

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: 3.7/4.0

Hunan University

Changsha, China

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

Sep. 2017 - Jul. 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: 3.5/4.0 (Ranking 2/25)

Research Experience

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

Beijing, China

Thesis, 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 LoRA model tailored for street garden scenes*, enabling Stable Diffusion to generate 4 design concepts 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 levels.

Balancing Development and Conservation in Wolong National Reserve

Beijing, China

Core Researcher, advised by Professor Liyan Xu

May. 2023 - Now

- Enhance the *policy evaluation sub-module* of an Agent-Based Model to enable comprehensive policy assessment capabilities.
- Simulate 15-year socio-ecological impacts of the *Grain-to-Green and Firewood-to-Electricity* programs in Wolong National Reserve.
- Evaluate the *cost-efficiency* of Grain-to-Green and Firewood-to-Electricity programs across various subsidy levels, identifying *18 optimal combinations* that balance *panda habitat, carbon emissions, and economic benefits*.

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., "Reconciling Human Development and Giant Panda Protection Goals: Cost-Effectiveness of Farmland Reversion and Energy Substitution Programs in Wolong National Reserve." Submitted to Ecological Modelling on Nov, 2024. (Under Review)
- [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 Dec, 2024)
- [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." Submitted to 39th AAAI-2024 Workshop on AI for Urban Planning on Nov, 2024. (Under Review)
- [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." Submitted to Journal of Asia Architecture and Building Environment on Sep, 2023. (In Press)
- [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.
- [C3] 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).
- [J5] 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).
- [J6] 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." Submitted to Scientific Data on May 14, 2024. Now Under Review

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	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, 2 credits, 150 students	Peking University
2023	Smart City Planning and Design Elective, 2 credits, 20 students	Peking University
2020	Administration and Law of Urban Planning Compulsory, 2 credits, 180 students	Hunan University

Skills

Coding	Python, Sql, \LaTeX
Software	SPSS, GIS (ArcGIS, QGIS), Adobe (PS, AI, AU), modeling (CAD, Sketchup, Unity)
Language	Chinese (Native), English (TOEFL: 101)

Activities

Academic Department Minister of the College of Architecture and Landscape <i>Organized 5 academic lectures and 2 PhD experience sharing lectures.</i>	Peking University Sep. 2023 - Sep. 2024
Rural Revitalization Workshop Organizer <i>Led 50 members from 23 universities to conduct field research and public welfare construction in rural.</i>	Peking University July. 2023
Debate Team Leader of the School of Architecture and Planning <i>Won the Individual Best Debater twice and Group Runner-up once.</i>	Hunan University Sep. 2018 - Jul. 2020

References

- **Master's Supervisor:** **Liyan Xu**, Associate Professor, Peking University.
- **Course Supervisor:** **Dihua Li**, Associate Professor, Deputy Dean, Peking University.
- **Undergraduate Supervisor:** **Yao Shen**, Professor, Deputy Dean, Hunan University.