Curriculum Vitae

DI ZHU
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Education

Ph.D., Peking University. *Cartology and Geographic Information Science* 2020
Thesis Title: Modelling and Analyzing Geospatial Distributions with Artificial Neural Networks

B.S., Peking University. *Geographic Information Systems* 2014
Thesis Title: An Incremental Map-Matching Method Based on Road Network Topology

B.A., Peking University. *Economics* 2014

Academic Appointments

University of Minnesota, Twin Cities
Geography, Environment and Society: Assistant Professor 2020 - Present
(Start date delayed to Sep. 1, 2021, because of COVID-19 pandemic)

Peking University
Geosoft Lab: Research Assistant 2016 - 2020

University College London
Civil Environmental and Geomatic Engineering: Visiting Lecturer 2018 - 2019

Peking University
School of Earth and Space Sciences: Teaching Assistant 2015 - 2018

Peking University
Geosoft Lab: Data Visualization Intern 2013 - 2013

Peking University
School of Earth and Space Sciences: RS, GIS & GPS Practice Intern 2012 - 2012

Other Professional Positions

Beijing GeekArt Technology Co. Ltd.
Chief Product Officer; Co-Founder 2018 - 2020

Beijing LongRuan Technology Co. Ltd
Software Engineer Intern 2015 - 2015

Current Membership in Professional Organizations

ACM Special Interest Group on Spatial Information (SIGSPATIAL) 2022 - Present
Association of American Geographers (AAG) 2019 - Present
International Association of Chinese Professionals in Geographic Information Sciences (CPGIS) 2017 - Present

RESEARCH, SCHOLARSHIP, AND CREATIVE WORK

Publications

Asterisk(*) - indicates co-senior author
Sharp(#) - indicates corresponding author
Underline - indicates student author

Peer-Reviewed Journal Article

[#] **Zhu, D.**, Liu, Y., Yao, X., & Fischer, M. M. (2021). Spatial regression graph convolutional neural networks: A deep learning paradigm for spatial multivariate distributions. *GeoInformatica*, 1--32. [80% design, 70% implementation, 90% writing]

Huang, X., **Zhu, D.**, Zhang, F., Liu, T., Li, X., & Zou, L. (2021). Sensing population distribution from satellite imagery via deep learning: Model selection, neighboring effects, and systematic biases. *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing, 14*, 5137--5151. [30% design, 20% implementation, 20% writing]

[#] **Zhu, D.**, Ye, X., & Manson, S. (2021). Revealing the spatial shifting pattern of COVID-19 pandemic in the United States. *Nature Scientific reports, 11*(1), 8396. [80% design, 100% implementation, 80% writing]

Xing, X., Huang, Z., Cheng, X., **Zhu, D.**, Kang, C., Zhang, F., & Liu, Y. (2020). Mapping human activity volumes through remote sensing imagery. *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing, 13*, 5652--5668.

Sari Aslam, N., **Zhu, D.**, Cheng, T., Ibrahim, M. R., & Zhang, Y. (2020). Semantic enrichment of secondary activities using smart card data and point of interests: a case study in London. *Annals of GIS, 27*(1), 29--41.

Yao, X., Gao, Y., **Zhu, D.**, Manley, E., Wang, J., & Liu, Y. (2020). Spatial origin-destination flow imputation using graph convolutional networks. *IEEE Transactions on Intelligent Transportation Systems, 22*(12), 7474--7484.

Wang, Y., **Zhu, D.**, Yin, G., Huang, Z., & Liu, Y. (2020). A unified spatial multigraph analysis for public transport performance. *Scientific Reports, 10*(1), 1--9.

Wu, L., Cheng, X., Kang, C., **Zhu, D.**, Huang, Z., & Liu, Y. (2020). A framework for mixed-use decomposition based on temporal activity signatures extracted from big geo-data. *International Journal of Digital Earth, 13*(6), 708--726.

Zhang, F., Zu, J., Hu, M., **Zhu, D.**, Kang, Y., Gao, S., Zhang, Y., & Huang, Z. (2020). Uncovering inconspicuous places using social media check-ins and street view images. *Computers, Environment and Urban Systems, 81*, 101478.

Zhu, D., Zhang, F., Wang, S., Wang, Y., Cheng, X., Huang, Z., & Liu, Y. (2020). Understanding place characteristics in geographic contexts through graph convolutional neural networks. *Annals of the American Association of Geographers, 110*(2), 408--420.

Chen, L., Gao, Y., **Zhu, D.**, Yuan, Y., & Liu, Y. (2019). Quantifying the scale effect in geospatial big data using semi-variograms. *PloS one, 14*(11), e0225139.

