

CAI WU

Assistant Professor

Urban Governance and Design Thrust, HKUST(GZ)

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Cai Wu is an Assistant Professor in the Urban Governance and Design (UGOD) Thrust at HKUST (Guangzhou). His research sits at the intersection of computational urban morphology, GeoAI, and data-driven urban design, with a focus on multi-scale spatial analysis and urban performance. He develops reproducible methods and open tools that support evidence-based urban planning and renewal.

Education

Faculty of Geo-Information Science and Earth Observation (ITC), University of Twente

PhD Urban Analytics

01/2020 – 06/2024, ENSCHEDE

- **Thesis:** An Urban Pattern Language Analytical Approach for Design and Planning with Spatial Data
- **Supervisors:** Professor Menno-Jan Kraak, Dr. Jiong Wang & Dr. Mingshu Wang

Bartlett Centre for Advanced Spatial Analysis (CASA), University College London

MSc Smart Cities & Urban Analytics

09/2018 – 09/2019, LONDON

- **Dissertation:** An Analysis of Singapore's master plan: Detecting and predicting the urban spatial structure and polycentricity via spatial network analysis.
- **Supervisor:** Dr. Duncan Smith

National University of Singapore

BA(Hons) Architecture

07/2012 – 10/2016, SINGAPORE

- Zigong, Sichuan Green Core & Belt concept plan and urban design, Zigong, China (2016)
 - Student Exchange Program - Meiji University, Tokyo, Japan (2015)
 - Asian City Workshop – Revitalization of Eastern Chao Phraya River, Bangkok, Thailand (2014)
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Professional Experience

Hong Kong University of Science and Technology (Guangzhou)

Assistant Professor

10/2024 - Present, GUANGZHOU

University of Glasgow

Visiting Fellow

06/2025 - 11/2025, GLASGOW

Urban Analytics Lab, National University of Singapore

Visiting Scholar

01/2024 – 08/2024, SINGAPORE

Sea Group

UI/UX Designer

12/2016 - 05/2018, SINGAPORE

Publications

Peer-reviewed Journal Articles

- **Wu, C.*** , Wang, J. , Wang, M. , Biljecki, F. , & Kraak, M. J. (2025). Formalising the urban pattern language: A morphological paradigm towards understanding the multi-scale structure of cities. *Cities* , 161, 105854.
- **Wu, C.** , Wang, M.* , Smith, D., Wang, J. , & Kraak, M. J. (2024). “Local Hubs and Global Gateways”: Understanding the Impact of Singapore’s master plan on urban polycentricity. *Environment and Planning B: Urban Analytics and City Science*.
- **Wu, C.*** , Wang, J. , Wang, M. , & Kraak, M. J. (2024). Machine learning-based characterisation of urban morphology with the street pattern. *Computers, environment and urban systems*, 109, 102078.
- **Wu, C.** , Wang, Y., Wang, J., Kraak, M. J., & Wang, M.* (2024). Mapping Street Patterns with Network Science and Supervised Machine Learning. *ISPRS International Journal of Geo-Information*, 13(4), 114.
- **Wu, C.** , Smith, D. , & Wang, M.* (2021). Simulating the urban spatial structure with spatial interaction: A case study of urban polycentricity under different scenarios. *Computers, environment and urban systems*, 89, 1-13.
- Wang, H., Lu, Z., Owyong, S., Chen, H. T., **Wu, C.**, Nguyen, T. H., & Lin, A. (2025). Advancing graph-supported machine learning in generative design for architectural engineering. *Automation in Construction*, 180, 106530.
- Zhao, W. , Li, M.* , **Wu, C.** , Zhou, W., & Chu, G. (2022). Identifying urban functional regions from high-resolution satellite images using a context-aware segmentation network. *Remote sensing*, 14(16), 3996.

Peer-reviewed Conference Proceedings

- Zhao, M.# & **Wu, C.** * (2025). GravityGNN: A Novel Graph Neural Network for Modelling Home-to-Work Spatial Flows in England. *The 19th International Conference on Computational Urban Planning and Urban Management (CUPUM) 2025*
- Su, Y.# , Zhao, W. , & **Wu, C.** * (2025). From Visual Perception to Behavioral Insights: A Comprehensive Workflow for Collecting and Processing Human-Built Environment Interaction Data. *The 19th International Conference on Computational Urban Planning and Urban Management (CUPUM) 2025*
- **Wu, C.** * , Wang, J. , & Kraak, M. J. (2023). Urban spatial structure from a street network perspective: mapping street patterns with random forest classification. In S. Sangiambut (Ed.), *The 18th International Conference on Computational Urban Planning and Urban Management (CUPUM) 2023*
- **Wu, C.** * , Wang, J. , Wang, M. , & Kraak, M. J. (2024). Evolving Urban Landscapes: A Spacematrix and Clustering Approach to understanding the morphology of Singapore's HDB Estates. *The Association of Geographic Information Laboratories in Europe (AGILE) 2024*

