

Keyi Liu

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Education

Peking University

Beijing, China

Master in Landscape Architecture, College of Architecture and Landscape

Sep. 2022 - Jul. 2025 (Expected)

- Research Field: Spatial-temporal geographic analysis, modeling and simulation
- Advisor: **Liyan Xu**, Tenured Associate Professor, College of Architecture and Landscape, Peking University.
- GPA: 3.73/4.0

Hunan University

Changsha, China

Bachelor in Urban and Rural Planning, School of Architecture and Planning

Sep. 2017 - June. 2022

- Graduation Design: Flood Resilient Park Planning and Design Based on Sponge City Principles
- Advisor: **Ran Jing**, Tenured Associate Professor, School of Architecture and Planning, Hunan University.
- GPA: 3.47/4.0 (Ranking 3/25)

Research Experience

Automated Generation and Multi-objective Optimization of Land-Use Planning

Beijing, China

Core Researcher, advised by Professor Liyan Xu

Jan. 2024 - Now

- Conceptualize a novel land-use planning strategy that combines *reinforcement learning and multi-objective optimization*.
- Enhance the Proximal Policy Optimization (PPO)-based reinforcement learning model for *provincial-scale applicability*.
- Incorporate Pareto multi-objective optimization to maximize both *economic land rent and ecological service value* in land-use.

AI-Human Collaboration in Urban Design: An AIGC Tool for Streetscape Imagery

Beijing, China

Core Researcher, advised by Professor Liyan Xu

Jan. 2024 - Now

- Fine-tune *a model using LoRA tailored for street garden*, enabling Stable Diffusion to generate 4 schemas within 1 minute.
- Design an experiment that varies user control over *redesign areas and prompt words* to model 4 levels of designer collaboration.
- *Recruit 160 participants* and analyze the *aesthetic and compatibility scores* of design outputs under different collaboration modes.

Simulation of Ecological Policy: Balancing Development and Conservation

Beijing, China

Core Researcher, advised by Professor Liyan Xu

May. 2023 - Now

- Develop an *Agent-Based Model* to simulate the comprehensive impacts of *260 policy combination scenarios* of Grain-to-Green (G2G) and Firewood-to-Electricity (F2E) programs in *Wolong National Reserve*.
- Simulate agent policy responses based on *microeconomics and individual behavioral patterns* (e.g., G2G participation decisions, F2E's impact on firewood collection).
- Conduct the *cost-efficiency analysis* to identify the *optimal compensation or subsidy levels* for individual policy direct benefits.
- Integrate *Pareto analysis with posterior optimization* to identify policy combinations balancing *panda habitat, carbon emissions, and economic benefits*, and aligning with *budget constraints and decision-maker preferences*.

Inference of user attributes based on geographic trajectory data

Beijing, China

Team member, advised by Professor Liyan Xu

Sep. 2022 - June. 2023

- Explore a strategy to extract *multi-dimensional high-order mobility features* for user profiling from trajectory data.
- Extract *4 mobility spatiotemporal features* and vectorize *3 location semantic features* of 501,158 users' trajectory data.
- Identify *4 levels, 7 user clusters* with different lifestyle profiles by adopting a multi-view k-means cluster method.

Interactions and behavioral preferences among road-user groups

Beijing, China

Team member, advised by Professor Liyan Xu

Nov. 2022 - June. 2023

- Apply YOLO and ByteTrack for *video target recognition and trajectory extraction*, and compute road users' kinematic features.
- Analyze the *behavioral choice differences* of 3 groups of road users (vehicle & pedestrian, vehicle & e-bike, e-bike & pedestrian) at crossroads conflict scenarios by using the *Quantal Response Equilibrium model*.

The Color Analysis of Ancient Architecture

Changsha, China

Core Researcher, won the 1st prize of National College Student Innovation Training Program

Sep. 2019 - May. 2021

- Collect 1,341 color samples encompassing *the entire range of ancient architectures* at Yuelu Academy.
- Propose a systematic and scientific working model for *the data collection and correction* of ancient architectural colors.
- Utilize the Nippon Color & Design (NCD) color system for the analysis of *ancient architectural color imagery*, exploring the *protection and revitalization* of ancient buildings from a human-centric perspective.

