

# Rui Zhu

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## Statement

My research interest lies in Urban Informatics, including three interconnected fields, i.e., Solar Cities, Urban Environment, and Urban Mobility. During the past few years, I have refined and further enriched the concept of Solar Cities and comprehensively developed models to address scientific challenges in the estimation of spatiotemporal solar photovoltaic (PV) potential on 3D urban surfaces, spatial optimization of PV installation constraint by the expected socioeconomic and environmental impacts, and PV penetration for adaptively and efficiently powering various urban sectors to dynamically balance the heterogeneous relationships between supply and demand over time and space.

Associate Editor, *Springer Nature Computer Science*  
Young Editor, *Advances in Applied Energy*  
Young Editor, *The Innovation*  
Board of Directors Member (2023-2024), CPGIS

## Professional experience

**Research Assistant Professor**, 01/2021-10/2022

[Department of Land Surveying and Geo-Informatics](#)  
Faculty of Construction and Environment  
The Hong Kong Polytechnic University, Hong Kong, China

**Postdoctoral Associate**, 01/2018-12/2020

MIT Senseable City Laboratory  
[Senseable City Laboratory](#), Singapore-MIT Alliance for Research and Technology, Singapore  
[Senseable City Laboratory](#), Massachusetts Institute of Technology, USA

## Education

PhD, Geo-Informatics, The Hong Kong Polytechnic University, Hong Kong, China, 2017  
PhD Exchange Study, Université Laval, Canada, 2015/08-2016/01  
[PhD Dissertation Awards for Postgraduate Students \(HKIS\), 2 winners only in HK every year](#)  
MSc, KTH - Geodesy and Geoinformation, Royal Institute of Technology, Sweden, 2013  
BSc, Geographical Information System, Nanjing Normal University, China, 2010

## Professional membership

- Member, American Association of Geographers
- Member, International Society for Photogrammetry and Remote Sensing (ISPRS)
- Member, International Society for Urban Informatics
- Member, International Society for Urban Informatics
- Member, International Association of Chinese Professionals in Geographic Information Sciences

- Member, Modeling Geographical Systems Commission, International Geographical Union (IGU)
- Member, Applied Energy Academy, Journal of Applied Energy
- Committee Member, Remote Sensing and Environment, Jiangsu-Hong Kong-Macao University Alliance
- Scientific Committee Member, [ISPRS Geospatial Week 2023](#), [GeoHB 2023: Geo-Spatial Computing for Understanding Human Behaviours](#), Cairo, Egypt, 2-7 September 2023.
- Program Committee Member, Space-time AI and Urban Analytics, [The 30th International Conference on Geoinformatics 2023](#), UK, 19-21 July 2023.
- Scientific Committee Member, [ISPRS Technical Commission IV Symposium 2018](#), 3D Spatial Information Science - The Engine of Change, 1-5 October 2018, Delft, The Netherlands.
- Session Chair, Session name: Climate risks and their implications for Asian societies, [The 2nd workshop of Asian Young Geographers](#), Virtual, 17-18 December 2022.
- Session Chair, Session name: Energy and Buildings. [Applied Energy Symposium 2022: Low carbon cities and urban energy systems](#), Virtual, 24-27 November 2022.
- Session Chair, Session name: Climate change and policy option. [Applied Energy Symposium 2021: Low carbon cities and urban energy systems](#), Matsue, Japan, 4-8 September 2021.

## Journal publications

\* Corresponding author

### 2023 (11)

57. **Zhu, R.**, Zhang, F., Yan, J., Ratti, C., Chen, M. (2023). A sustainable solar city: From utopia to reality facilitated by GIScience. *The Innovation Geoscience*, 1(1), 100006. [\[Link\]](#)
56. **Zhu, R.\***, Kwan, M.P., Perera, A.T.D., Fan, H., Yang, B., Chen, B., Chen, M., Qian, Z., Zhang, H., Zhang, X., Yang, J., Santi, P., Ratti, C., Li, W., Yan, J. (2023). GIScience can facilitate the development of solar cities for energy transition. *Advances in Applied Energy*, 10, 100129. [\[Link\]](#)
55. **Zhu, R.**, Guo, D., Wong, M.S., Qian, Z., Chen, M., Yang, B., Chen, B., Zhang, H., You, L., Heo, J., Yan, J. (2023). Deep Solar PV Refiner: An advanced deep learning network for photovoltaic area segmentation from satellite imagery. *International Journal of Applied Earth Observation and Geoinformation*, 116, 103134. (IF: 7.5, 5/33, Q1) [\[Link\]](#)
54. Yan, L., **Zhu, R.\***, Kwan, M.P., Luo, W., Wang, D., Zhang, S., Wong, M.S., You, L., Yang, B., Chen, B., Feng, L. (2023). Estimation of building-integrated photovoltaic potential: A detail-oriented deep learning network for constructing three-dimensional building models from optical remote sensing imagery. *Sustainable cities and society*, 93, 104515. (IF: 11.7, 1/68, Q1) [\[Link\]](#)
53. Xu, F., Wong, M.S., **Zhu, R.**, Heo, J. (2023). Semantic Segmentation of Urban Building Surface Materials using Multi-Scale Contextual Attention Network. *ISPRS Journal of Photogrammetry and Remote Sensing*, 202, 158–168. (IF: 12.7, 1/49, Q1) [\[Link\]](#)
52. Zhang, Z., Chen, M., Zhong, T., **Zhu, R.**, Qian, Z., Zhang, F., Yang, Y., Zhang, K., Santi, P., Wang, K., Pu, Y., Tian, L., Lü, G., Yan, J. (2023). Significant carbon mitigation potential of rooftop solar photovoltaics in China. *Nature Communications*, 14, 2347. (IF: 16.6, 6/73, Q1) [\[Link\]](#)
51. Cao, R., Liao, C., Li, Q., Tu, W., **Zhu, R.**, Luo, N., Qiu, G., Shi, W. (2023). Integrating satellite and street-level images for local climate zone mapping. *International Journal of Applied Earth Observation and Geoinformation*, 119, 103323. (IF: 7.5, 5/33, Q1) [\[Link\]](#)
50. Yang, J., Wu, Z., Shi, Q., Menenti, M., Xie, Y., **Zhu, R.**, Abbas, S., Xu, Y. (2023). Impacts of urban morphology on sensible heat flux and net radiation exchange. *Urban Climate*, 50, 101588. (IF: 6.4, 14/94, Q1) [\[Link\]](#)
49. Luo, W., Zhou, Y., Liu, Z., Kang, W., He, S., **Zhu, R.**, Li, R., Huang, B. (2023). Cross-Regional Analysis of the Association Between Human Mobility and COVID-19 Infection in Southeast Asia During the Transition Period of “Living with COVID-19”. *Health & Place*, 81, 103000. (IF: 4.8, 34/180, Q1) [\[Link\]](#)

