Xiaoyu Chen

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State Key Laboratory of Information Engineering in Surveying, Mapping and Remote Sensing, Wuhan University

Research Interest

Geographical Artificial Intelligence; Spatio-temporal Data Mining; Urban Informatics; Graph Neural Network; Human Mobility; Social Sensing; Transportation

Education

- **Wuhan University** *Sep. 2022 - Jun. 2025*
  M.S. in Cartography and Geographical Information System Wuhan, China
  - Advisor: Prof. Guan Xuefeng, Prof. Wu Huayi
  - Grade: 89.5/100
- **Wuhan University** *Sep. 2018 - Jun. 2022*
  B.S. in Geophysics Wuhan, China
  - Advisor: Prof. Guan Xuefeng, Prof. Yu Hui
  - GPA: 3.82/4.00

Publications

[1] **Chen, X.**, Xu, Q., Yang, C., Yang, X., Wu, H., & Guan, X.* (2024). **UniGCA: A universal graph cellular automata framework for both raster and vector-based urban growth simulation**. *(To be submitted in Oct. 2024)*

[2] Xu, Q., **Chen, X.**, Yang, C., Yang, X., Wu, H., & Guan, X.* (2024). **A Local Moran's I guided Transformer Cellular Automata for simulating heterogeneous urban growth**. In *International Journal of Geographical Information Science (Submitted)*

[3] Yang, C., Guan, X.*, Xu, Q., Xing, W., **Chen, X.**, Chen, J., & Jia, P. (2024). **How can SHAP (SHapley Additive exPlanations) interpretations improve deep learning based urban cellular automata model?**. In *Computers, Environment and Urban Systems, 111, 102133.*

[4] Xu, Q., Guan, X.*, Yang, C., Xing, W., **Chen, X.**, & Wu, H. (2024). **Enhancing outlying growth simulation in urban cellular automata via intelligent extraction-fusion of land suitability and neighborhood effects: a case study of Wuhan, China**. In *Geo-spatial Information Science, 1-19.*

Research Projects

- **The Cellular Automata Based Urban Expansion Simulation with the Representation of Hierarchical Heterogeneous Spatial Interaction** *Oct. 2022 - Oct. 2024*
  Advisor: Prof. Guan Xuefeng, Prof. Wu Huayi
  - Designed and implemented specialized data formats and urban spatial partitioning strategies, specifically tailored for vector and raster data types to support large-scale urban research applications.
  - Employed advanced deep learning architectures like CNN, GNN and Transformer to simulate complex spatial dependencies, enhancing both local and long-range interaction representation through multi-level coupling.
  - Developed urban expansion driving force analysis methods based on deep learning interpretability theories, such as SHAP.
- **Fine-Scale Meteorological Risk Early Warning for Geological Hazards in Huanggang City** *Oct. 2021 - Oct. 2022*
  Advisor: Prof. Guan Xuefeng, Prof. Yu Hui
  - Integrated advanced attention modules, including SENet, SKNet and CBAM, within CNN model to enhance the predictive accuracy of landslide susceptibility mapping.
  - Employed SHAP to quantify the contributions of driving factors in improving predictions for landslide susceptibility mapping.
  - Developed an early warning model for landslide geological hazards in Huanggang, incorporating meteorological factors such as early and forecasted rainfall.

Invited Conference Presentations

- **Chen, X.** (2024). UniGCA: A universal graph cellular automata framework for both raster and vector-based urban growth simulation. In *2024 China Annual Conference on Theories and Methods of Geographic Information Science, Xi'an, China.* (Invited) *Oct. 2024*

Honors and Awards

- Social activists of Wuhan University (Top 3%) *2023*
- Outstanding Graduate of Wuhan University (Top 10%) *2022*
- The First-Class Academic Scholarship of Wuhan University (Top 5%) *2021*
- Second Prize in the 12th Chinese Mathematics Competition (CMC) for College Students *2020*
- Second Prize in the 9th Chinese Mathematics Competition (CMC) for College Students in Hubei Province *2020*

Service and Leadership

- **Teaching Assistant** *July 2023*
  The International GeoInformatics Summer School (IGSS) [🌐]
  - Addressed various inquiries from international students, assisted instructors with organizing courses and seminars, and helped in evaluating reports and presentations.
  - Enhanced intercultural communication skills, networked with peers from diverse countries, and broadened understanding of global geographical challenges faced by different nations.
- **Department Member** *Mar. 2023 - Present*
  Social Activity Department of GeoScience Cafe [🌐]
  - Organized over ten English-language academic lectures, inviting scholars from the fields of surveying, remote sensing, and GIS to share their latest research and academic experiences.
  - Enhanced my organizational capabilities and expanded my academic network through interactions with distinguished scholars.

Skills

- **Programming Languages:** Python, Matlab, R, C++
- **Softwares:** ArcGIS, ArcGIS Pro, SPSS
- **Other Tools:** PyTorch, Linux, LaTeX, MarkDown
- **Languages:** English (TOEFL 103), Mandarin