

# Keyi Liu

✉ ky.liu@stu.pku.edu.cn | 🏠 ok0209.github.io/

## 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., "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 Feb, 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." [Submitted to Scientific Data on May 14, 2024. \(Minor Revision\)](#)

## Selected Honors

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

## Teaching Assistant

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

## Skills

<b>Coding</b>	Python, Sql, $\text{\LaTeX}$
<b>Software</b>	SPSS, GIS (ArcGIS, QGIS), Adobe (PS, AI, AU), Modelling (CAD, Sketch Up, Unity)
<b>Language</b>	Chinese (Native), English (TOEFL: 97; DET: 130)

## Activities

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