48. Cao, M., Tian, Y., Wu, K., Chen, M., Chen, Y., Hu, X., Sun, Z., Zuo, L., **Zhu, R.**, Xu, Z., Luo, L., Lin, J., Bandrova, T., Konecny, M., Yuan, W., Guo, H., Lin, H., Lü, G. (2023). Future land-use change and its impact on terrestrial ecosystem carbon pool evolution along the Silk Road under SDG scenarios. *Science Bulletin*, 68(7), 740–749. (IF: 18.9, 5/73, Q1) [\[Link\]](#)
  47. Chen, M., Qian, Z., Boers, N., Jakeman, A.J., Kettner, A.J., Brandt, M., Kwan, M.P., Batty, M., Li, W., **Zhu, R.**, Luo, W., Ames, D.P., Zhang, F., Cuddy S.M., Reichstein, M., Ratti, C., Barton M.C., Zhong, T., Liu, J., Sun, Z., Zhang, Z., Zhu, Z., Ma, Z., He, Y., Lü, G. (2023). Towards intelligent Earth surface system modeling: human insights join neural strengths. *Nature Reviews Earth & Environment* (IF: 42.1, 1/274, Q1) [\[Link\]](#)
- 2022 (16)**
46. **Zhu, R.**, Anselin, L., Kwan, M.P., Batty, M., Chen, M., Luo, W., Cheng, T., Lim, C.K., Santi, P., Cheng, C., Gu, Q., Wong, M.S., Zhang, K., Guonian Lü, Ratti, C. (2022). The effect of different travel modes and travel destinations on COVID-19 transmission in global cities. *Science Bulletin*, 67, 588–592. (IF: 20.577, 5/73, Q1) [\[Link\]](#)
  45. **Zhu, R.**, Kondor, D., Cheng, C., Zhang, X., Santi, P., Wong, M.S., Ratti, C. (2022). Solar photovoltaic generation for charging shared electric scooters. *Applied Energy*, 313, 118728. (IF: 11.446, 9/142, Q1) [\[Link\]](#) [\[Website\]](#)
  44. **Zhu, R.**, Cheng, C., Santi, P., Chen, M., Zhang, X., Mazzarello, M., Ratti, C. (2022). Optimization of photovoltaic provision in a three-dimensional city using real-time electric demand. *Applied Energy*, 316, 119042. (IF: 11.446, 9/142, Q1) [\[Link\]](#)
  43. **Zhu, R.**, Wong, M.S., Kwan, M.P., Chen, M., Santi, P., Ratti, C. (2022). An economically feasible optimization of photovoltaic provision using real electricity demand: A case study in New York city. *Sustainable Cities and Society*, 103614. (IF: 10.696, 2/68, Q1) [\[Link\]](#)
  42. **Zhu, R.**, Dong, X., Wong, M.S. (2022). Estimation of the urban heat island effect in a reformed urban district: A scenario-based study in Hong Kong. *Sustainability*, 14, 4409. (IF: 3.889, 57/127, Q2) [\[Link\]](#)
  41. Liao, X., **Zhu, R.\***, Wong, M.S. (2022). Simplified estimation modeling of land surface solar irradiation: A comparative study in Australia and China. *Sustainable Energy Technologies and Assessments*, 52, 102323. (IF: 7.632, 32/119, Q2) [\[Link\]](#)
  40. Cheng, C., **Zhu, R.\***, Costa, A.M., Thompson, R.G., Huang, Y. (2022). Multi-period two-echelon location routing problem for disaster waste clean-up. *Transportmetrica A: Transport Science*, 18(3), 1053–1083. (IF: 3.496, 17/38, Q2) [\[Link\]](#)
  39. Adeniran, I.A., **Zhu, R.**, Yang, J., Zhu, X., Wong, M.S. (2022). Cross-comparison between Landsat-8 and Himawari-8 satellite derived land surface temperature for image fusion: A case study in Hong Kong. *Remote Sensing*, 14, 4444. (IF: 5.349, 30/201, Q1) [\[Link\]](#)
  38. Cheng, C., Lu, J.-W., **Zhu, R.**, Xiao, Z., Costa, A.M., Thompson, R.G. (2022). An integrated multi-objective model for disaster waste clean-up systems optimization. *Transportation Research Part E*, 165, 102867. (IF: 10.047, 6/379, Q1) [\[Link\]](#)
  37. Yu, X., Wong, M.S., Liu, C.H., **Zhu, R.** (2022). Synergistic data fusion of satellite observations and in-situ measurements for hourly PM2.5 estimation based on hierarchical geospatial long short-term memory. *Atmospheric Environment*, 286, 119257. (IF: 5.755, 19/94, Q1) [\[Link\]](#)
  36. Qian, Z., Chen, M., Zhong T., Zhang, F., **Zhu, R.**, Zhang, Z., Zhang, K., Sun, Z., Lü, G. (2022). A detail-oriented deep learning network for refined delineation of roof structure lines using satellite imagery. *International Journal of Applied Earth Observation and Geoinformation*, 107, 102680. (IF: 7.672, 5/34, Q1) [\[Link\]](#)
  35. Zhang, K., Chen, M., Yang, Y., Zhong, T., **Zhu, R.**, Zhang, F., Qian, Z., Lü, G., Yan, J. (2022). Quantifying the photovoltaic potential of highways in China. *Applied Energy*, 324, 119600. (IF: 11.446, 9/142, Q1) [\[Link\]](#)
  34. Qian, Z., Chen, M., Yang, Y., Zhong, T., Zhang, F., **Zhu, R.**, Zhang, K., Zhang, Z., Sun, Z., Ma, P., Lü, G., Yan, J. (2022). Vectorized dataset of roadside noise barriers in China using street view imagery. *Earth System Science Data*, 14, 4057–4076. (IF: 11.333, 4/200, Q1) [\[Link\]](#)
  33. Zhang, K., Qian, Z., Chen, M., Yang, Y., Zhong, T., **Zhu, R.**, Lü, G., Yan, J. (2022). Using street view images to identify road noise barriers with ensemble classification model and geospatial analysis. *Sustainable Cities and Society*, 78, 103598. (IF: 10.696, 2/68, Q1) [\[Link\]](#)

