XIMENG CHENG

chengximeng612@gmail.com
Homepage: https://gischeng.github.io/

RESEARCH INTERESTS

GIScience, spatio-temporal data mining, explainable artificial intelligence (XAI), geospatial artificial intelligence (GeoAI), social sensing, machine learning, time-series analysis, urban studies, remote sensing, transportation, disaster assessment, forestry.

RESEARCH EMPLOYMENT EXPERIENCE

Research Assistant (Postdoc) *November 2021 - Present*
Applied Machine Learning Group, Artificial Intelligence Department, Fraunhofer Institute for Telecommunications, Heinrich Hertz Institute (HHI)

Parental Leave *December 2023 - May 2024*

Research Assistant (Postdoc) *August 2021 - October 2021*
High Performance Computing (HPC) Group, Gesellschaft für wissenschaftliche Datenverarbeitung mbH Göttingen (GWDG)

Research Assistant *September 2016 - April 2021*
Institute of Remote Sensing and Geographical Information Systems, Peking University (PKU)

Visiting Scholar *April 2019 - August 2019*
CyberGIS Center for Advanced Digital and Spatial Studies, Department of Geography and Geographic Information Science, University of Illinois at Urbana-Champaign (UIUC)

Visiting Graduate Student *November 2014 - January 2016*
Institute of Remote Sensing and Digital Earth, Chinese Academy of Sciences (CAS)

EDUCATION

Doctor of Natural Science *September 2016 - August 2020*
Cartology and GIS, Peking University (PKU)
Spatio-temporal expression and mining method of urban group activity intensity based on big geo-data
Advisors: Prof. Lun Wu, Prof. Yu Liu

Master of Engineering *September 2013 - July 2016*
Cartography and Geographic Information Engineering, China University of Geosciences, Beijing (CUGB)
The study of disaster target automatic classification based on high-resolution remote sensing images
Advisor: Prof. Tingyan Xing, Prof. Zhanfeng Shen

Bachelor of Science *September 2009 - June 2013*
Geographic Information System, China University of Geosciences, Beijing (CUGB) GPA: 3.65/4

PUBLICATIONS AND PATENTS

Publications (* for corresponding author)

1. **Ximeng Cheng***, Tianqi Wang, Di Zhu, and Jackie Ma. Uncertainty explanation of artificial intelligence models by SHAP. *Knowledge-Based Systems*, 2025, under review.

2. **Ximeng Cheng***. Explainable AI applications in GIS. *The Geographic Information Science & Technology Body of Knowledge (Issue 2, 2025 Edition)*, 2025.
https://doi.org/10.22224/gistbok/2025.2.1

3. **Ximeng Cheng***, and Jackie Ma. Global or local modeling for XGBoost in geospatial studies upon simulated data and German COVID-19 infection forecasting. *Scientific Reports*, 15, 8858, 2025.
https://doi.org/10.1038/s41598-025-92995-6

4. **Ximeng Cheng***, Marc Vischer, Zachary Schellin, Leila Arras, Monique M. Kuglitsch, Wojciech Samek, and Jackie Ma. Explainability in GeoAI. *Handbook of Geospatial Artificial Intelligence*, CRC Press, 177-200, 2023.
https://doi.org/10.1201/9781003308423-9

5. Jintong Tang, **Ximeng Cheng***, Aihan Liu, Qian Huang, Yinsheng Zhou, Zhou Huang, Yu Liu, and Liyan Xu*. Inferring "high-frequent" mixed urban functions from telecom traffic. *Environment and Planning B: Urban Analytics and City Science*, 51(8):1775-1793, 2023.
https://doi.org/10.1177/23998083231221867

6. **Ximeng Cheng***, Ali Doosthosseini, and Julian Kunkel. Improve the deep learning models in forestry based on explanations and expertise. *Frontiers in Plant Science*, 13:902105, 2022.
https://doi.org/10.3389/fpls.2022.902105

7. **Ximeng Cheng**, Jianying Wang, Haifeng Li, Yi Zhang, Lun Wu, and Yu Liu*. A method to evaluate task-specific importance of spatio-temporal units based on explainable artificial intelligence. *International Journal of Geographical Information Science*, 35(10):2002-2025, 2021.
https://doi.org/10.1080/13658816.2020.1805116

8. **Ximeng Cheng***, Zhiqian Wang, Xuexi Yang, Liyan Xu, and Yu Liu. Multi-scale detection and interpretation of spatio-temporal anomalies of human activities represented by time-series. *Computers, Environment and Urban Systems*, 88:101627, 2021.
https://doi.org/10.1016/j.compenvurbsys.2021.101627

