

BINYU LEI

Assistant Professor in Urban Planning and Data Analytics

School of Geography, Earth and Environmental Sciences, University of Birmingham Dubai Campus

b.lei@bham.ac.uk • [Google Scholar](#) • [ResearchGate](#) • [LinkedIn](#)

EDUCATION

PhD in Urban Analytics (Architecture)

August 2021–October 2025

Department of Architecture, National University of Singapore, Singapore

Master of Urban Planning

July 2017–July 2019

The University of Melbourne, Melbourne, Australia

Bachelor of Human Geography and Regional Planning

September 2013–July 2017

East China Normal University, Shanghai, China

RESEARCH INTEREST

Urban digital twins, 3D GIS, Urban informatics, Human-centric urban technology, Urban complexity, Human perception, Human health, Data quality, Crowdsourced data, GeoAI

RESEARCH GRANTS

Al Qasimi Foundation Seed Grant

September 2026 – Present

Principal Investigator

- **Project:** Walking in the Heat: Measuring and Explaining Urban Walkability in Ras Al Khaimah.
- Investigating how built environment and microclimate conditions influence walking experiences in the heat environment.
- Combining field measurements, subjective perception, and geospatial analysis to identify gaps in walking provision.
- Developing a walkability index to demonstrate spatial variation and inform planning and design strategies.
- **Award value:** AED 150,000

QR Enhancing Research Culture Fund

July 2026 – Present

Principal Investigator

- **Project:** After dark: Modelling nighttime urban vitality in Dubai.
- Developing an agent-based model of nighttime activity and movement using social media data and street network.
- Producing spatial vitality variation and scenario simulations to support vibrant and inclusive nighttime environments.
- **Award value:** AED 30,000

NUS Humanities and Social Sciences Seed Fund

2023–2025

Co-Investigator & Lead Proposal Writer

- **Project:** *From Models to Pavements: Advancing Urban Digital Twins with a Multidimensional Human-Centric Approach for Smart Walkability Analysis.*
- Developed a human-centric framework integrating to evaluate outdoor comfort.
- Applied wearable sensing and microsurveys to connect urban digital twins with street-level pedestrian experiences.
- **Award value:** SGD 40,000.

RESEARCH PUBLICATIONS

X. Wei, F. Biljecki, P. Liu, **B. Lei**, N. Van de Weghe, and H. Huang, “Modeling adolescents’ perception of cycling safety: A new approach using graph neural networks and street view imagery,” *Computers, Environment and Urban Systems*, vol. 128, 102454. doi:10.1016/j.compenvurbsys.2026.102454 2026