32. Meng, Y., Wong, M.S., Xing, H., Kwan, M.P., **Zhu, R.** (2022). Association between Global Air Pollution and COVID-19 Mortality: A Study of Forty-Six Cities in the World. *Annals of the American Association of Geographers*, 112(6), 1777-1793. (IF: 3.982, 19/85, Q1) [\[Link\]](#)
31. Zhang, Z., Qian, Z., Zhong, T., Chen, M., Zhang, K., Yang, Y., **Zhu, R.**, Zhang, F., Zhang, H., Zhou, F., Yu, J., Zhang, B., Lü, G., Yan, J. (2022). Vectorized rooftop area data for 90 cities in China. *Scientific Data*, 9, 66. (IF: 8.501, 12/73, Q1) [\[Link\]](#)

## 2021 (12)

30. Wong, M.S., **Zhu, R.\***, Kwok, Y.T., Kwan, M.P., Santi, P., Lee, K.H., Heo, J., Li, H., Ratti, C. (2021). Association between NO<sub>2</sub> concentrations and spatial configuration: A study of the impacts of COVID-19 lockdowns in 54 US cities. *Environmental Research Letters*, 16, 054064. (IF: 6.793, 8/94, Q1) [\[Link\]](#)
29. Cheng, C., **Zhu, R.\***, Thompson, R.G., Zhang, L. (2021). Reliability analysis for multiple-stage solid waste management systems. *Waste Management*, 120, 650–658. (IF: 7.145, 29/274, Q1) [\[Link\]](#)
28. Cheng, C., **Zhu, R.\***, Costa, A.M., Thompson, R.G. (2021). Optimisation of waste clean-up after large-scale disasters. *Waste Management*, 119, 1-10. (IF: 7.145, 29/274, Q1) [\[Link\]](#)
27. Chen, X., Yang, J., **Zhu, R.**, Wong, M.S., Ren, C. (2021). Spatiotemporal impact of vehicle heat on urban thermal environment: a case study of Hong Kong. *Building and Environment*, 205, 108224. (IF: 6.456, 6/136, Q1) [\[Link\]](#)
26. Zhong, T., Zhang, Z., Chen, M., Zhang, K., Zhou, Z., **Zhu, R.**, Wang, Y., Qian, Z., Lu, G., Yan, J. (2021). A city-scale estimation of rooftop solar photovoltaic potential based on deep learning. *Applied Energy*, 298, 117132. (IF: 9.746, 6/143, Q1) [\[Link\]](#)
25. Zhong, T., Zhang, K., Chen, M., Wang, Y., **Zhu, R.**, Zhang, Z., Zhou, Z., Qian, Z., Lv, G., Yan, J. (2021). Assessment of solar photovoltaic potentials on urban noise barriers using street-view imagery. *Renewable Energy*, 168, 181–194. (IF: 8.001, 16/114, Q1) [\[Link\]](#)
24. Meng, Y., Wong, M.S., Xing, H., **Zhu, R.**, Qin, K., Kwan, M.P., Lee, K.H., Kwok, C.Y.T., Li, H. (2021). Effects of urban functional fragmentation on nitrogen dioxide (NO<sub>2</sub>) variation with anthropogenic-emission restriction in China. *Scientific Reports*, 11, 11908. (IF: 4.379, 17/73, Q1) [\[Link\]](#)
23. Meng, Y., Wong, M.S., Xing, H., Kwan, M.P., **Zhu, R.** (2021). Yearly and Daily Relationship Assessment between Air Pollution and COVID-19 Incidence: Evidence from 254 Countries and Regions. *ISPRS International Journal of Geo-Information*, 10, 401. (IF: 2.899, 76/162, Q2) [\[Link\]](#)
22. Meng, Y., Wong, M.S., Xing, H., Kwan, M.P., **Zhu, R.** (2021). Assessing the country-level excess all-cause mortality and the air pollution-human activity impacts during COVID-19 epidemic. *International Journal of Environmental Research and Public Health*, 18(13), 6883. (IF: 3.390, 41/176, Q1) [\[Link\]](#)
21. Yang, Z., Hui, K.W., Abbas, S., **Zhu, R.**, Kwok, C.Y.T., Heo, J., Ju, S., Wong, W.S. (2021). A Review of Dynamic Tree Behaviors: Measurement Methods on Tree Sway, Tilt and Root-plate Movement. *Forests*, 12, 379. (IF: 2.633, 13/67, Q1) [\[Link\]](#)
20. Yu, X., Wong, M.S., Kwan, M.P., Nichol, J., **Zhu, R.**, Heo, J., Chan, P.W., Chin, D.C.W., Kwok, C.Y.T., Kan, Z. (2021). COVID-19 infection and mortality: association with PM<sub>2.5</sub> concentration and population distribution – an exploratory study. *ISPRS International Journal of Geo-Information*, 10, 123. (IF: 2.899, 76/162, Q2) [\[Link\]](#)
19. Yu, Z., Zhu, X., Liu, X., Chen, X., Wei, T., Yuan, H.Y., Xu, Y., **Zhu, R.**, He, H., Wang, H., Wong, M.S., Jia, P., Shi, W.Z., Chen, W. (2021). Reopening International Borders without Quarantine: Contact Tracing Integrated Policy against COVID-19. *International Journal of Environmental Research and Public Health*, 18(14), 7494. (IF: 3.390, 41/176, Q1) [\[Link\]](#)

