

MEILIU WU

Lecturer/Assistant Professor in Geospatial Data Science
School of Geographical & Earth Sciences
University of Glasgow, UK
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Glasgow, G12 8RZ
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Research interests

- Geospatial Data Science, GIScience, & GeoAI
- Urban Analytics
- Human Mobility & Segregation
- Social-Environmental Sustainability, Equity & Justice

EDUCATION

PhD	University of Wisconsin-Madison, Geography Minored in Computer Science Thesis: "Towards GeoAI Foundation Models: A Multimodal Learning Framework with Spatial Knowledge" Committee: Drs. Qunying Huang (Chair), Song Gao, Zhou Zhang, Yong Jae Lee Grades: 4.00/4.00	2021/01 – 2024/05
MS	University of Wisconsin-Madison, GIScience & Cartography Thesis: "Human Movement Patterns of Different Racial-Ethnic and Economic Groups in U.S. Top 50 Cities: What Can Social Media Tell Us About Segregation?" Committee: Drs. Qunying Huang (Chair), Song Gao, Robert Roth, David W. Wong Grades: 3.96/4.00	2017/08 – 2019/08
BS	University of Cincinnati, GIS & Remote Sensing <i>High Degree Honors in Geography & STEM Research</i> Grades: 3.96/4.00	2013/08-2017/08
BS	Sun Yat-Sen University, China, GIS & Remote Sensing 2+2 Undergraduate Program with University of Cincinnati Grades: 4.1/5.0 (ranked 1st/250)	2013/08-2017/08
	Queensland University of Technology, Australia Exchange Program in Urban Planning and Surveying	2015/08-2015/12

GRANTS

2024 University of Glasgow College of Science and Engineering Early Career Grant (£7,000)
2024 Association of Geographic Information Laboratories in Europe (AGILE) Student Grant (\$1,000)
2023-24 UW-Madison Capstone Ph.D. Teaching Award & Grant (Nominated, \$1,000)

2024 AAG Travel Grant for Geospatial Cyberinfrastructure Workshop: Building High-Performance, Ethical, and Secured Geospatial Software (\$650)

2024 & 2023 AAG Student Travel Award & Grant (Nominated, \$500 per year)

2022 ACM SIGSPATIAL Student Travel Award & Grant (\$1,000)

2021-2024 UW-Madison Trewartha/Odebolt Graduate Research & Travel Award (\$4,000)

2017 University of Cincinnati High Degree Honors in Geography & STEM Research Awards (\$1,000)

2016-2017 University of Cincinnati Undergraduate Global Scholarship (\$28,000)

2015 National Exchange Scholarships (\$9,600, Queensland University of Technology)

2014 Ministry of Education of China National Undergraduate Scholarship (Top 1%) (\$1,600)

HONORS AND AWARDS

2024 (Spring) UW-Madison Commencement Flag bearer of College of Letters & Science for the Doctoral, MFA, and Medical Professional Degree Candidate Ceremony

2023-24 UW-Madison Capstone Ph.D. Teaching Award

2023 University Consortium for Geographic Information Science (UCGIS) Symposium Student Paper Award (1st)

2023 AAG Geographic Information Science and Systems (GISS) Specialty Group Student Honors Paper Award (2nd)

2023 AAG Cyberinfrastructure Specialty Group (CISG) Robert Raskin Student Competition (1st)

2022 AAG Spatial Analysis and Modeling (SAM) Student Paper Competition John Odland Award (2nd)

2021 International Graduate Workshop on Geoinformatics Best Participation Award

2021 28th International Conference on Geoinformatics Best Student Paper Award (2nd)

RESEARCH/WORK EXPERIENCE

University of Glasgow, Glasgow, UK

2024/08 – present

Lecturer/Assistant Professor in Geospatial Data Science

- Initiated and developed a cutting-edge GeoAI research group to advance the integration of GIScience and AI technologies
- Submitted funding proposals to national and international funding bodies
- Supervised postgraduate students and worked with research associates, providing mentorship and fostering a collaborative research environment
- Designed and delivered undergraduate and postgraduate courses in GIScience and GeoAI
- Facilitated a new MSc program in Geospatial Data Science, AI & Modeling
- Engaged in outreach activities by organizing international conference sessions, workshops, seminars, and public lectures
- Established partnerships with industry and governmental organizations to promote the application of GIScience and AI in solving real-world spatial problems