In Progress

- Yang, G.# , Su, Y. , Zhao, M. , Li, C. , & **Wu, C.***. Beyond Single Snapshots: Quantifying Multi-Scale Heterogeneity from Street-View Imagery and What It Reveals about Perception. *Cities (Under Review)*
- Zhao, M.# , Zhang, W. , Liu, Q. , Du, J. , Zhuang, W. , Nie, P. & **Wu, C.***. Urban Boundaries, Social Barriers: Multimodal Classification of Gated Communities and Their Equity Implications. *CVPR (Under Review)*.
- Liu, Q.# , Dai, S. , Yang, G. , & **Wu, C.***. The Transformation of Green Spaces Under Urban Expansion: A Study on the Coordination of Urban Expansion and Green Spaces in Guangzhou. *Sustainable Cities and Society (Under Review)*.

* Corresponding Author # Student Author

Selected Awards

- **Best Paper (Early Career) – CUPUM, 2025**
- **Best Paper (Third Prize) – International Conference on Urban Informatics, 2025**
- **Marine Alliance for Science and Technology for Scotland (MASTS) Visiting Fellowship, 2025**
- **Association of Geographic Information Laboratory in Europe (AGILE) Grant, 2024**
- **Dutch Assistant in Opleiding (AIO) Scholarship, 2020-2023**
- **NUS Awards for Study Abroad – NASA Enhancement Scholarship, 2014, 2016**
- **Japanese Student Service Association (JASSO) Scholarship 日本留学奨学金, 2015**
- **Singapore Ministry of Education Senior-Middle 1 (SM1) Scholarship, 2008-2011**

Teaching

UGOD, Hong Kong University of Science and Technology (Guangzhou)

- UGOD 5555: Urban Simulation with ABM and Network Science, 2025
- UGOD 5104: Visualisation for Urban Informatics, 2025
- UCUG 1000: Introduction to Critical Thinking and Data Literacy, 2026

ITC, University of Twente

- 202001419-1A Course 1: GIS and RS or Geospatial Solutions / **TA**, 2021,2022
- 202001419-1A Course 2: Geospatial Data: Concepts, Acquisition and Management / **TA**, 2020-2023
- 202001419-1A Course 3: Geospatial Analysis and Interpretation / **TA**, 2020-2023
- HTHT GIS Minor / **TA**, 2020

Supervision

PhD

- **Minwei Zhao**, Since 2025 Spring
- **Yunlei Su**, Since 2025 Spring
- **Dailuo Zhang**, Since 2025 Autumn
- **Jiawang Du**, Since 2026 Spring

MPhil

- **Guosheng Yang**, Since 2024 Autumn
- **Hanzhi Zu**, Since 2024 Autumn

Selected Presentations & Talks

Oral Presentation

- Global Smart Cities Summit cum The 4th International Conference on Urban Informatics (GSCS & ICUI 2025), Hong Kong, 2025
- Association of Geographic Information Laboratory in Europe (AGILE), Glasgow, 2024
- The 18th International Conference on Computational Urban Planning and Urban Management (CUPUM), Montreal, 2023
- The 16th Spatial Behaviour and Planning Research Conference, Online, 2020

Talks

- School of Architecture, Harbin Institute of Technology, Harbin, China, 2025
 - College of Architecture and Arts, Hunan University of Science and Technology, Xiangtan, China, 2023
 - Urban Analytics Lab, National University of Singapore, Singapore, 2021
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Academic Services

- **Youth Council:** Chinese Society for Urban Studies
 - **Program Committee** Association of Geographic Information Laboratory in Europe (AGILE), 2024,2026
 - **Session Moderator:** International Geoscience and Remote Sensing Symposium (IGARSS), Brussels, 2021
 - **Reviewer:** Nature Communication, Computers Environment and Urban Systems, Landscape and Urban Planning, Land Use Policy, Habitat International, Cities, Applied Geography, Transactions in GIS, URBAN DESIGN International, Humanities and Social Sciences Communications, Scientific Reports, Scientific Data, Applied Spatial Analysis and Policy, Computational Urban Science, Asian Geographer, International Journal of Health Geographics, Applied Geomatics, Journal of Land Use Science, JAG, City and Environment Interactions, Journal of Urban Management
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Skills

Programming & Data Science

Python, R, JavaScript, SQL, HTML/CSS, ABM, GIS, Machine Learning, Deep Learning, Network Analysis, PyTorch

Design & Visualization

Sketch, Photoshop, Illustrator, Sketchup, Rhino, AutoCAD