## 2020 (5)

18. **Zhu, R.**, Wong, W.S., You, L., Santi, P., Nichol, J., Ho, H.C., Lu, L., Ratti, C. (2020). The effect of urban morphology on the solar capacity of three-dimensional cities. *Renewable Energy*, 153, 1111–1126. (IF: 6.274, 19/112, Q1) [\[Link\]](#) [\[Website at MIT SCL\]](#)
17. **Zhu, R.**, Zhang, X., Kondor, D., Santi, P., Ratti, C. (2020). Understanding spatio-temporal heterogeneity of bike-share and scooter-share mobility. *Computers, Environment and Urban Systems*, 81, 101483. (IF: 4.655, 6/84, Q1; [ESI high citation](#)) [\[Link\]](#)

16. **Zhu, R.**, Guilbert, E., Wong, W. S. (2020). Object-oriented tracking of spatial and thematic dynamic behaviors of urban heat islands. *Transactions in GIS*, 24, 85–103. (IF: 2.119, 40/84, Q2) [\[Link\]](#)
  15. Yan, L., Luo, X., **Zhu, R.**, Santi, P., Wang, D., Ratti, C. (2020). Quantifying and analyzing traffic emission reduction by ridesharing: a case study of Shanghai. *Transportation Research Part D: Transport and Environment*, 89, 102629. (IF: 4.577, 5/37, Q1) [\[Link\]](#)
  14. Kan, Z., Wong, W. S., **Zhu, R.** (2020). Understanding space-time patterns of vehicular emission flows in urban areas using geospatial technique. *Computers, Environment and Urban Systems*, 79, 101399. (IF: 4.655, 6/84, Q1) [\[Link\]](#)
- 2019 (5)**
13. **Zhu, R.**, You, L., Santi, P., Wong, W.S., Ratti, C. (2019). Solar accessibility in developing cities: A case study in Kowloon East, Hong Kong. *Sustainable Cities and Society*, 51, 101738. (IF: 5.268, 5/63, Q1) [\[Link\]](#)
  12. You, L., Tuncer, B., **Zhu, R.**, Xing, H., Yuen, C. (2019). A Synergetic Orchestration of Objects, Data and Services to Enable Smart Cities. *IEEE Internet of Things Journal*, 6(6), 10496–10507. (IF: 9.936, 3/156, Q1) [\[Link\]](#)
  11. Ho, H. C., Wong, W.S., Abbas, S., **Zhu, R.** (2019). Development of the Adjusted Wind Chill Equivalent Temperature (AWCET) for cold mortality assessment across a subtropical city: validation and comparison with a spatially-controlled time-stratified approach. *BMC Public Health*, 19, 1290. (IF: 2.521, 70/193, Q2) [\[Link\]](#)
  10. Lu, M., An, K., Hsu, S.C., **Zhu, R.** (2019). Considering user behavior in free-floating bike sharing system design: A data-informed spatial agent-based model. *Sustainable Cities and Society*, 49, 101567. (IF: 5.268, 5/63, Q1) [\[Link\]](#)
  9. Ho, H.C., Abbs, S., Yang, J., **Zhu, R.**, Wong, W.S. (2019). Spatiotemporal prediction of increasing winter perceived temperature for climate change mitigation: A sustainable planning guideline for a sub-tropical city. *International Journal of Environment Research and Public Health*, 16, 497. (IF: 2.849, 32/171, Q1) [\[Link\]](#)
- 2018 (2)**
8. Na, J., Yang, X., Dai, W., Li, M., Xiong, L., **Zhu, R.**, Tang, G. (2018). Bidirectional DEM relief shading method for extraction of gully shoulder-line in loess tableland area. *Physical Geography*, 39(4), 368-386. (IF: 1.435, 149/200, Q3) [\[Link\]](#)
  7. **Zhu, R.**, Guilbert, E., Wong, W. S. (2018). Object-core oriented data modelling for tracking of behaviors of urban heat islands. *The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences*, 42(4), 763–770. [\[Link\]](#)
- 2017 and before (6)**
6. **Zhu, R.**, Wong, W. S., Guilbert, E., Chan, P. W. (2017). Understanding heat patterns produced by vehicular flows in urban areas. *Scientific Reports*, 7, 16309. (IF: 4.543, 17/71, Q1) [\[Link\]](#) [\[Video\]](#)
  5. **Zhu, R.\***, Guilbert, E., Wong, W. S. (2017). Object-oriented tracking of the dynamic behavior of urban heat islands. *International Journal of Geographical Information Science*, 31(2), 405–424. (IF: 3.733, 10/84, Q1) [\[Link\]](#)
  4. Wong, W. S., **Zhu, R.**, Liu, Z., Lu, L., Peng, J., Tang, Z., Lo, C. H., Chan, W. K. (2016). Estimation of Hong Kong's solar energy potential using GIS and remote sensing technologies. *Renewable Energy*, 99, 325–335. (IF: 6.274, 19/112, Q1) [\[Link\]](#)
  3. **Zhu, R.\***, Guilbert, E., Wong, W. S. (2016). Tracking the spatial evolution of urban heat islands. *ISPRS Annals of the Photogrammetry, Remote Sensing and Spatial Information Sciences*, 3(2), 3–8. [\[Link\]](#)
  2. Li, F., Tang, G., Wang, C., Cui, L., **Zhu, R.** (2016). Slope Spectrum Variation in a Simulated Loess Watershed. *Frontiers of Earth Science*, 10(2), 328–339. (IF: 1.62, 134/200, Q3) [\[Link\]](#)
  1. Yang, Y., Tang, G., Cao, M., **Zhu, R.** (2013). An intelligent method to discover transition rules for cellular automata using bee colony optimization. *International Journal of Geographical Information Science*, 27 (10), 1849–1864. (IF: 3.733, 10/84, Q1) [\[Link\]](#)