University of Wisconsin-Madison, Madison, WI

2021/01 – 2024/05

Research Assistant, Spatial Computing and Data Mining Lab

- Professional training: DJI unmanned aerial systems (UAS) training center 3-year program
- DSFAS-AI: Developing an integrated deep learning model framework for county-level crop yield prediction in support of USDA NASS operation (Project No.WIS04084, National Institute of Food and Agriculture)
- Spatially explicit multi-modal deep learning for urban informatics (Project No.1940091, National Science Foundation)
- A unified framework for measuring environmental (in)justice in access inequality as well as risk exposure across hybrid physical-virtual spaces (Project No. R01 DA047315, National Institutes of Health)
- Measuring racial-ethnic and income segregation in US largest cities (Project No. MSN242675, Wisconsin Alumni Research Foundation)
- Citizen-sourced social sensing: A case study of developing a cross-platform mobile application for rapid disaster response (Project No. 1940091, National Science Foundation)

Beijing Digital Union Network Technology Co., Ltd., Beijing

2019/08 – 2021/01

Big Data Mining Engineer, Department of Location-Based Service

- Designed a hybrid positioning system (GPS+Wi-Fi+Base station) for a nation-wide location-based service with stream processing frameworks on HPC, HTC, and/or Cloud
- Predicted activity zones based on the trajectories of mobile devices

NASA Ames Research Center, Mountain View, CA

2018/06 – 2018/08

Big Data Scientist

- **Wu, M.,** Sorek-Hamer, M., Just, A., Nemani, R (2018). “Exploring Diurnal Variations in the Correlation between PM2.5 and Aerosol Optical Depth” - 2018 NASA Ames Internship Symposium
- Responsibility: Big spatial data analysis and statistical modeling; Satellite image processing; Data visualization using point clouds; UI design using R-Studio Shiny

Cincinnati Area Geographic Information System, Cincinnati, OH

2017/01 - 2017/08

GIS Developer Intern

- Developed Esri ArcMap Desktop Add-ins
- Offered mapping service to business, universities, and governments

TEACHING EXPERIENCE

University of Glasgow, Scotland, UK

2024/08 - present

Program facilitator & Lecturer, School of Geographical & Earth Sciences

- *GEOG5018 Principles of Cartographic Design & Production*, F24 (In-person; 40 graduates);
- *Designing a new MSc program in Geospatial Data Science & AI*, 2024-25, including courses of GeoAI, Spatial Data Analytics and Visualization, Big Data in Geospatial Science, etc.

Supervisor

- **Yuwei Cai** (PhD student). Building Detection in Conflict Areas with Deep Learning and Super-Resolution. 2024/08 – present.

University of Wisconsin-Madison, Madison, WI

2017 - 2019, 2021 – 2024

Lecturer, Instructor & Teaching Assistant, Department of Geography

Avg. teaching rate: 4.5/5.0 (Top 5%)

- **Geog 574 Geospatial Database Design and Development**, F23 & F17 (In-person; 50 graduates & undergraduates); S19 (Online; 50 graduates from UW-Madison GIS Professional Programs)
- **Geog 170 Intro of GIScience and its Technology**, S21 & S24 (Online; 485 undergraduates)
- **Geog 576 Web Interactive Mapping & Geovisualization**, S19 (Online; 50 graduates from UW-Madison GIS Professional Programs)
- **Geog 370 Introduction to Cartography**, F18 (In-person; 80 graduates & undergraduates)
- **Geog 578 GIS Applications**, S18 (In-person; 50 graduates & undergraduates)

Graduate students Advised

- **Mingda Wu**. Pixel-wise Wildfire Burn Severity Classification with Bi-temporal Sentinel-2 Data and Deep Learning. 2022/09 – present.
- **Tang Sui**. Empowering Urban Wildfire Burnt Area Detection with Deep Learning. 2022/08 – present.
- **Yang Qiu**. Using deep learning to predict neighborhood wealthiness based on street view images. 2022/05 – present.
- **Yuehan Qin**. Big data mining on social media data (tweets) for human mobility using unsupervised machine learning - Latent Dirichlet Allocation Model. 2018/08 – 2019/05