Publications (*Corresponding Author)

- [J1] **K. Liu**, Y. Chen, L. Xu*, X. Zhang, Z. Wang, H. Li*, et al., "Synergizing Farmland Reverting and Energy Substitution Programs in Wolong through Agent-Based Modelling and Cost-Efficiency Analysis." *Ecological Modelling*, 2025, 504: Article 111079. DOI:10.1016/j.ecolmodel.2025.111079.
- [J2] **K. Liu**, J. Tang, H. Yin, S. Li, L. Xu*, "Development of an Automated Land-Use Planning Framework Utilizing Multi-Objective Reinforcement Learning for Enhanced Spatial Allocation and Decision-Making." (In Preparation. Expected Apr, 2025)
- [C1] **K. Liu**, S. Ge, X. Wu, D. Li*, "Evaluation of Oasis Habitat Stability in Arid Regions Based on the PPSD Model: A Case Study of Wensu County, Xinjiang." *2024 International Association for China Planning. (Oral Presentation)*
- [C2] D. Mo, **K. Liu**, Q. Tian, D. Li, L. Xu*, "The Role of Urban Designers in the Era of AIGC: An Experimental Study Based on Public Participation." *2025-AAAI Workshop on AI for Urban Planning. (Oral Presentation)*
- [J3] Q. Huang, **K. Liu***, J. Gu, et al., "Enhancing Preservation of Ancient Buildings through Color Imagery Analysis and Activation: Take Yuelu Academy as an Example." *Journal of Asia Architecture and Building Environment*, 2025, 1-19.
- [J4] Q. Huang, **K. Liu***, Y. He, Z. Yang, J. Gu, Y. Zhao, "Research on the Application of Color Acquisition Method and Process Design in the Protection of Ancient Buildings—A Case Study of Yuelu Academy." *Furniture & Interior Design*, 2024, 31(02): 116-121.
- [J5] S. Ye, G. Zhang, **K. Liu**, J. Tang, L. Xu*, "A Framework for Mining Lifestyle Profiles Through Multi-Dimensional and High-Order Mobility Feature Clustering." *arXiv:2312.00411 (2023)*.
- [J6] G. Zhang, S. Ye, **K. Liu**, Y. Wang, D. Li, L. Xu*, "Vehicles, Pedestrians, and E-bikes: A Three-Party Game at Right-Turn-on-Red Crossroads Revealing the Dual and Irrational Role of E-bikes that Risks Traffic Safety." *arXiv:2411.02183 (2023)*.
- [J7] J. Tang, H. Yu, D. He, T. Li, W. Xiao, X. Zheng, **K. Liu**, Y. Li, L. Xu*, "A Dataset of Multi-level Street-block Divisions of 985 Cities Worldwide." *Scientific Data*, 2025, 12. 10.1038/s41597-025-04704-7

Selected Honors

2024	Outstanding Scientific Research Award (1 Student Each Year)	Peking University
2023	Merit Student (3 Students Each Year)	Peking University
2023	Scientific Innovation Award Scholarship (3 Students Each Year)	Peking University
2023	1st Prize (TOP 1%) of International Innovation Design & Science for SDGs Innovation Contest	China
2020	1st Prize (TOP 1%) of National College Student Innovation Training Program	China
2018-2021	Outstanding Undergraduate Researcher Scholarship (3 Consecutive Years)	Hunan University
2018	Excellent Student Cadre	Hunan University
2017	Undergraduate Comprehensive Scholarship	Hunan University

Teaching Assistant

2023	History of Chinese and Foreign Cities Compulsory, 32 class periods, 150 students	Peking University
2023	Smart City Planning and Design Elective, 32 class periods, 20 students	Peking University
2020	Administration and Law of Urban Planning Compulsory, 32 class periods, 180 students	Hunan University

Skills

Coding	Python, Sql, \LaTeX
Software	SPSS, GIS (ArcGIS, QGIS), Adobe (PS, AI, AU), Modelling (CAD, Sketch Up, Unity)

Activities

Academic Department Minister of the College of Architecture and Landscape	Peking University
Organized 10 academic lectures and 2 PhD experience sharing lectures.	Sep. 2023 - Sep. 2024
Rural Revitalization Workshop Organizer	Peking University
Led 19 members from 9 universities to conduct field research and public welfare construction in rural.	Aug. 2022
Barrier-Free Living Environment Center	Peking University
Improved accessibility of 2 campus buildings	Sep. 2022 - Jul. 2023

References

- **Dean and Advisor: Kongjian Yu**, Academician of American Academy of Arts and Sciences, Dean, Peking University.
- **Dean and Advisor: Dihua Li**, Associate Professor, Deputy Dean, Peking University.
- **Master's Advisor: Liyan Xu**, Associate Professor, Peking University.
- **Undergraduate Advisor: Jing Ran**, Associate Professor, Hunan University.