- P. Liu, W. Yap, Y. Hou, **B. Lei**, R. Stouffs, and F. Biljecki, “A graph-based human-centered GeoAI for understanding street-level environment and traffic accident frequency with street view imagery,” *Journal of Urban Technology*, vol. 33, no. 3, pp. 93–123. doi:10.1080/10630732.2026.2665592 2026
- B. Lei**, P. Liu, K. Fujiwara, M. Frei, C. Miller, Y. X. Chua, and F. Biljecki, “Multidimensional analysis of human outdoor comfort: Integrating just-in-time adaptive interventions (JITAI) in urban digital twins,” *Cities*, vol. 168, 106443. doi:10.1016/j.cities.2025.106443 2026
- K. Fujiwara, R. Tsurumi, T. Kiyono, Z. Fan, X. Liang, **B. Lei**, W. Yap, K. Ito, and F. Biljecki, “Vox-City: A seamless framework for open geospatial data integration, grid-based semantic 3D city model generation, and urban environment simulation,” *Computers, Environment and Urban Systems*, vol. 123, 102366. doi:10.1016/j.compenvurbsys.2025.102366 2026
- S. Cheng, **B. Lei**, K. Fujiwara, C. Miller, F. Biljecki, and J. van Ameijde, “Walking through green and grey: Exploring sequential exposure and multisensory environmental effects on psychological restoration,” *Building and Environment*, vol. 287, 113748. doi:10.1016/j.buildenv.2025.113748 2026
- P. Liu, Y. Wang, S. De Sabbata, **B. Lei**, F. Biljecki, J. Tang, and R. Stouffs, “Living upon networks: A heterogeneous graph neural embedding integrating waterway and street systems for urban form understanding,” *Environment and Planning B: Urban Analytics and City Science*, vol. 53, no. 2, pp. 453–469. doi:10.1177/23998083251358527 2026
- C. Miller, Y. X. Chua, M. Quintana, **B. Lei**, F. Biljecki, and M. Frei, “Make yourself comfortable: Nudging urban heat and noise mitigation with smartwatch-based just-in-time adaptive interventions (JITAI),” *Building and Environment*, vol. 284, 113388. doi:10.1016/j.buildenv.2025.113388 2025
- M. Abdelrahman, E. Macatulad, **B. Lei**, M. Quintana, C. Miller, and F. Biljecki, “What is a digital twin anyway? Deriving the definition for the built environment from over 15,000 scientific publications,” *Building and Environment*, vol. 274, 112748. doi:10.1016/j.buildenv.2025.112748 2025
- B. Lei**, P. Liu, X. Liang, Y. Yan, and F. Biljecki, “Developing the urban comfort index: Advancing liveability analytics with a multidimensional approach and explainable artificial intelligence,” *Sustainable Cities and Society*, vol. 120, 106121. doi:10.1016/j.scs.2024.106121 2025
- P. Liu, **B. Lei**, W. Huang, F. Biljecki, Y. Wang, S. Li, and R. Stouffs, “Sensing climate justice: A multi-hyper graph approach for classifying urban heat and flood vulnerability through street view imagery,” *Sustainable Cities and Society*, vol. 118, 106016. doi:10.1016/j.scs.2024.106016 2025
- B. Lei**, P. Liu, N. Milojevic-Dupont, and F. Biljecki, “Predicting building characteristics at urban scale using graph neural networks and street-level context,” *Computers, Environment and Urban Systems*, vol. 111, 102129. doi:10.1016/j.compenvurbsys.2024.102129 2024
- S. Wang et al. (including **B. Lei**), “Mapping the landscape and roadmap of geospatial artificial intelligence (GeoAI) in quantitative human geography: An extensive systematic review,” *International Journal of Applied Earth Observation and Geoinformation*, vol. 128, 103734. doi:10.1016/j.jag.2024.103734 2024
- P. Liu, T. Zhao, J. Luo, **B. Lei**, M. Frei, C. Miller, and F. Biljecki, “Towards human-centric digital twins: Leveraging computer vision and graph models to predict outdoor comfort,” *Sustainable Cities and Society*, vol. 93, 104480. doi:10.1016/j.scs.2023.104480 2023
- B. Lei**, P. Janssen, J. Stoter, and F. Biljecki, “Challenges of urban digital twins: A systematic review and a

Delphi expert survey,” *Automation in Construction*, vol. 147, 104716. doi:10.1016/j.autcon.2022.104716
2023

B. Lei, R. Stouffs, and F. Biljecki, “Assessing and benchmarking 3D city models,” *International Journal of Geographical Information Science*, vol. 37, no. 4, pp. 788–809. doi:10.1080/13658816.2022.2140808
2023

CONFERENCE PUBLICATIONS

K. Fujiwara, R. Tsurumi, T. Kiyono, Z. Fan, X. Liang, B. Lei, W. Yap, K. Ito, and F. Biljecki, “VoxCity: A one-stop package for open geospatial data integration, grid-based 3D city model generation and urban simulation,” *12th International Conference on Urban Climate (ICUC12)*, Rotterdam, the Netherlands, ICUC12-313. doi:10.5194/icuc12-313
2025