Zhang, F., Wu, L., **Zhu, D.**, & Liu, Y. (2019). Social sensing from street-level imagery: A case study in learning spatio-temporal urban mobility patterns. *ISPRS Journal of Photogrammetry and Remote Sensing, 153*, 48--58.

Zhu, D., Cheng, X., Zhang, F., Yao, X., Gao, Y., & Liu, Y. (2019). Spatial interpolation using conditional generative adversarial neural networks. *International Journal of Geographical Information Science, 34*(4), 735-758.

Yao, X., Wu, L., **Zhu, D.**, Gao, Y., & Liu, Y. (2019). Visualizing spatial interaction characteristics with direction-based pattern maps. *Journal of Visualization*, 1--15.

Zhang, S., [#*] **Zhu, D.**, Yao, X., Cheng, X., He, H., & Liu, Y. (2018). The scale effect on spatial interaction patterns: An empirical study using taxi OD data of Beijing and Shanghai. *IEEE Access, 6*, 51994--52003.

[#] **Zhu, D.**, & Liu, Y. (2018). Modelling irregular spatial patterns using graph convolutional neural networks. *arXiv preprint arXiv:1808.09802*.

Yao, X., **Zhu, D.**, Gao, Y., Wu, L., Zhang, P., & Liu, Y. (2018). A stepwise spatio-temporal flow clustering method for discovering mobility trends. *IEEE Access, 6*, 44666--44675.

Zhu, D., Huang, Z., Shi, L., Wu, L., & Liu, Y. (2018). Inferring spatial interaction patterns from sequential snapshots of spatial distributions. *International Journal of Geographical Information Science, 32*(4), 783--805.

Liu, Y., Zhan, Z., **Zhu, D.**, Chai, Y., Ma, X., & Wu, L. (2018). Incorporating Multi-source Big Geo-data to Sense Spatial Heterogeneity Patterns in Urban Space. *GEOMATICS AND INFORMATION SCIENCE OF WUHAN UNIVERS, 43*(3), 327--335.

Zhu, D., Wang, N., Wu, L., & Liu, Y. (2017). Street as a big geo-data assembly and analysis unit in urban studies: A case study using Beijing taxi data. *Applied Geography, 86*, 152--164.

[#] **Zhu, D.**, & Liu, Y. (2017). An incremental map-matching method based on road network topology. *GEOMATICS AND INFORMATION SCIENCE OF WUHAN UNIVERS, 42*(1), 77--83.

Conference Proceeding

Chen, T., & [#] **Zhu, D.** *The Spatio-temporal stratified association between human activities and crime patterns during the COVID-19 stay-at-home mandate*. (Proceedings of the 2021 ACM SIGSPATIAL China Annual Conference on Space Intelligence (SpatialDI 2021), Apr., Hangzhou, China) *[Accepted.*:2021] [60% design, 50% implementation, 60% writing]

Chen, T., Cheng, T., & **Zhu, D.** (2021). *The exploration of human activity zones using geo-tagged big data during the COVID-19 first lockdown in London, UK*. (Proceedings of the 29th Conference on GIS Research UK, Apr. 13-16 2021, Cardiff University, United Kingdom) [60% design, 30% implementation, 20% writing]

Soundararaj, B., & **Zhu, D.** *Estimating pedestrian flow from footfall counts using Geo-propagation*. (2019 Annual Conference on Complex Systems (CCS 2019), Sep. 30 - Oct. 4, Singapore) *[Accepted.*:2019]

[#] **Zhu, D.**, Zhang, F., Cheng, X., & Liu, Y. (2019). *Spatial interpolation based on conditional generative adversarial neural networks*. (American Association of Geographers Annual Meeting 2019, Apr. 3-7, Washington, DC, United States (AAG 2019))

Wang, Y., **Zhu, D.**, Yin, G., Huang, Z., & Liu, Y. (2019). *Investigating local travel speed with spatial network structures and properties*. (Proceedings of the 2nd International Conference on Urban Informatics, June 24-26, Hong Kong, China (ICUI 2019))

[#] **Zhu, D.**, Cheng, T., & Liu, Y. (2019). *Geo-propagation from Incomplete Spatial Distribution Data: A Case Study of House Price Estimation*. (Proceedings of the 27th Conference on GIS Research UK, Apr. 23-26, Newcastle upon Tyne, United Kingdom).

