

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." [Accepted by Ecological Modelling on Mar. 5th, 2025. \(In Press\)](#)
- [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." [Accepted by Scientific Data on Feb. 12th, 2025. \(In Press\)](#)

Selected Honors

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

Teaching Assistant

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

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	<i>Peking University</i>
Organized 10 academic lectures and 2 PhD experience sharing lectures.	Sep. 2023 - Sep. 2024
Rural Revitalization Workshop Organizer	<i>Peking University</i>
Led 19 members from 9 universities to conduct field research and public welfare construction in rural.	Aug. 2022
Barrier-Free Living Environment Center	<i>Peking University</i>
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.