PUBLICATIONS

Peer-Reviewed Journal Articles

1. Sui T., Huang Q., Wu M., **Wu M.**, Zhang Z., 2024. BiAU-Net: Wildfire burnt area mapping using bi-temporal Sentinel-2 imagery and U-Net with attention mechanism. *International Journal of Applied Earth Observation and Geoinformation*. DOI: 10.1016/j.jag.2024.104034
2. **Wu M.**, Huang Q., Gao S., Zhang Z., 2023. Mixed Land Use Measurement and Mapping with Street View Images and Spatial Context-Aware Prompts via Zero-shot Multimodal Learning. *International Journal of Applied Earth Observation and Geoinformation*. DOI: 10.1016/j.jag.2023.103591
3. **Wu M.**, Liu X., Qin Y., Huang Q., 2023. Revealing racial-ethnic segregation with individual experienced segregation indices based on social media data: A case study in Los Angeles-Long Beach-Anaheim. *Computers, Environment and Urban Systems*, 104 (2023): 102008 - 102021. DOI: 10.1016/j.compenvurbsys.2023.102008
4. Vongkusolkiet J., Peng B., **Wu M.**, Huang Q., Andresen CG., 2023. Near Real-Time Flood Mapping with Weakly Supervised Machine Learning. *Remote Sensing*. DOI: 10.3390/rs15133263
5. Liu X., **Wu M.**, Peng B., Huang Q., 2022. Graph-based representation for identifying individual travel activities with spatiotemporal trajectories and POI data. *Scientific Reports*. DOI: 10.1038/s41598-022-19441-9
6. **Wu, M.** Huang, Q., 2022. Human movement patterns of different racial-ethnic and economic groups in U.S. top 50 populated cities: What can social media tell us about isolation? *Annals of GIS*, 28 (2):161-183. DOI: 10.1080/19475683.2022.2026471

Papers Under Review/Revision

7. **Wu M.**, Huang Q., Basiri A., Gao, S., 2024. GeospatialCLIP: A GeoAI Multimodal Foundation Model for Urban Analytics. *International Journal of Geographical Information Science*. (Under review)
8. Yang S., Liu H., Wang X., **Wu M.**, Zhang Z., Yang Z., Huang Q., 2024. A Cyber-agricultural System for Automating Near Real-time Crop Yield Prediction and Dissemination. *Computers and Electronics in Agriculture*. (Under review)
9. Zhou S., **Wu M.**, Ye X., Huang Q., 2024. Advancing Smart Disaster Response by Leveraging Social Sensing and Mobile Technology. *Environmental Modelling and Software*. (Under review)
10. **Wu M.**, Wong D., Huang Q., 2024. Segregation: what is in a name? A review of segregation measurement and a prospective framework. *Annals of the American Association of Geographers*. (Under the 2nd review with minor revisions)
11. Qiu Y., **Wu M.**, Kang Y., Huang Q., 2024. Predicting neighbourhood wealthiness based on street view images and Swin Transformer. *Cities*. (Under the 3rd review with minor revisions, preprint DOI: 10.2139/ssrn.4597219)

Papers in Preparation

*Underlined name is Ph.D. Advisor.

12. **Wu M.**, Huang Q., 2024. Evaluating Multimodal Foundation Models on Geospatial Image Reasoning via Zero-shot Learning. *Environmental Science & Technology*. (To be submitted in Oct, 2024)
13. **Wu M.**, Huang Q., 2024. GPT-4V Augmented Spatial-context Prompt Tuning on Multimodal Foundation Models for Urban Analytics. *International Journal of Geographical Information Science*. (Abstract accepted by IJGIS Special Issue on Geo-Foundation Model, to be submitted in Nov, 2024)
14. **Wu M.**, Huang Q., Huang X., 2024. Segregated pleasure: Measuring racial-ethnic and income segregation in the entertainment and recreational POIs in US largest cities. *Sustainable cities and society*. (To be submitted in December, 2024)

