

RUI ZHU

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1. WORKING EXPERIENCE

Singapore-MIT Alliance for Research and Technology, Singapore 01/2018-12/2019
Postdoctoral Associate
MIT Senseable City Laboratory
Future Urban Mobility IRG
Joint Researcher at MIT Senseable City Laboratory, MIT, USA
Websites: <https://smart.mit.edu/> & <http://senseable.mit.edu/>

2. EDUCATION

The Hong Kong Polytechnic University, Hong Kong SAR 2014-2017
Ph.D. in Geo-Informatics
Department of Land Surveying and Geo-Informatics
Faculty of Construction and Environment
Dissertation: *Spatiotemporal data modeling for the analysis of dynamic behaviors of urban heat island*
[HKIS – Dissertation Awards for Postgraduate Students, 2 winners in 2019](#)

Université Laval, Canada 08/2015-01/2016
Ph.D. Exchange Study
Department of Geomatics
Faculty of Forestry, Geography and Geomatics

KTH - Royal Institute of Technology, Sweden 2010-2013
M.Sc. in Geodesy and Geo-Informatics
Department of Urban Planning and Environment
School of Architecture and the Built Environment
Dissertation: *Moving object trajectory based intelligent traffic information hub*

Nanjing Normal University, China 2006-2010
B.Sc. Geographic Information System
Department of Geographical Information System
School of Geography Science – National “Double-First Class” Initiative
Final-year Project: *Virtual-Reality based Railway Visualization with VC++ and OpenGL*

3. JOURNAL PUBLICATIONS

2020

- 20 **Rui Zhu**, Danial Kondor, Xiaohu Zhang, Paolo Santi, Carlo Ratti, 2020. Solar charging improve operational efficiency of shared electric scooters. ([Ongoing project](#)).
- 19 **Rui Zhu**, Xiaohu Zhang, Danial Kondor, Paolo Santi, Carlo Ratti, 2020. Understanding spatio-temporal heterogeneity of bike-share and scooter-share mobility. *Computers, Environment and Urban Systems*. [Major revision](#).
- 18 **Rui Zhu**, Man Sing Wong, Linlin You, Paolo Santi, Janet Nichol, Hung Chak Ho, Lin Lu, Carlo Ratti, 2020. The effect of urban morphology on the solar capacity of three-dimensional cities. *Renewable Energy*, [Major review](#). ([Portfolio Magazine Interview](#))
- 17 Coco Yin Tung Kwok, Man Sing Wong, Karena Ka Wai Hui, Zihan Kan, Hon Li, **Rui Zhu**, Florence Wan Yee Ko, Herman Yiu Kay Shiu, 2020. Detection of Structural Defects of Urban Trees Using Thermal

Infrared Imaging Technique. *Remote Sensing*. [In peer review](#).

- 16 Meilian Wang, Man Sing Wong, **Rui Zhu**, 2020. Identification of healthy and unhealthy tree crowns from remote sensing images using convolutional neural networks. *Sustainability*. [In peer review](#).
- 15 Zi Yang, Ka Wai Hui, Sawaid Abbas, **Rui Zhu**, Coco Yin Tung Kwok, Joon Heo, Sungha Ju, Man Sing Wong, 2020. A Review of Monitoring Methods on Tree Sway, Tilt and Root-plate Movement. *Urban Forestry & Urban Greening*. [In peer review](#).
- 14 Zihan Kan, Man Sing Wong, **Rui Zhu**, 2020. Understanding space-time patterns of vehicular emission flows in urban areas using geospatial technique. *Computers, Environment and Urban Systems*, 79, 101399.

2019

- 13 **Rui Zhu**, Linlin You, Paolo Santi, Man Sing Wong, Carlo Ratti, 2019. Transformation of solar accessibility in reforming urban areas: A case study in Kowloon East, Hong Kong. *Sustainable Cities and Society*, 51, 101738. ([Singapore TV Channel 8 Interview](#))
- 12 **Rui Zhu**, Eric Guilbert, Man Sing Wong, 2019. Object-oriented tracking of spatial and thematic dynamic behaviors of urban heat islands. *Transactions in GIS*, <https://doi.org/10.1111/tgis.12586>.
- 11 Linlin You, Bige Tuncer, **Rui Zhu**, Hexu Xing, Chau Yuen, 2019. A Synergetic Orchestration of Objects, Data and Services to Enable Smart Cities. *IEEE Internet of Things Journal*, 6(6), 10496–10507.
- 10 Hung Chak Ho, Man Sing Wong, Sawaid Abbas, **Rui Zhu**, 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.
- 9 Miaoia Lu, Kecheng An, Shu-Chien Hsu, **Rui Zhu**, 2019. Considering user behavior in free-floating bike sharing system design: A data-informed spatial agent-based model. *Sustainable Cities and Society*, 49, 101567.
- 8 Hung Chak Ho, Sawaid Abbs, Jinxin Yang, **Rui Zhu**, Man Sing Wong, 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.