## Working paper

- You, L., **Zhu, R.\***, Qu, H., Chen, Q., Kwan, M.P., Ratti, C., Santi, P., et al. (2023). Adaptive changes in electric-vehicle charging behaviours transitioning to the post-pandemic era. *The Innovation*. Submitted
- Huang, Z., **Zhu, R.\***, You, L. (2023). Unravelling the effects of dynamic urban thermal environment on utility-scale photovoltaic electricity generation. *Sustainable Cities and Society*. Submitted.
- Ye, Y., **Zhu, R.\***, Yan, J., Lu, L., Wong, M.S., Luo, W., Chen, M., Zhang, F., You, L., Feng, L., Ramli, M.A.B., Qin, Z. (2023). Planning of building-integrated photovoltaic shading devices: Mutli-objective optimization using geospatial technologies. *Renewable Energy*. Major revision
- Liao, X., **Zhu, R.**, Wong, M.S., Heo, J., Chan, P.W., Kwok, C.Y.T. (2023). Fast and accurate estimation of solar irradiation on building rooftops in Hong Kong: A machine learning-based parameterization approach. *Renewable Energy*. Major revision
- Adeniran, I.A., **Zhu, R.**, Wong, M.S. (2023). Improved fusion model for generating hourly fine scale land surface temperature data under all-weather condition.
- Chen, Z., Yang, B., **Zhu, R.**, Dong, Z. (2023). City-scale solar PV potential estimation on 3D buildings using multi-source RS data: A case study in Wuhan, China. *Applied Energy*. Submitted
- Mepparambath, R.M., Huynh, H.N., Feng, L., Oon, J., Song, J., **Zhu, R.** (2023). Unravelling the invariance of urban mobility models under COVID-19 pandemic using transit data from Singapore. *Transportation Research Interdisciplinary Perspectives*. Major revision
- You, L., Chen, Q., Liu, S., **Zhu, R.**, Qu, H., Yuen, C. (2023). AF2L: An Asynchronous Federated Learning to Learn Mechanism for the Occupancy Prediction of Charging Stations with Small Samples. *IEEE Internet of Things Journal*. Major revision
- Liu, S., You, L., Liu, R., **Zhu, R.**, Yu, H., Yuen, C. (2023). AFM3D: An Asynchronous Federated Meta-learning Framework for Driver Distraction Detection. *IEEE Transactions on Intelligent Transportation Systems*. Submitted
- Zhang, K., Wang, D., **Zhu, R.**, Zhang, F., Zhong, T., Qian, Z., Wang, Y., Li, H., Yang, Y., Lü, G., Yan, J. (2023). Assessment of the photovoltaic potential of photovoltaic noise barriers in 52 of China's main cities. *Sustainable Cities and Society*. Submitted
- Waqas, M., Wong, M.S., Abbas, S., Stocchino, A., **Zhu, R.** (2023). Marine Plastic Pollution Detection and Identification by Using Remote Sensing-Meta Analysis. *Science of the Total Environment*. Submitted
- Cao, M., Chen, M., Zhang, J., Pradhan, P., Guo, H., Fu, B., Li, Y., Bai, Y., Chang, L., Chen, Y., Sun, Z., Xu, Z., **Zhu, R.**, Meadows, M.E., Lü, G. (2023). Control beneficial synergies from being offset by harmful trade-offs among the Sustainable Development Goals. *PNAS*. Submitted

## Conference publications

8. Chen, Q., Liu, S., Qu, H., **Zhu, R.**, You, L. (2022). TWAFFR-GRU: An Integrated Model for Charging Station Occupancy Prediction. *The 19th IEEE International Conference on Ubiquitous Intelligence and Computing*. Haikou, China, 15-18 December 2022. [\[Link\]](#)
7. Yang, J., Chen, X., **Zhu, R.**, Wong, M.S., Ren, C. (2022). Potential Benefit of Electric Vehicles on Urban Heat Mitigation Under Future Climate (Invited). AGU Fall Meeting. Chicago, IL, 12-16 December 2022.
6. Chen, X., Yang, J., **Zhu, R.**, Wong, M.S., Ren, C. (2022). Spatiotemporal impact of vehicle heat on urban thermal environment: a case study of Hong Kong. *Urban Climate News*, 84, 12-16. [\[Link\]](#)
5. **Zhu, R.**, Guilbert, E., Wong, W. S. (2016). Tracking the spatial evolution of urban heat islands, Commission II, WG II/1. In Proceeding of the XXIII ISPRS Congress. Prague, Czech Public, 12-19 July 2016.
4. **Zhu, R.**, Guilbert, E., Wong, W. S. (2015). Event-based tracking of the dynamic behavior of urban heat islands. In Proceeding of the 2nd International Conference on Sustainable Urbanization, 239. Hong Kong, China, 7-9 January 2015.
3. **Zhu, R.**, Gidófalvi, G. (2013). GPS-based crowd sourced intelligent traffic information hub. In Proceeding of the 26th International Cartographic Conference, 669-670. Dresden, Germany, 25-30 August 2013.

2. **Zhu, R.**, Alizadeh, A., Wu, W. (2011). A GIS based potential risk assessment for water body, In Proceeding of the 1st Higher Technical Institution in Russia, 168–171. St. Petersburg, Russia, 20-23 April 2011.
1. Yang Tao, Guoan Tang, Shanshan Ge, Shijie Zhu, Xiangxi Dai, **Zhu, R.** (2009). Assessment of urban building layout based on spatial pattern analysis methods, IEEE 2009 17th International Conference on Geoinformatics, 1-5. Fairfax, VA, USA, 12-14 August 2009.