9. Jesper Sören Dramsch*, Monique M. Kuglitsch, Miguel-Ángel Fernández-Torres, Andrea Toreti, Rustem Arif Albayrak, Lorenzo Nava, Saman Ghaffarian, **Ximeng Cheng**, Jackie Ma, Wojciech Samek, Rudy Venguswamy, Anirudh Koul, Raghavan Muthuregunathan, and Arthur Hrast Essenfelder. Explainability can foster trust in artificial intelligence in geoscience. *Nature Geoscience*, 18:112-114, 2025.
https://doi.org/10.1038/s41561-025-01639-x

10. Fan Xia, **Ximeng Cheng**, Zhen Lei*, Jintao Xu, Yu Liu, Yingxin Zhang, and Qinghong Zhang. Heterogeneous impacts of local traffic congestion on local air pollution within a city: Utilizing taxi trajectory data. *Journal of Environmental Economics and Management*, 122:102896, 2023.
https://doi.org/10.1016/j.jeem.2023.102896

11. Lun Wu, **Ximeng Cheng**, Chaogui Kang, Di Zhu, Zhou Huang, and Yu Liu*. 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, 2020.
https://doi.org/10.1080/17538947.2018.1556353

12. Di Zhu, **Ximeng Cheng**, Fan Zhang, Xin Yao, Yong Gao, and Yu Liu*. Spatial interpolation using conditional generative adversarial neural networks. *International Journal of Geographical Information Science*, 34(4):735-758, 2020.
https://doi.org/10.1080/13658816.2019.1599122

13. Xiaoyue Xing, Zhou Huang*, **Ximeng Cheng**, Di Zhu, Chaogui Kang, Fan Zhang, and Yu Liu. Mapping human activity volumes through remote sensing imagery. *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing*, 13:5652-5668, 2020. https://doi.org/10.1109/JSTARS.2020.3023730

14. Di Zhu, Fan Zhang, Shengyin Wang, Yaoli Wang, **Ximeng Cheng**, Zhou Huang, and Yu Liu. Understanding place characteristics in geographic contexts through graph convolutional neural networks. *Annals of the American Association of Geographers*, 110(2):408-420, 2020. https://doi.org/10.1080/24694452.2019.1694403

15. Jianying Wang, Lei Dong, **Ximeng Cheng**, Weijun Yang, and Yu Liu*. An extended exploration and preferential return model for human mobility simulation at individual and collective levels. *Physica A: Statistical Mechanics and its Applications*, 534:121921, 2019. https://doi.org/10.1016/j.physa.2019.121921

16. Shiliang Zhang, Di Zhu*, Xin Yao, **Ximeng Cheng**, Huagui He, and Yu Liu. The scale effect on spatial interaction patterns: an empirical study using taxi O-D data of Beijing and Shanghai. *IEEE Access*, 6:51994-52003, 2018. https://doi.org/10.1109/ACCESS.2018.2869378

17. **Ximeng Cheng***, Zhanfeng Shen, Tingyan Xing, and Wen Dong. Damaged building extraction and rapid assessment for earthquake disasters based on high-resolution remote sensing images. *Journal of Natural Disasters*, 25(3):22-31, 2016. (In Chinese) https://doi.org/10.13577/j.jnd.2016.0303

18. **Ximeng Cheng**, Zhanfeng Shen*, Tingyan Xing, Liegang Xia, and Tianjun Wu. Efficiency and accuracy analysis of multispectral image classification based on mRMR feature selection method. *Journal of Geo-information Science*, 18(6):815-823, 2016. (In Chinese) http://www.dqxxkx.cn/CN/10.3724/SP.J.1047.2016.00815

19. Wen Dong*, Zhanfeng Shen, and **Ximeng Cheng**. The rapid assessment method of earthquake disaster based on high-resolution remote sensing target feature library. *Journal of Geo-information Science*, 18(5):699-707, 2016. (In Chinese) http://www.dqxxkx.cn/CN/10.3724/SP.J.1047.2016.00699

Patents

1. Lingling Li, Zhanfeng Shen, Yida Fan, Tong Tang, Qi Wen, Wei Wang, Ping Wang, Wen Dong, Wei Zhang, Yueguan Lin, Yan Cui, He Huang, and **Ximeng Cheng**. Building vector boundary simplification method. Chinese patent: CN105787977B, 09/10/2018.