[#] **Zhu, D.**, & Liu, Y. (2018). *Modelling spatial patterns using graph convolutional networks*. (Proceedings of the 10th International Conference on Geographic Information Science (GIScience 2018), Aug. 28-31, Melbourne, Australia)

Xing, X., **Zhu, D.**, Cheng, X., & Liu, Y. (2018). *Population mapping based on deep features of remote sensing imagery*. (Proceedings of the 26th International Conference on Geoinformatics, June 28-30, Kunming, China)

Chen, L., **Zhu, D.**, & Liu, Y. (2018). *Quantify the scale effect in geospatial big data using semi-variograms*. (Proceedings of the 26th International Conference on Geoinformatics, June 28-30,

Kunming, China)

Zhu, D., Shi, L., Wang, Y., Cheng, X., & Liu, Y. (2017). *Infer spatial interaction patterns from spatial distributions*. (Proceedings of the 25th International Conference on Geoinformatics, Aug. 2-4, Buffalo, United States)

Zhu, D., Wang, N., & Liu, Y. (2016). *Street perspective: a novel spatial unit in urban social sensing*. (Proceedings of the 17th International Symposium on Spatial Data Handling (SDH), Aug. 18-20, Beijing, China)

Zhu, D., & Liu, Y. (2016). *The distance effect in spatial interaction and spatial similarity: a big data view of Tobler's First Law*. (Proceedings of the 33rd International Geographical Congress (IGC 2016), Aug. 21-23, Beijing, China)

Publications Submitted or in Progress

Asterisk(*) - indicates co-senior author
Sharp(#) - indicates corresponding author
Underline - indicates student author

Peer-Reviewed Journal Article

Chen, T., Bowers, K., # **Zhu, D.**, Gao, X., & Cheng, T. Spatio-temporal Stratified Associations between Urban Human Activities and Crime Patterns: A case study in San Francisco around the COVID-19 Stay-at-home Mandate. *Cities*. [Revising to Resubmit] [80% design, 50% implementation, 50% writing]

Zhang, Y., Yu, W., & **Zhu, D.** Terrain Features-Aware Deep Learning Network for Digital Elevation Model Super-Resolution. *ISPRS Journal of Photogrammetry and Remote Sensing*. [Revising to Resubmit] [20% design, 10% implementation, 20% writing]

Book Chapter

Zhu, D., & Hu, Y. Artificial Intelligence. *Concise Encyclopedia of Human Geography*. Edward Elgar Publishing. [Revising to Resubmit] [50% design, 60% implementation, 50% writing]

Invited Presentations, Posters, and Exhibits

Underline - indicates student presenter

Keynote/Plenary Address

Zhu, D. "Intelligent spatial prediction: Rethinking geospatial modeling in the era of GeoAI," Annual Conference of Geomatics and GIScience Central South University, China. (December 26, 2020). *Invited*.

Lecture

Zhu, D. "Inferring national migration flows from sequential population snapshots," Geospatial Seminar Department of Civil Environmental & Geomatic Engineering, University College London. (February 21, 2019). *Invited*.

Zhu, D. "Intelligent Sensing of Urban Space in Street Perspective," Intelligent Transportation Systems Course Institute of Remote Sensing and GIS, PKU. (October 17, 2017). *Invited*.

Presentation/Talk

Zhu, D. "Intelligent spatial prediction in incomplete-data scenarios," GeoAI Research Seminar Discussion Knowledge Computing Lab, Department of Computer Science & Engineering, University of Minnesota. (December 16, 2021). *Invited*.

Zhu, D. "Inferring spatial interaction pattern from spatial distribution snapshots," China Data Lab

2021 Workflow Webinar Wuhan University & Harvard University. (June 18, 2021). *Invited*.

Zhu, D. "Intelligent spatial understanding: representation, modeling and prediction," CPGIS 2021 GeoAI Seminar Series China University of Geosciences. (May 9, 2021). *Invited*.

Zhu, D. "Linkages between Spatial Regression and Graph Neural Networks," The 5th GIScience Symposium Peking University, Beijing Normal University, and Chinese Acedemy of Science. (April 17, 2021). *Invited*.

Zhu, D. "Intelligent spatial prediction in incomplete-data scenarios," CPGIS 2020 GeoAI Seminar Series China University of Geosciences. (May 6, 2020). *Invited*.

Zhu, D. "Spatial prediction using black-box models," SpaceTimeLab Research Discussion SpaceTimeLab, University College London. (October 12, 2018). *Invited*.