## Grants

### [08/2022–07/2024] Brownfield Recognition

**PI** for the project entitled with “*Brownfield recognition and planning analysis in the Northern Metropolis of Hong Kong by integrating remote sensing, deep learning, and augmented reality technologies*”, Funded by Research Institute of Land and Space, HK PolyU, HKD 400,000, 24 months.

### [12/2021–11/2023] Water Quality Prediction

**Co-I** for the project entitled with “*Study of Water Quality Parameters in Hong Kong: From Present to Future Prediction under the Government Development Schemes*”, Funded by Research Institute of Land and Space, HK PolyU, HKD 1,200,000, 24 months.

### [04/2021–06/2022] Solar techno-economic assessment

**PI** for the project entitled with “*Economic assessment of solar photovoltaic projects: Modelling solar photovoltaic potential in a dynamic geographical environment*”, Funded by HK PolyU, HKD 250,000, 14 months

### [06/2021–06/2022] Large Equipment Fund

**Co-I** for the project entitled with “*GNSS-embedded Backpack-LiDAR and UAV-LiDAR (LSGI-2)*”, PolyU (UGC) (LEF2021-028), HKD 842,806.00, 12 months.

### [04/2021–06/2022] Marine Environmental Management

**Project Manager** for the project entitled with “*Provision of Services for Pilot Application of Satellite Imagery Technology for Marine Environmental Management*”, Funded by Environmental Protection Department, The Government of the Hong Kong Special Administrative Region, HKD 1,380,000, 18 months.

### [09/2020–08/2023] Urban thermal environment

**Co-I** for the project entitled with “*An integrated knowledge-based Remote Sensing and GIS dynamic model for the urban thermal environment*”, Funded by Hong Kong GRF, HKD 1,581,600 (the 5th highest fund in the current year in HK), 36 months.

### [09/2019–08/2022] Solar energy potential on 3D urban envelops

**Co-I** for the project entitled with “*Development of an integrated model for estimating 3D solar energy potential using GIS, Remote Sensing and Deep learning techniques*”, Funded by Hong Kong GRF, HKD 1,210,980, 36 months.

### [09/2015–08/2017] Augmented Reality based vehicular navigation

**PI** for the project entitled with “*Augmented Reality based vehicular navigation based on smart glasses*”, Funded by HK PolyU, CNY 200,000, 48 months.

### [06/2018–06/2019] Smart City Tree Management

**Major Participate** for the project entitled with “*Jockey Club Smart City Tree Management Project*” for monitoring and detection of tree rotation and tilt angles using Smart Sensing Technologies, Funded by the Hong Kong Jockey Club Charities Trust, HKD \$32.28 million, 36 months.

## Presentations

37. Spatial optimization of solar photovoltaic installation for charging shared electric scooters. The 30th International Conference on Geoinformatics, University College London, UK, July 19-21, 2023.

36. Solar cities for energy transition facilitated by GIScience with multi-sourced spatiotemporal big data. The 18th Academic Annual Conference in Chinese Geographic Information Science Theory and Method, Guilin, China, May 19-21, 2023.
35. Solar cities for energy transition facilitated by GIScience with multi-sourced spatiotemporal big data. Guest Lecture for LSGI547 Advanced GIS, HK PolyU, Hong Kong, China, March 20, 2023.
34. Solar cities for energy transition facilitated by GIScience with multi-sourced spatiotemporal big data. [Research Seminar](#), Department of Geography and Resource Management, Chinese University of Hong Kong, Hong Kong, China, February 16, 2023. [\(Invited\)](#)
33. Solar cities for energy transition facilitated by GIScience with multi-sourced spatiotemporal big data. Department of Geography, National University of Singapore, Singapore, February 10, 2023.
32. A detail-oriented deep learning network for refined segmentation of distributed photovoltaic areas from satellite imagery. [Applied Energy Symposium 2022: Low carbon cities and urban energy systems](#), Virtual/Matsue, Japan, November 24-27, 2022.
31. [CRDIG webinar: Creating a sustainable solar city: The spatiotemporal data modeling for the energy transition](#). Department of Geomatics, Université Laval, Québec City, Canada, October 6, 2022.
30. Solar cities for energy transition facilitated by Geographical Information Science with multi-sourced spatiotemporal big data. Guest lecture for LSGI 524 Urban Big Data, LSGI, HK PolyU, Hong Kong, China, September 28, 2022.
29. The effect of different travel modes and travel destinations on COVID-19 transmission in global cities. Singapore General Hospital Research Labs Presentation 2022, Singapore, April 29, 2022.
28. Creating a sustainable solar city. International Forum for Interdisciplinary Sciences and Engineering, Wuhan University, China, April 2, 2022.
27. Creating a sustainable solar city (90 mins). Institute of Space and Earth Information Science, The Chinese University of Hong Kong, Hong Kong, November 26, 2021.
26. Creating a sustainable solar city (60 mins). [Digital Futures](#), KTH - Royal Institute of Technology, Stockholm, Sweden, November 11, 2021.
25. GeoHealth Hub Seminar talk on The effect of different travel modes and travel destinations on COVID-19 transmission in global cities. Department of Geography, National University of Singapore, Singapore, November 10, 2021.
24. Creating a sustainable solar city. Guest Lecturer for Urban Big Data, LSGI, HK PolyU, Hong Kong, China, November 4, 2021.
23. Optimization of scooter-sharing services using a solar-charging based real-time shareability network. [Applied Energy Symposium 2021: Low carbon cities and urban energy systems](#), Matsue, Japan, September 4-8, 2021.
22. An economically feasible optimization of photovoltaic provision using real electricity demand: A case study in New York City. [Applied Energy Symposium 2021: Low carbon cities and urban energy systems](#), Matsue, Japan, September 4-8, 2021.
21. Solar charging improves operational efficiency of shared electric scooters. Webminer on Space Intelligence and Digital Energy Development. Hosted by Nanjing Normal University and the Journal of Applied Energy, Nanjing, China, August 7, 2021. [\(Invited\)](#)
20. Creating a sustainable solar city. RISE Smart Energy Research Seminar III. [Research Institute of Smart Energy](#), HK PolyU, Hong Kong, China, August 4, 2021.
19. Creating a sustainable solar city. Webminer on the development of smart and sensing cities, Nanjing Normal University, Nanjing, China, January 16, 2021.
18. Creating a sustainable solar city. Guest Lecturer for the subject of Smart City and Urban Informatics (LSGI653), HK PolyU, Hong Kong, November 15, 2020.
17. Creating a sustainable solar city. Guest lecturer for the subject of Urban Big Data (LSGI524), HK PolyU, Hong Kong, September 22, 2020.
16. The effect of urban morphology on the solar capacity of three-dimensional solar cities. [CREATE Symposium 2019. SMART](#), Singapore, December 6, 2019. [\(Invited\)](#)