B. Lei, X. Liang, and F. Biljecki, “Integrating human perception in 3D city models and urban digital twins,” *ISPRS Annals of the Photogrammetry, Remote Sensing and Spatial Information Sciences*, vol. X-4/W5-2024, pp. 211–218. doi:10.5194/isprs-annals-X-4-W5-2024-211-2024
2024

B. Lei and F. Biljecki, “Evaluating the development of open 3D city models: A multidimensional assessment,” *ISPRS Annals of the Photogrammetry, Remote Sensing and Spatial Information Sciences*, vol. X-4/W6-2025, pp. 137–144. doi:10.5194/isprs-annals-X-4-W6-2025-137-2025
2025

B. Lei, Y. Su, and F. Biljecki, “Humans as sensors in urban digital twins,” in *Recent Advances in 3D Geoinformation Science: Proceedings of the 18th 3D GeoInfo Conference*, Springer, pp. 693–706. doi:10.1007/978-3-031-43699-4_42
2024

INVITED TALKS AND KEYNOTES

Climate Change AI Virtual Summer School August 2026
Invited lecturer: “AI for cities and urban planning.”
Organised by Climate Change AI, virtual event.

Climate Change AI Discussion Seminar Series #3 October 2024
Invited speaker: “Predicting building characteristics at urban scale using graph neural networks and street-level context.”
Organised by Climate Change AI.

128th Open Geospatial Consortium Meeting March 2024
Invited speaker: “Humans as sensors in urban digital twins.”
Organised by the Open Geospatial Consortium, TU Delft, the Netherlands.

London Data Week July 2023
Invited keynote: “Understanding urban data and digital twins in cities.”
Organised by the Centre for Urban Science and Progress, King’s College London, UK.

124th Open Geospatial Consortium Meeting October 2022
Invited speaker: “Understanding challenges to urban digital twins.”
Organised by the Open Geospatial Consortium, Lifelong Learning Institute, Singapore.

122nd Open Geospatial Consortium Meeting March 2022
Invited speaker: “Assessing and benchmarking 3D city models.”
Organised by the Open Geospatial Consortium, virtual event.

TEACHING EXPERIENCE

University of Birmingham Dubai

2025–Present

Module Lead

- *AI and Big Data in Urban Analytics: Theory and Practice*
- *Research Skills for Urban Scientists: Research with AI, Data Handling and Statistical Modelling*

Teaching Contributor

- *Spatial Analysis and Urban Living: Evaluating the Qualities and Quantities of Urban Spaces*
- *Urban Lab: Data Modelling and Transport Systems*

Master's Dissertation Supervision

- Supervision of MSc dissertations in Urban Analytics and AI, including research design, geospatial data analysis, computational methods and academic writing.

ACADEMIC SERVICE

Guest Editor, *City and Environment Interactions*

2026–Present

Special Issue: “Next-Generation GeoAI for Sustainable Urban Development: Methods, Data, and Applications.”

Track Co-chair, Track 9: Technologies and Methods

July 2027

Association of European Schools of Planning (AESOP) Annual Congress, Birmingham, UK.

Programme Committee Member, Communities and Technologies (C&T), Delft

2027

Journal Reviewer

2022–Present

Automation in Construction; Building and Environment; Building Simulation; Cities; Computers, Environment and Urban Systems; Energy and Buildings; Environment and Planning B; International Journal of Geographical Information Science; Resources, Conservation and Recycling; Sustainable Cities and Society; Transactions in GIS.

PROFESSIONAL MEMBERSHIPS

Open Geospatial Consortium, 3D Information Management Domain Working Group

2021–Present

International Society for Photogrammetry and Remote Sensing, Individual Member

OUTREACH AND VOLUNTEERING

Organiser, ICLR Workshop on Tackling Climate Change with Machine Learning
Workshop website.

2025

Team Lead, Jane's Walk Singapore

Designed and led a public city walk on Singapore's urban cooling strategies. Event details.

2024