Grants, Awards, Gifts, or Endowment Earnings (Internal Sources)

Intelligent Spatial Models and Analytical Methods: 1000-10964-20042-5672018
PI; Start-up Funding**;** College of Liberal Arts, University of Minnesota
September 1, 2021 - Present

Grants, Contract, Awards (External Sources)

National Spatiotemporal Population Research Infrastructure: 2R01HD057929-11
Collaborative Researcher; National Institutes of Health, Eunice Kennedy Shriver National Institute of Child Health and Human Development
September 9, 2020 – Present
Modelling spatial heterogeneity and spatial interactions from the big geo-data perspective: 201806010077
PI; China Scholarship Council (CSC) Funding
October 1, 2018 - October 1, 2019
Geo-spatial models and analytical methods: 41625003
Research Assistant; National Natural Science Fund for Distinguished Young Scholars
January 2017 - July 2020
Theoretical and analytical methods of spatial interaction networks in geospatial big data: 41830645
Research Assistant; The Major Program of the National Natural Science Foundation of China
January 2019 - January 2021
Multi-sensing of urban locations with big geo-data: 2017YFB0503602
Research Assistant; National Key Research and Development Program of China
July 2017 - July 2020
Investigating human mobility pattern based on massive spatio-temporal data: 41271386
*Research Assistant***;** National Natural Science Foundation of China
January 2013 - December 2016

Distinction of Doctoral Thesis Peking University 2020
Excellent Graduates Peking University 2020
China National Scholarship Ministry of Education, P. R. China 2019
Early Career Scholarship GIS Research UK 2019
Travel Award AAG, Applied Geography Speciality Group 2019
Presidential Fellowship Peking University 2018

Rising Star Award College GIS Forum (CGF), China 2018
Tang Lixin Scholarship Peking University 2017
Founder Scholarship Peking University 2012
54 Scholarship: Peking University 2011

TEACHING

Scheduled Teaching

GEOG 3531/5531 Numerical Spatial Analysis	Fall 2021; Spring 2022
GEOG 8980 Topics: Geography - Geospatial Artificial Intelligence	Spring 2022
GIS 8990 Research Problems in GIS	Spring 2022

Instructional Activity

Peking University

04831410: Introduction to Computation, Peking University, Teaching Assistant	2016 - 2018
01213660: Intelligent Transportation Systems, Peking University, Guest Lecturer	2017
01213610: GIS Algorithms and Applications, Peking University, Teaching Assistant	2016 - 2017
01235080: Geo-mathematical Models, Peking University, Teaching Assistant	2015

University College London

CEGE 0097: Spatial Analysis and Geocomputation, University College London, Guest Lecturer; Tutor	2019

ADVISING AND MENTORING

Graduate Student Activities

Committee Advising

Doctoral Preliminary Committee: Committee Member

Zekun Li, Computer Science Ph D	2021 - Present
Mohsen Ahmadkhani, Geography Ph D	2021 - Present

SERVICE

Service to the Discipline/Profession/Interdisciplinary Area(s)

Program Committee Member

The 4th International Workshop on AI for Geographic Knowledge Discovery (GeoAI'21)	2021
The 3th International Workshop on AI for Geographic Knowledge Discovery (GeoAI'19)	2019

Reviewer

ISPRS Journal of Photogrammetry and Remote Sensing	2022 - Present
Cartography and Geographic Information Science	2021 - Present
CRC Press - Taylor & Francis Group	2021 - Present
Geomatics and Information Science of Wuhan University	2021 - Present
Humanities and Social Sciences Communications	2021 - Present
International Journal of Applied Earth Observation and Geoinformation	2021 - Present
International Journal of Digital Earth	2021 - Present
ISPRS International Journal of Geo-Information	2021 - Present
Journal of Planning Education and Research	2021 - Present
Stochastic Environmental Research and Risk Assessment	2021 - Present
Annals of the American Association of Geographers	2020 - Present
Cities	2020 - Present
Computational Urban Science	2020 - Present
Geo-spatial Information Science	2020 - Present
Nature Scientific Reports	2020 - Present
Transactions on Spatial Algorithms and Systems	2020 - Present
Applied Geography	2018 - Present
IEEE ACCESS	2018 - Present
IEEE Transactions on Industrial Informatics	2018 - Present
International Journal of Geographical Information Science	2018 - Present
PLOS ONE	2018 - Present
Acta Geodaetica et Cartographica Sinica	2017 - Present
Computers, Environment and Urban Systems	2017 - Present
Spatial Statistics	2016 - Present

Session Chair

AAG 2022 Symposium on Data-Intensive Geospatial Understanding the Era of AI and CyberGIS: GeoAI - Intelligent Geospatial Analytics	March, 2022
The 28th Geographical Information Science Research UK Conference (GISRUK'20)	April 2020

Service to the University/College/Department

University of Minnesota

Department

Member, Admissions Committee	2021 - Present
Member, Awards Committee	2021 - Present
Member, Undergraduate Education Policy Committee	2021 - Present

University

Member, Minnesota Population Center	2021 - Present