15. The effect of urban morphology on the solar capacity of three-dimensional solar cities. The Second International Conference on Urban Informatics. HK PolyU, Hong Kong SAR, June 24-26, 2019.
14. The effect of urban morphology on the solar capacity of three-dimensional solar cities. Applied Energy “A+B” Symposium. MIT, USA, May 22-24, 2019.
13. Strong effect of urban geomorphology to solar capacity of three-dimensional cities (poster presentation). Future Urban Mobility Symposium 2019. Singapore, January 28-29, 2019.
12. The development of senseable cities. Urban Planning, Land & Resources Commission of Shenzhen Municipality. Shenzhen, China, November 9, 2018. ([Invited](#))
11. Mapping of three-dimensional solar cities. SMART FM Seminar. Singapore, October 23, 2018.
10. Challenges of Drive-By IoT Sensing for Smart Cities: City Scanner Case Study. PURBA 2018, The 7th International Workshop on Pervasive Urban Applications. Singapore, October 12, 2018.
9. A prototype of Vibour AR smart glasses. SMART-REMIX Event. Singapore, July 25, 2018.
8. Modelling of urban mobility for sustainable cities. Workshops of Future Urban Mobility Summer Research. Singapore, July 6 & 9, 2018.
7. Modelling of urban mobility to solve environmental and transportation problems. Location: SMART at CREATE Tower. Singapore, May 15, 2018.
6. My studying experience during the past ten years. Location: Nanjing Normal University. Nanjing, China, November 24, 2017.
5. Understanding heat patterns produced by vehicular flows in urban areas. The 38th Research Salon of HK PolyU. Hong Kong, China, February 17, 2017.
4. Understanding spatiotemporal heat patterns of vehicular flows in urban areas. Conference of the 2016 Cartographic Visualization of Big Data for Early Warning and Disaster/Crisis Management (EW&CM)-Methodology, Techniques and Applications. Nanjing, China, November 27-29, 2016.
3. Going abroad to see the world. Location: Nanjing Normal University. Nanjing, China, October 26, 2016.
2. Object-oriented tracking of dynamic behaviors of urban heat islands. The 7th Nationwide PhD-students Forum in Geo-Information, China. Nanjing, China, November 26-28, 2016.
1. Tracking thematic and spatiotemporal dynamic behaviors of urban heat islands. Location: Laval University. Quebec City, Canada, November 30, 2015. ([Invited](#))

## Supervision

### PhD students (as co-supervisor)

- Ibrahim Adeniran (Urban heat islands; registered at HK PolyU in 2021)
- Songyang Li (Urban heat islands; registered at HK PolyU in 2021)
- Xuan Liao (registered at HK PolyU in 2021; PhD Dissertation: Estimation of solar irradiation on building rooftop based on machine learning models)
- Fan Xu (registered at HK PolyU in 2021; PhD Dissertation: Estimation of solar potential on three-dimensional urban envelopes using artificial intelligence)

### Master students

- Tianyi Yang (Dissertation: The effects of COVID-19 on urban mobility demands using electric vehicles; grade to be given; Singapore Management University; 2023)
- Ziyi Huang (Dissertation: Unraveling the effects of urban thermal environment on solar photovoltaic conversion efficiency: A case study in Singapore; grade B+; 2023)

- Nanfan Ji (Dissertation: Dynamic dispatching of rooftop photovoltaic electricity for charging electric vehicles; grade B; 2023)
- Vincy WS Lau (Dissertation: Estimation of Rooftop Photovoltaic Carbon Reduction Potential: A Deep Learning-based Semantic Segmentation Approach; grade A; 2023)
- Yuk Man Chung (Dissertation: Comparison between deep learning and machine learning-based models for estimation of land surface temperatures in Kowloon, Hong Kong SAR; grade B+; 2022)
- Dongxue Guo (Dissertation: Segmentation of rooftop photovoltaic areas from satellite images by advancing a deep learning-based semantic segmentation model; grade A; 2022)
- Sui Peng Hui (Dissertation: Solar photovoltaic extraction by using deep-learning and image segmentation; grade B+; 2022)
- Ho Mam Ng (Dissertation: Evaluation of payback periods of distributed photovoltaic systems using remote sensing image processing; grade B+; 2021)
- Yidian Liu (Dissertation: Assess the life cycle gas emissions of electric vehicles; grade A-; 2021)
- Xijia Dong (Dissertation: Estimation of the urban heat island effect in a planned urban area: A case study in Kowloon East, Hong Kong; grade A; 2021)
- Yiya Wang (Dissertation: Life cycle assessment of electricity generation and carbon reduction of utility-scale photovoltaic systems using Google and PlanetScope imagery; grade A-; 2021)

### Undergraduate students

- Li Mei Suet (FYP: Study of Urban Heat Island effect in Northern Hong Kong Island; registered in 2021)
- Yeung Chun Yin (FYP: Investigating the relationship between Urban Heat Island Intensity and Local Climate Zone – A case study of Hong Kong; registered in 2021)

## Teaching

### [2021-2022] MSc Dissertation (Course code: LSGI551, 9 credits, HK PolyU)

**Subject leader.** Manage all MSc dissertations, including: 2 hours lecture per weeks (5 teaching weeks in each semester); subject registration; proposal, mid-term report, and final report management; finalizing oral presentation schedules; grade finalization, etc.