Peer-Reviewed Conference Papers and Book Chapters

Refereed Conference Papers (Full-length, equivalent to journal articles)

15. **Wu M.**, Huang Q., Gao S., 2023. Measuring access inequality in a hybrid physical-virtual world: A case study of racial disparity of healthcare access during CoVID-19. In *Proceedings of 2023 30th International Conference on Geoinformatics*, Jul 19-21, 2023 London, UK, pg.1-10. DOI: 10.1109/Geoinformatics60313.2023.10247690
16. **Wu M.**, Huang Q., 2022. IM2City: Image geo-localization via multi-modal learning. In *Proceedings of the 5th ACM SIGSPATIAL International Workshop on AI for Geographic Knowledge Discovery (GeoAI '22)*, ACM SIGSPATIAL 2022, Nov 1-4, Seattle, WA, USA, pg.1-10. DOI: 10.1145/3557918.3565868
17. Liu X., Huang Q., Li Z., **Wu M.**, 2017. The impact of MTUP: Explore online trajectories for human mobility studies. In *Proceedings of the 1st Workshop on Prediction of Human*

Mobility, ACM SIGSPATIAL 2017, Nov 7-10, Redondo Beach, CA, USA, pg.1-9. DOI:10.1145/3152341.3152348

Refereed Conference Papers (Short paper, 6 pages)

18. Liu X., Peng B., **Wu M.**, Wang M., Cai H., Huang Q., 2024. Occupation Prediction with Multimodal Learning from Tweet Messages and Google Street View Images. In *Proceedings of the 27th AGILE Conference on Geographic Information Science*, Jun 4–7 2024, Glasgow, UK, AGILE GIScience Series 5:1-6. DOI: 10.5194/agile-giss-5-36-2024
19. Wu M.D., Huang Q., Sui T., **Wu M.**, 2023. Pixel-wise Wildfire Burn Severity Classification with Bi-temporal Sentinel-2 Data and Deep Learning. In *Proceedings of the 6th International Conference on Big Data Technologies (ICBDT 2023) Conference*, Sep 22-24, 2023, Qingdao, China, pg.1-6. DOI: 10.1145/3627377.3627433

Refereed Book Chapters

20. Huang Q., **Wu M.**, 2023. Database Fundamentals. In Xia J., Huang Q., Tu W., and Gui Z., eds. *Open GIS*. Springer Nature. ISBN-10: 303141747X. ISBN-13: 978-3031417474
21. Huang Q., **Wu M.**, 2023. Relational Databases. In Xia J., Huang Q., Tu W., and Gui Z., eds. *Open GIS*. Springer Nature. ISBN-10: 303141747X. ISBN-13: 978-3031417474

Semi-Refereed (Abstracts only) Conference Papers

22. Sui T., Huang Q., Wu M., **Wu M.**, 2023. “Empowering Urban Wildfire Burnt Area Detection with Deep Learning,” Global Smart Cities Summit & The 3rd International Conference on Urban Informatics (GSCS & ICUI 2023), Aug 20-23, Hong Kong.
23. **Wu M.**, Huang Q., Gao S., 2022. “Mixed land use detection via vision-language multi-modal learning,” 2022 American Geophysical Union (AGU) Fall Meeting, Dec 12-16, Chicago, IL, USA. *ESS Open Archive*. DOI: 10.22541/essoar.167252584.47036748/v1
24. Huang Q., Peng B., **Wu M.**, Vongkusolkiet J., Liu X., Scheele C., 2022. “Big data and GeoAI for natural hazard,” 2022 American Geophysical Union (AGU) Fall Meeting, Dec 12-16, Chicago, IL, USA.

Book Chapters Under Review/Revision

25. **Wu M.**, Huang Q., 2024. From Human Mobility to Social Segregation: What Insights Can Social Media Data Provide? *Urban Human Mobility: Practices, Analytics, and Strategies for Smart Cities*. CRC Press Taylor & Francis.
26. **Wu M.**, Huang Q., Basiri A., Bicakci Y., Shingleton J., 2024. Towards GeoAI Foundation Models: A Multimodal Learning Framework with Spatial Knowledge. *Geography According to ChatGPT*. IOS PRESS.

