

Urban Sustainability Modelling: Foundations and Future Agenda for Cellular Automata and Agent-Based Approaches

22nd January 2026 (Thu)
4:30 – 6:00 pm (UTC+8)
Rm 221, Chen Kou Bun
Building, CUHK

The pursuit of sustainable urban development requires advanced computational tools to simulate the complex interplay between urban spatial dynamics and human decision behaviours. This seminar explores the complementary roles of Cellular Automata (CA) and Agent-Based Modelling (ABM) as powerful tools for urban scenario planning and sustainability analysis. I will first introduce the foundational principles of CA and an integrated CA-ABM approach, illustrating through empirical studies how CA models are developed and applied to simulate land use change and urban spatial dynamics, while ABM captures the decision behaviours of individual agents such as developers, planners, and residents. Together, they provide a robust platform for exploring alternative urban futures. I will then discuss contemporary challenges we face and outline a critical future research agenda requiring concerted attention from the urban modelling community. I will conclude by advocating for the development of next-generation cellular automata that embed agent-based rules and leverage 'big data' as the most promising pathway for strengthening our capacity to inform and achieve sustainable urban development.



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Professor Liu is a Quantitative Human Geographer and Spatial Data Scientist, specialising in GIS, urban analytics and modelling, and computational social science research. Her research has broad impact on sustainable city development, urban planning, transport planning, social inequality, and healthcare services. She is a Fellow of the UK Royal Geographical Society and is recognized as amongst the World's Top 2% Scientists by Stanford University. She serves as an Executive Member of the IGU Applied Geography Commission and the CUHK Computational Social Science Lab, and at the editorial board of *Computers, Environment and Urban Systems*, and *Environment and Planning B: Urban Analytics and City Science*, amongst others.



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