### [2021-2022] MSc Project (Course code: LSGI552, 6 credits, HK PolyU)

**Subject leader.** Manage all MSc projects, including: 2 hours lecture per weeks (5 teaching weeks in each semester); subject registration; proposal, mid-term report, and final report management; finalizing oral presentation schedules; grade finalization, etc.

### [2021-2022] Remote Sensing Image Processing (Course code: LSGI536, MSc, HK PolyU)

**Lecturer.** 25 registered students, 3 hours lecture per weeks (13 teaching weeks in semester 2, academic year 20-21). Teach the principles and technology of remote sensing, and theories and techniques for processing remote sensing images.

### [2013] Spatial Database (Course code: AG2425, MSc, KTH)

**Teaching Assistant.** Created the tutorial, gave lectures, and marked homework. It contained spatial database development, geometry definition, spatial queries and spatial indices with PostgreSQL and PostGIS. ([Link](#); [Tutorial](#))

### [2012] Web and Mobile GIS (Course code: AG2417, MSc, KTH)

**Teaching Assistant.** Created the tutorial, gave lectures, and marked homework. It contained GIS computer solutions, such as web maps based on GeoServer, ArcGIS Server, and ArcGIS API for JavaScript, mobile maps based on OpenStreetMap, Google Map, and ArcGIS SDK for Android. ([Link](#); [Tutorial](#))

## Selected awards

- 06/2021 Dean's Award for Outstanding Achievement in Technology Transfer – Remote Sensing on Urban Trees. Recipients: Man Sing Wong, Rui Zhu, etc.
- 06/2021 2021 Smart 50 Awards – “First-Ever Smart Tree Monitoring Project Using Low-Power Wireless Network For Urban Forestry and Tree Management, Hong Kong”. Recipients: Man Sing Wong, Rui Zhu, etc. (Link)
- 04/2019 The Hong Kong Institute of Surveyors – Dissertation Awards for Postgraduate Students (2 winners in 2019 in Hong Kong)
- 10/2016 The best oral representation and conference paper for the 7th Nationwide PhD-students Forum in Geo-Information, China (5)
- 05/2015 Innovation and Seed Fund for Augmented Reality-based Vehicle's Navigation Development, HK PolyU
- 04/2014 PhD Scholarship of General Research Fund provided by University Grants Committee of Hong Kong
- 04/2011 Diploma for participating in the International Forum-Competition of Young Researchers, Russia
- 05/2010 Outstanding Graduate in School of Geographic Science, Nanjing Normal University
- 12/2009 First Prize for Comprehensive Ability Scholarship (5)
- 03/2009 Second Prize of Outstanding Academic Report Spatio-temporal Distribution Pattern Prediction of Motor Stolen Cases in Urban Areas
- 05/2007 Leadership award in May the fourth Recognition
- 06/2006 Outstanding University Student Union Member

## Services

### Serve as editors

- Guest Editor, Special Issue of Current Trends Using Cutting Edge Geospatial Remote Sensing (Remote Sensing, Impact factor: 5.347)
- Guest Editor, Special Issue of Urban Heat Island and Building Energy Sustainability (Sustainability, Impact factor: 3.251)
- Guest Editor, Special Issue of Autonomous Transportation Systems Enabled by Emerging Technologies (Journal of Advanced Transportation, Impact factor: 2.419)
- Guest Editor, Special Issue of The 2nd Edition of Urban Environmental Quality (International Journal of Environmental Research and Public Health, Impact factor: 2.849)
- Guest Editor, Special Issue of Understanding and Mitigating Urban Heat Island-Remote Sensing and GIS Technologies (Climate)
- Guest Editor, Special Issue of The Interaction of Climate Change with Landscape and Environment (Climate)
- Guest Editor, Special Issue of Holistic Evaluation and Management of Urban Systems Before, During and After Major Emergencies (International Journal of Chinese Culture and Management)

### Serve as reviewers

- Advances in Applied Energy
- Atmosphere
- Climate
- Complexity
- Energy Engineering
- Geography and Sustainability

- International Journal of Geographical Information Science
- International Journal of Digital Earth
- International Journal of Sustainable Transportation
- International Journal of Disaster Risk Reduction
- ISPRS International Journal of Geo-Information
- IEEE Transactions on Network Science and Engineering
- IEEE Transactions on Cognitive and Developmental Systems
- Scientific Reports
- Sustainable Energy Technologies and Assessments
- Transactions in GIS
- Transactions in Urban Data, Science, and Technology
- Transportmetrica A: Transport Science
- Remote Sensing Applications: Society and Environment
- Remote Sensing
- Urban Informatics (Springer)
- Urban Climate
- The 19th COTA ICTP 6-8 July 2019, Nanjing, China

## Media reports

### Solar Cities

[Interviewed by Singapore TV](#)  
[Interviewed by Portfolio Magazine](#)  
[Interview video](#)  
[MIT SCL Website](#)  
[MIT Newsletter](#)  
[SMART Newsletter](#)  
[Invited Article in Topos Magazine](#)

### Urban Mobility

[Singapore Lianhe Zaobao](#)  
[MIT News](#)  
[SMART Newsletter](#)  
[Topic News](#)  
[USA News Hub](#)  
[Amazing4You](#)  
[ONRede](#)  
[News Break](#)  
[TechXplore](#)  
[Transport News](#)  
[UrAllNews](#)