CONFERENCE AND INVITED TALKS & LECTURES

1. **Wu M.**, 2024. “GeoAI Multimodal Foundation Models for Urban Analytics,” Invited Talk at Urban Big Data Centre, University of Glasgow. (TBD in Oct, 2024, Invited)
2. **Wu M.**, 2024. “Geo-Foundation Models,” Invited Talk at the Department of Geography and the Environment, University of Texas at Austin (Oct 24, 2024, Invited)
3. **Wu M.**, 2024. “GeoAI Multimodal Foundation Models,” GeoComp Cluster Seminar, University of Glasgow (Sep 20, 2024, Invited)

4. **Wu M.**, 2024. "Generative AI for Geospatial Science," Generative AI Workshop, University of Glasgow (Sep 16, 2024, Invited)
5. **Wu M.**, 2024. "Apply for a Job in Academia," GISalon hosted by GISphere & CPGIS (online). (Aug 18, 2024, Invited)
6. **Wu M.**, 2024. "Towards GeoAI Multimodal Foundation Models for Urban Analytics," 2024 AGILE Workshop on Humans in the City: Artificial Intelligence Research and Urban Environments, Glasgow, UK. (Jun 4, 2024, Invited)
7. **Wu M.**, 2024. "Spatial Context-Aware Prompt Engineering for Vision-Language Multimodal Learning," 2024 AAG GeoAI and Deep Learning Symposium: Spatially Explicit Machine Learning and Artificial Intelligence, Honolulu, Hawaii, USA. (Apr 16, 2024, Invited)
8. **Wu M.**, 2023. "Measuring access inequality in a hybrid physical-virtual world: A case study of racial disparity of healthcare access during CoVID-19," Salad Seminar, Department of Psychology, UW–Madison. (Sep 27, 2023, Invited)
9. Huang Q., Liu X., **Wu M.**, 2023. "Trajectory Data Enrichment, Learning and Application. Geography Seminar," Huadong Normal University. (Aug 9, 2023, Invited)
10. Huang Q., Tang S., **Wu M.**, 2023. "Empowering Urban Wildfire Burnt Area Detection with U-Net and Sentinel-2 Imagery." 2023 Spatial Data Science Symposium. (Online, Sep 5–6, 2023, Invited)
11. **Wu M.**, 2023. "From human mobility to social segregation: what insights can geospatial data provide?" Esri GeoScene and GISphere Public Talk (Online, Sep 18, 2023, Invited)
12. **Wu M.**, Huang Q., Gao S., 2023. "Measuring Racial Disparity in Healthcare Access During CoVID-19 in Hybrid Physical-Virtual World," The 30th International Conference of Geoinformatics 2023, University College London, London, UK. (Jul 19-21, 2023)
13. **Wu M.**, Huang Q., Gao S., 2023. "A Unified Framework for Measuring Access Inequality in Hybrid Physical-Virtual World," UCGIS Symposium 2023, Yale University, New Haven, CT, USA. (Jun 6-9, 2023)
14. **Wu M.**, Huang Q., Gao S., 2023. "Vision-Language Multimodal Learning for Mixed Land Use Mapping with Street View Images," 2023 AAG Robert Raskin Student Paper Competition, Denver, CO, USA. (Mar 23-27, 2023)
15. **Wu M.**, Huang Q., 2023. "Estimating experienced racial-ethnic segregation based on social media data: A case study in Los Angeles-Long Beach-Anaheim," 2023 AAG Geographic Information Science and Systems (GISS) Specialty Group Student Competition, Denver, CO, USA. (Mar 23-27, 2023)
16. **Wu M.**, 2023. "From human mobility to social segregation: what insights can geospatial data provide?" GIS Professional Programs Coffee Talk, Department of Geography, University of Wisconsin-Madison. (Mar 22, 2023, Invited)
17. **Wu M.**, 2023. "Gap Year for a GISer – Why & How," GISalon hosted by GISphere & CPGIS (online). (Mar 5, 2023, Invited)
18. Huang Q., Vongkusolkiet J., Peng B., **Wu M.**, 2023. "Weakly Supervised Learning For Near Real-Time Flood Mapping," 2023 AAG Annual Meeting, Denver, CO. (Mar 23-27, 2023)