CONFERENCES

1. **Ximeng Cheng**, Jost Arndt, Emilia Marquez, and Jackie Ma. Decomposition learning based on spatial heterogeneity: A case study of COVID-19 infection forecasting in Germany. *2023 European Geosciences Union (EGU) General Assembly, Vienna, Austria, April 2023.* (PICO presentation)

2. **Ximeng Cheng**, and Yu Liu. Evaluation of spatio-temporal tensor data based on the explainable artificial intelligence methods. *2019 Chinese Geography Information Science Theories and Methods Annual Conference, Shanghai, China, October 2019.* (Oral presentation)

3. Di Zhu, **Ximeng Cheng**, Fan Zhang, Yong Gao, and Yu Liu. Spatial interpolation based on conditional generative adversarial neural network. *2019 American Association of Geographers (AAG) Annual Meeting, Washington D.C., United States, April 2019.*

4. Zhiqian Wang, **Ximeng Cheng**, and Yu Liu. Study on the precipitation weather influence on taxi behaviors based on the Fourier transform. *2018 Chinese Geography Information Science Theories and Methods Annual Conference, Taiyuan, China, November 2018.*

5. Xiaoyue Xing, Di Zhu, **Ximeng Cheng**, and Yu Liu. Population mapping based on deep features of remote sensing imagery. *The 26th International Conference on Geoinformatics, Kunming, China, June 2018.*

6. **Ximeng Cheng**, and Yu Liu. Urban mixed-use decomposition based on the temporal activity signatures. *2017 Chinese Geography Information Science Theories and Methods Annual Conference, Changsha, China, November 2017.* (Oral presentation)

7. *Spatio-temporal Patterns and Geographical Analysis, GIScience Symposium Series No.2, Beijing, China, October 2017.* (Conference organizer)

8. Di Zhu, Li Shi, Yuxia Wang, **Ximeng Cheng**, and Yu Liu. Infer spatial interaction patterns from spatial distributions. *The 25th International Conference on Geoinformatics, Buffalo, United States, August 2017.*

ADVISING OF THESES

1. Emilia Marquez. Spatiotemporal analysis of remote sensing nightlight data in Germany using geographically weighted regression (GWR). Master in Remote Sensing, geoInformation and Visualization, University of Potsdam, 2024.

PROJECTS

2021.12-2024.11, DAKI-FWS, Data- and AI- supported early warning system, Federal Ministry for Economic Affairs and Climate Action (BMWK), Germany (No.01MK21009A)
Using AI-based models (e.g., LSTM, XGBoost) to forecast daily COVID-19 infection numbers in each county of Germany based on multiple datasets (e.g., historical infection data, disease-related policy index, human contact index). In addition, I also studied model uncertainty, time lags between time series, and AI modeling considering spatial heterogeneity.

2021.08-2023.10, FORESTCARE, Single tree-based, satellite-supported forest ecosystem monitoring using auto-adaptive hyperdimension geodata analysis, Federal Ministry of Education and Research (BMBF), Germany (No.02WDG014E)
Combining AI model explanations obtained from XAI methods with expertise, I used the feature unlearning (FUL) method to improve the AI model performance on multiple forestry tasks (e.g., disease identification and species classification) based on leaf image data.

2019.04-2019.08, Doctoral student short-term aboard study project supported by Graduate School of Peking University (No.7101702197)
As a visiting scholar, I engaged in in-depth academic exchanges with the CyberGIS group at the University of Illinois at Urbana-Champaign (UIUC).

2019.01-2020.08, Towards theories and methods for spatial interaction networks derived from big geo-data, National Natural Science Foundation of China (No.41830645)
Considering the spatio-temporal expression of data at multiple scales, I used the time series decomposition-based method to detect and explain the human activity anomalies based on the taxi traffic data and environmental data (e.g., weather) in Beijing, China.

2017.07-2020.08, Big geo-data mining and spatio-temporal pattern discovery, National Key Research and Development Program of China (No.2017YFB0503600)
Using the social sensing method (i.e., treating humans as sensors and investigating the human activity patterns and environmental characteristics based on big geo-data) to analyze the mixed-use of urban function in Beijing and Shenzhen, China, based on multiple human activity data, such as social media check-ins, points of interest (POIs), and telecom traffic data.