2018 and before

- 7 Jiaming Na, Xin Yang, Wen Dai, Min Li, Liyang Xiong, **Rui Zhu**, Guoan Tang, 2018. Bidirectional DEM relief shading method for extraction of gully shoulder-line in loess tableland area. *Physical Geography*, 39(4), 368-386.
- 6 **Rui Zhu**, Man Sing Wong, Eric Guilbert, Pok Wai Chan, 2017. Understanding heat patterns produced by vehicular flows in urban areas. *Scientific Reports*, 7, 16309.
- 5 **Rui Zhu**, Eric Guilbert, Man Sing Wong, 2017. Object-oriented tracking of the dynamic behavior of urban heat islands. *International Journal of Geographical Information Science*, 31(2), 405–424.
- 4 **Rui Zhu**, Eric Guilbert, Man Sing Wong, 2016. Tracking the spatial evolution of urban heat islands. *ISPRS Annals of the Photogrammetry, Remote Sensing and Spatial Information Sciences*, 3(2), 3–8.
- 3 Man Sing Wong, **Rui Zhu**, Zhizhao Liu, Lin Lu, Jingqing Peng, Zhaoqin Tang, Chung Ho Lo, Wai Ki Chan, 2016. Estimation of Hong Kong's solar energy potential using GIS and remote sensing technologies.

- 2 Fayuan Li, Guoan Tang, Chun Wang, Lingzhou Cui, **Rui Zhu**, 2016. Slope Spectrum Variation in a Simulated Loess Watershed. *Frontiers of Earth Science*, 10(2): 328–339.
- 1 Yianyi Yang, Guoan Tang, Min Cao, **Rui Zhu**, 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.

4. CONFERENCE PUBLICATIONS

- **Rui Zhu**, Eric Guilbert, Man Sing Wong, 2018. Object-core oriented data modelling for tracking of behaviors of urban heat islands. In *Proceeding of ISPRS Technical Commission IV Symposium 2018*. Delft, The Netherlands, 1-5 October 2018.
- **Rui Zhu**, Eric Guilbert, Man Sing Wong, 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.
- **Rui Zhu**, Eric Guilbert, Man Sing Wong, 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.
- **Rui Zhu**, Gyöző Gidófalvi, 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.
- **Rui Zhu**, Amin Alizadeh, Wenbo Wu, 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.
- Yang Tao, Guoan Tang, Shanshan Ge, Shijie Zhu, Xiangxi Dai, **Rui Zhu**, 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.

5. PRESENTATIONS

- **Rui Zhu**. The effect of urban morphology on the solar capacity of three-dimensional solar cities. [CREATE Symposium 2019](#). SMART, Singapore, 06 December 2019. (Invited)
- **Rui Zhu**. 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, 24-26 June 2019.
- **Rui Zhu**. The effect of urban morphology on the solar capacity of three-dimensional solar cities. Applied Energy “A+B” Symposium. MIT, USA, 22-24 May 2019.
- **Rui Zhu**. Strong effect of urban geomorphology to solar capacity of three-dimensional cities (poster presentation). Future Urban Mobility Symposium 2019. Singapore, 28-29 January 2019.
- **Rui Zhu**. The development of senseable cities. Urban Planning, Land & Resources Commission of Shenzhen Municipality. Shenzhen, China, 09 November 2018. (Invited)
- **Rui Zhu**. Mapping of three-dimensional solar cities. SMART FM Seminar. Singapore, 23 October 2018.