19. Huang Q., Liu X., **Wu M.**, 2022. "Graph Neural Networks for Individual Travel Activity Inference," Digital Twins and GeoAI Symposium, Beijing, China. (Dec 20, 2022, Invited)
20. **Wu M.**, Huang Q., Gao S., 2022. "Mixed Land Use Detection via Multi-modal Learning," American Geophysical Union (AGU) Fall Meeting, Chicago, IL, USA. (Dec 12, 2022)
21. Huang Q., Peng B., **Wu M.**, Vongkusolkiet J., Liu X., Scheele C., 2022. "Big data and GeoAI for natural hazard," American Geophysical Union (AGU) Fall Meeting, Chicago, IL, USA. (Dec 12-16, 2022, Invited)
22. **Wu, M.**, Huang, Q., 2022. "IM2City: Image Geo-localization via Multi-modal Learning," In The 5th ACM SIGSPATIAL International Workshop on AI for Geographic Knowledge Discovery (GeoAI '22), Seattle, WA, USA. (Nov 1, 2022)
23. **Wu, M.**, Qin, Y., Huang, Q., 2022. "People-based Segregation Indices: Measuring Segregation with Individual's Activity Space and Demographics in U.S. 50 Largest Cities Using Social Media," 2022 AAG John Odland Spatial Analysis & Modeling Student Paper Competition. (Online, Feb 26, 2022)
24. **Wu, M.**, 2021. "People-based Segregation Indices: Measuring Segregation with Individual's Activity Space and Demographics in U.S. 50 Largest Cities Using Social Media," 2021 International Graduate Workshop on GeoInformatics. (Online, Dec 18-19, 2021)
25. **Wu, M.**, 2021. "Measuring segregation from human-based perspective: a data-driven revolution of segregation measurement," Spatial Data Science Symposium 2021. (Online, Dec 13–14, 2021, Invited)
26. **Wu, M.**, 2021. "Human movement patterns of different racial-ethnic and economic groups in U.S. top 50 cities: What can social media tell us about segregation?" The 28th International Conference on GeoInformatics. (Online, Nov 2-5, 2021)

PROFESSIONAL AND COMMUNITY SERVICES

Session Chair

- 2023 AAG Annual Meeting
 - Symposium on Harnessing the Geospatial Data Revolution for Sustainability Solutions: Multimodal Learning with Geospatial Big Data ([Link](#))
 - Symposium on Human Dynamics Research: Exploring Social Inequality and Segregation with Geospatial Big Data ([Link](#))
- GISphere GISalon International 2023
 - Topic: *Apply GIS/Cartography/Environment Graduate Programs*, Jun 16, 2023 ([Link](#))
 - Topic: *Apply a Job with GIS/Cartography Major*, Sep 14, 2023 ([Link](#))
- IEEE International Geoscience and Remote Sensing Symposium (IGARSS), 2021

Presentation Judge

- Outstanding Student Presentation Awards (OSPA) program, AGU Fall Meeting, 2022

Student Director

- AAG Cyber-Infrastructure Specialty Group (CISG), 2023-2024

Manuscript Reviewer

- International Journal of Geographical Information Science (IJGIS), 2023-present
- International Journal of Applied Earth Observation and Geoinformation, 2021-present

- IEEE IGARSS Conference, 2020-2023
- Transactions in GIS, 2021-2023
- Scientific Reports, 2022-2023

Graduate Representatives to Faculty/Staff Meetings

- Department of Geography, UW-Madison, 2022-2024

Student Lead of Graduates Social Committee

- Department of Geography, UW-Madison, 2017-2019

MEMBERSHIP AND OUTREACH

2017 - Present: Member, American Association of Geographers

2021 - Present: Member, The International Association of Chinese Professionals in Geographic Information Sciences

2021 - Present: Member, University Consortium for Geographic Information Science

2022 - Present: Member, American Geophysical Union

2022 - Present: Member, Association for Computing Machinery

2024 - Present: Member, Association of Geographic Information Laboratories in Europe