2017.01-2020.08, Methods for geo-spatial modeling and analyzing, National Natural Science Foundation of China (No.41625003) Using the improved XAI method that considers the

geographical characteristics of data (e.g., spatio-temporal dependence and spatial heterogeneity) to mine the task-specific spatio-temporal knowledge. I proposed a spatio-temporal layer-wise relevance propagation (ST-LRP) method to assess the task-specific importance of each data unit on both spatial and temporal dimensions.

ACADEMIC SERVICES

Peer reviews

2025 - Present	Journal of Selected Topics in Applied Earth Observations and Remote Sensing
2025 - Present	ISPRS Journal of Photogrammetry and Remote Sensing
2025 - Present	Information Fusion
2025 - Present	Habitat International
2024 - Present	Geoscience Data Journal
2024 - Present	Computational Urban Science
2023 - Present	Computers, Environment and Urban Systems
2023 - Present	International Journal of Digital Earth
2023 - Present	Annals of GIS
2023 - Present	Information Processing and Management
2023 - Present	Pest Management Science
2023 - Present	Journal of Agricultural, Biological, and Environmental Statistics
2022 - Present	Transactions in GIS
2022 - Present	Sustainability
2021 - Present	Electronics
2021 - Present	Sensors
2019 - Present	IEEE Access
2018 - Present	International Journal of Geographical Information Science

Editor

1. Special issue:Remote Sensing for Air Quality, Health, and Sustainable Development, 2026.05.01, *Remote Sensing*.

AWARDS AND HONORS

2020	**Excellent Graduate**	Peking University
2020	**Special Academic Scholarship**	Peking University
2019	**Merit Student**	Peking University
2019	**Special Academic Scholarship**	Peking University
2018	**Special Academic Scholarship**	Peking University
2016	**Excellent Graduate**	Beijing Municipal Education Commission
2016	**Excellent Graduate**	China University of Geosciences, Beijing
2014	**Merit Student**	China University of Geosciences, Beijing
2013	**Excellent Graduate**	China University of Geosciences, Beijing
2012	**Professional Scholarship**	China University of Geosciences, Beijing
2011	**Excellent Student Cadre**	China University of Geosciences, Beijing
2011	**Professional Scholarship**	China University of Geosciences, Beijing
2010	**Merit Student**	China University of Geosciences, Beijing
2010	**Outstanding Volunteer**	China University of Geosciences, Beijing
2010	**Professional Scholarship**	China University of Geosciences, Beijing

COMPETITIONS

2015	**Semi-final**	Beauty of Programming, Microsoft (China)
2014	**First Prize**	International Underwater Robot Competition (URC)
2012	**Second Prize**	Lan Qiao Cup Collegiate Programming Contest, China
2012	**First Prize**	Lan Qiao Cup Collegiate Programming Contest, Beijing
2012	**Third Prize**	Peking University Programming Contest (Guest)
2011	**Second Prize**	The Electrician Mathematical Contest in Modeling, China
2010	**Gold Medal**	Campus Programming Contest, China University of Geosciences, Beijing

SKILLS

Programming Related	Python, Jupyter, PyTorch, TensorFlow, C#, SQL, C/C++, Matlab
GIS Related	ArcGIS, QGIS, PostGIS, ENVI, GDAL, OpenStreetMap
Languages	Chinese, English

ACTIVITIES

2017-2019	**Leader of the spatio-temporal analysis group** Spatio-temporal big data and social sensing laboratory, Peking University
2014	**Member of University Robot Team**, China University of Geosciences, Beijing
2013	**Volunteer** of 9th China (Beijing) International Garden Expo
2013	**Volunteer** of Beijing Marathon
2012	**Volunteer** organizer of sixty university anniversary, CUGB
2012	**Volunteer** of Esri (China) User Conference, Beijing
2012	**Volunteer** of 3rd Beijing Olympic City Sports & Culture Festival
2012	**Volunteer** of Beijing Marathon
2012	**Volunteer** of 2nd National Undergraduate Geological Skills Competition, China
2011-2012	**Council member of Youth Volunteers Association**, CUGB
2011-2012	**President of Youth Volunteers Association** School of Information Engineering, China University of Geosciences, Beijing
2010-2012	**Member of University ACM/ICPC Team**, China University of Geosciences, Beijing
2010	**Volunteer** of 1st Beijing Olympic City Sports & Culture Festival

REFERENCES

Yu Liu
Professor
School of Earth and Space Sciences
Peking University
liuyu@urban.pku.edu.cn

Jackie Ma
Head of Applied Machine Learning Group
Fraunhofer Institute for Telecommunications, Heinrich Hertz Institute, HHI
jackie.ma@hhi.fraunhofer.de