- **Rui Zhu.** Challenges of Drive-By IoT Sensing for Smart Cities: City Scanner Case Study. PURBA 2018, The 7th International Workshop on Pervasive Urban Applications. Singapore, 12 October 2018.
- **Rui Zhu.** Vibour AR glasses - A prototype. SMART-REMIX Event. Singapore, 25 July 2018.
- **Rui Zhu.** Modelling of urban mobility for sustainable cities. Workshops of Future Urban Mobility Summer Research. Singapore, 6 & 9 July 2018.
- **Rui Zhu.** Modelling of urban mobility to solve environmental and transportation problems. Location: SMART at CREATE Tower. Singapore, 15 May 2018.
- **Rui Zhu.** My studying experience during the past ten years. Location: Nanjing Normal University. Nanjing, China, 24 November 2017.
- **Rui Zhu.** Understanding heat patterns produced by vehicular flows in urban areas. The 38th Research Salon of HK PolyU. Hong Kong, China, 17 February 2017.
- **Rui Zhu.** 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, 27-29 November 2016.
- **Rui Zhu.** Object-oriented tracking of dynamic behaviors of urban heat islands. The 7th Nationwide PhD-students Forum in Geo-Information, China. Nanjing, China, 26-28 November 2016.
- **Rui Zhu.** Going abroad to see the world. Location: Nanjing Normal University. Nanjing, China, 26 October 2016.
- **Rui Zhu.** Tracking thematic and spatiotemporal dynamic behaviors of urban heat islands. Location: Laval University. Quebec City, Canada, 30 November 2015. ([Invited](#))

6. LECTURES AND SUPERVISIONS

- | | |
|---|--|
| <p>Teaching Assistant
 <i>Course of Spatial Database (Course code: AG2425)</i></p> | <p>03/2013 – 05/2013
 <i>KTH</i></p> |
| <p>· 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, Source]</p> | |
| <p>Teaching Assistant
 <i>Course of Web and Mobile GIS (Course code: AG2417)</i></p> | <p>08/2012 – 10/2012
 <i>KTH</i></p> |
| <p>· 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, Source]</p> | |
| <p>Co-Supervisor</p> | <p>May 2017</p> |
| <p>· bachelor's final-year project entitled with <i>Detection of tree health with multispectral remote sensing data</i>. Student: Christy Lui; HK PolyU.</p> | |
| <p>Co-Supervisor</p> | <p>May 2017</p> |
| <p>· bachelor's final-year project entitled with <i>Electricity Usage of Different Land Use in Hong Kong</i>. Students: Chan Wai Yan, Ngan Hui Yee, and Yim Cheuk Yuet; HK PolyU.</p> | |
| <p>Co-Supervisor</p> | <p>April 2016</p> |

- Bachelor's final-year project entitled with *Advance solar photovoltaic system on building facets for supporting individual households*. Student: Chan Wai Ki; HK PolyU.

Co-Supervisor

April 2016

- Bachelor's final-year project entitled with *Estimation of land surface temperature for the satellite images using spatial interpolation method*. Student: Kong Cheuk Lam; HK PolyU.

Co-Supervisor

April 2015

- Master's dissertation entitled with *Influence of the anthropogenic heat flux to the urban heat islands intensity*. Student: Xiaoyuan Zhi; HK PolyU.

Co-Supervisor

April 2015

- Master's dissertation entitled with *Map matching for smartphone-based vehicle's navigation*. Student: Zhefu Li; HK PolyU.

7. EXPERIENCES

Research Assistant

07/2011 – 09/2011

MapReduce-based Spatial Data Mining with Eclipse and Hadoop

KTH

- Developed a spatial-data generator to create billions of points with x-dimensional attributions in normal spatial distribution patterns, and discovered frequent item sets in MapReduce and Hadoop.

Internship

07/2009 – 08/2009

WebGIS Development

NJNU

- Developed administration management and registration-login functions for a website by Visual C# and Oracle database.

Internship

07/2007 – 08/2007

Database Management

GSI Co.,

- Management of GPS-based vehicles with ArcInfo and Oracle database.

8. PROJECTS

Solar energy potential on 3D urban envelops

09/2019 – 08/2022

- **Co-PI** 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.

Thermal images analysis for detecting trees' health

01/2015 – 05/2015

- Based on the thermal images of trees taken by UAVs, a new method/algorithm is designed to detect decayed parts of trees effectively.

Moving Object Trajectory Based Intelligent Traffic Information Hub

03/2012 – 05/2013

- The system enables mobile users to locate and send real-time tracking information to a dynamic website for the trajectory analysis. The system can detect spatio-temporal distribution of traffic congestion, and send real-time warnings to the relevant vehicles. Notification accuracy and scaling performance of the system are systematically tested. All the streaming data are recorded in PostgreSQL, so that information is passed through Servlet and JavaBeans, and visualized by OpenLayers and JSP.

