessions.

- Spatial Analysis and Modeling Specialty Group Business Meeting
- AAG 2022 Symposium on Data-Intensive Geospatial Understanding in the Era of AI and

CyberGIS: GeoAI - Intelligent Geospatial Analytics: 3/1/2022 (8 AM), Virtual 35.

- AAG 2022 Symposium on Data-Intensive Geospatial Understanding in the Era of AI and CyberGIS: Reproducibility and Replicability in Geography: 2/25/2022 (9:40 AM), Virtual 5.
- John Odland Student Paper Competition 1: 2/25/2022 (12:40 PM), Virtual 18.
- John Odland Student Paper Competition 2: 2/25/2022 (2:00 PM), Virtual 26.
- Multiple Dimensions of Gendered and Racialized Economic Spaces 1: Social Vulnerability pre- and during COVID-19, Evidence from North America: 2/26/2022 (3:40 PM), Virtual 15.
- Multiple Dimensions of Gendered and Racialized Economic Spaces 2: Social Vulnerability pre- and during COVID-19, International Perspectives: 2/26/2022 (5:20 PM), Virtual 16.
- View Session Role of GIS in planning smart and resilient cities III: 3/1/2022 (11:20 AM), Virtual 26.
- Spatial Analysis and Modeling Specialty Group Business Meeting: 2/26/2022 (5:20 PM), Virtual 59.
- Spatial Analysis and Modeling Students: 2/25/2022 (3:40 PM), Virtual 64.
- Symposium on Scale in Spatial Analytics and Modeling: On the measurement of scale in spatial processes: 2/26/2022 (11:20 AM), Virtual 33.
- Symposium on Scale in Spatial Analytics and Modeling: Recent Progress in the Modifiable Areal Unit Problem (MAUP) 2/26/2022 (8:00 AM), Virtual 3.
- Symposium on Scale in Spatial Analytics and Modeling: Scales of Vulnerability, Resilience and Disaster Risk Assessment: 2/26/2022 (2:00 PM), Virtual 28.
- Symposium on Scale in Spatial Analytics and Modeling: Scaling and Analysis on Urban Big Data: 2/28/2022 (8:00 AM), Virtual 2.

Highlight: Symposium on Scale in Spatial Analytics and Modeling in 2022 AAG

The Symposium on Scale in Spatial Analytics and Modeling will be held in 2022 Annual Meeting of AAG on Feb 25 – Mar.1, 2022 at New York City. With an organization team formed by earlier-career researchers from multiple countries, the Symposium is expected to bring new insights to this fundamental topic and facilitate idea exchange, collaboration, and personal connections among interdisciplinary scholars and practitioners. The Symposium consists of eight paper sessions (including both virtual and in-person sessions) to discuss the scale issue in the following topics:

- Modifiable Areal Unit Problem (MAUP)
- Measurement of Scale in Spatial Processes.
- Movement and Mobility Data Analytics
- Multi-Scale Data Visualization, Analytics and Modeling
- Vulnerability, Resilience and Disaster Risk Assessment
- Scaling and Analysis on Urban Big Data
- Scale and Spatial Associations

Detailed information of the Symposium and the specific sessions can be found here.

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 (http://sam-aag.org/).

Membership Dues
Regular: $6
Student: $1

Submissions
This newsletter reaches a large number of 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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