National Economic Analysis of a Flooding of Lake Mälaren, Sweden

10/2011 – 12/2011

- Group project on flooding area prediction and urban planning based on spatial analysis by ArcGIS with the support of a Swedish company of Sweco.

Software Development for Essential GIS Algorithms with Eclipse

01/2010 – 12/2010

- Individually developed GIS software, which imports ArcGIS-supported raster data, provides spatial analysis functions such as slope, aspect, focal sum, zonal minimum, etc., and visualize each of the operation results.

Virtual-Reality based Railway Roads with VC++ and OpenGL 01/2010 – 06/2010

- Developed a prototype for DEMs reading, rendering and visualizing remote sensing images in 3D environment.

Digital Image Processing in Remote Sensing with Visual C# 09/2008 – 01/2009

- Individually developed software for digital image processing, which reads optional seven bands of digital images, draws the images in RGB, and provides functions of image smoothing, image stretching, and ISH color transformation, etc.

Criminal Spatio-temporal Distribution Patterns Prediction 05/2008 – 09/2009

- The project did the research on criminal spatio-temporal distribution analysis with the cooperation of one local police office. I was the project manager, and physically participated in the research. The project got two awards and one paper published. ([PI, Funded by Nanjing Normal University.](#))

9. SELECTED AWARDS

- [The Hong Kong Institute of Surveyors – Dissertation Awards for Postgraduate Students](#) (13 December 2018, 2 winners per year in Hong Kong)
- The best oral representation and conference paper for the 7th Nationwide PhD-students Forum in Geo-Information, China ([5% Selection](#), 10/2016)
- Innovation and Seed Fund for Augmented Reality-based Vehicle's Navigation Development, HK PolyU (05/2015)
- PhD Scholarship of General Research Fund provided by University Grants Committee of Hong Kong (04/2014)
- Diploma for participating in the International Forum-Competition of Young Researchers, Russia (04/2011)
- Outstanding Graduate in School of Geographic Science (05/2010)

First Prize for Comprehensive Ability Scholarship ([5% Selection](#), 12/2009)

- Second Prize of Outstanding Academic Report Spatio-temporal Distribution Pattern Prediction of Motor Stolen Cases in Urban Areas (03/2009)
- Leadership award in May the fourth Recognition (05/2007)
- Outstanding University Student Union Member (06/2006)

10. MEMBER AND REVIEWER

- Member of The International Society for Photogrammetry and Remote Sensing (ISPRS)
- Member of The International Association of Chinese Professionals in Geographic Information Sciences (CPGIS)
- Editorial board member in the Journal of Geospatial Engineering
- ISPRS Scientific Committee 1-5 October 2018, Delft, The Netherlands

- Guest Editor for Climate – Understanding and Mitigating Urban Heat Island-Remote Sensing and GIS Technologies
- Guest Editor for Climate – The Interaction of Climate Change with Landscape and Environment
- Reviewer for *Scientific Reports*
- Reviewer for *International Journal of Geographical Information Science*
- Reviewer for *Transactions in GIS*
- Reviewer for *IEEE Transactions on Cognitive and Developmental Systems*
- Reviewer for *Remote Sensing* ([Reviewer Board](#))
- Reviewer for *Atmosphere*
- Reviewer for *Climate*
- Reviewer for *Urban Climate*
- Reviewer for *Remote Sensing Applications: Society and Environment*
- Reviewer for *the 19th COTA ICTP 6-8 July 2019, Nanjing, China*

11. COMPUTER SKILLS

8 Years	PostgreSQL, PostGIS, and pgRouting Java in Eclipse (J2EE), ArcMap, and Quantum GIS
3 Years	Web GIS (JSP + Servlet + JavaBeans, GeoServer, OpenLayers, WMS and WFS) Mobile GIS (GPS + OpenStreetMap SDK / Google Map SDK + Android) ArcGIS solutions (ArcMap, ArcGIS Server)
2 Years	Apache Spark, HTML, JavaScript & CSS Visual C#, Visual C++ (MFC), OpenGL, Oracle, MATLAB

12. REFEREE

Carlo Ratti

Professor of the Practice
Department of Urban Studies and Planning
Massachusetts Institute of Technology
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Director, MIT Senseable City Laboratory
Director, MIT Italy Program
Visiting Scholar, Cornell Tech, NYC
Visiting Professor, Università di Roma Tor Vergata, Rome
Visiting Professor, IAAC, Barcelona