

# Keyi Liu

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## Education & Background

### The University of Hong Kong

Research Assistant in Digital Construction, Department of Real Estate and Construction

- Research Field: Cross-Border Logistics of Modular Integrated Construction (MiC)
- Advisor: **Wilson Lu**, Head of Department and Chair Professor.

Hong Kong, China

Aug. 2025 - Now

### Peking University

Master in Landscape Architecture, College of Architecture and Landscape, GPA: 3.73/4.0

- Master Thesis: Cost-Benefit & Multi-Objective Balance of Ecological Policies via Agent-Based Modeling
- Advisor: **Liyan Xu**, Associate Professor.

Beijing, China

Sep. 2022 - Jul. 2025

### Hunan University

Bachelor in Urban and Rural Planning, School of Architecture and Planning, GPA: 3.47/4.0 (Ranking 2/25)

- Graduation Design: Flood Resilient Park Planning and Design Based on Sponge City Principles
- Advisor: **Yao Shen**, Professor, Deputy Dean

Hunan, China

Sep. 2017 - Jun. 2022

## Research Experience

### Research Assistant - The University of Hong Kong

#### Vibration Risk Mapping in Cross-Border MiC Logistics

Hong Kong, China

Core Researcher, advised by Prof. Wilson Lu

Aug. 2025 - Now

- Processed **400k+ GNSS/IMU records** and road data to construct segmented vibration indicators and feature set for risk modeling.
- Identifying **vibration hotspots and risk patterns** through exploratory analysis and spatial visualization.
- Establishing extensible data pipeline and modeling framework for **multi-phase risk mapping and transfer learning**.

### Research Intern - 'MIT-UF-NU' 2025 Summer Joint Research Camp

#### Human Perception-Driven Urban Street View Generation with ControlNet

MIT-UF-NU

Core Researcher, advised by Prof. Yuebing Liang

Jun. 2025 - Now

- Fine-tuned a ControlNet model to generate street-view images from **urban layout maps** and **human perception scores**.
- Validated the **output quality and perceptual alignment**, ensuring the model's reliability for visual and semantic urban analysis.
- Probing **model embeddings** to uncover the underlying relationships between spatial elements and human perceptions.

### Graduate Researcher - Peking University

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

Beijing, China

Core Researcher, advised by Prof. Liyan Xu

Jan. 2024 - Now

- Conceptualized a novel land-use planning strategy that combines **reinforcement learning and multi-objective optimization**.
- Enhancing the Proximal Policy Optimization (PPO)-based reinforcement learning model for **provincial-scale applicability**.
- Incorporating 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 Prof. Liyan Xu

Jan. 2024 - Jan. 2025

- Fine-tuned **a model using LoRA tailored for street garden**, enabling Stable Diffusion to generate 4 schemas within 1 minute.
- Designed an experiment that varies user control over **redesign areas and prompt words** to model 4 levels of designer collaboration.
- **Recruited 160 participants** and analyzed the **aesthetic and alignment scores** of generations under different collaboration modes.

#### Simulation of Ecological Policy: Balancing Development and Conservation

Beijing, China

Core Researcher, advised by Prof. Liyan Xu

May. 2023 - Jan. 2025

- Developed an **Agent-Based Model** to simulate the comprehensive impacts of **260 policy combination scenarios** of Grain-to-Green and Firewood-to-Electricity programs in **Wolong National Reserve**.
- Conducted the **cost-efficiency analysis** to identify the **optimal compensation or subsidy levels** for individual policy.
- Integrated **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**.

### Undergraduate Researcher - Hunan University

#### The Color Analysis of Ancient Architecture

Hunan, China

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

Sep. 2019 - May. 2021

- Collected 1,341 color samples encompassing **the entire range of ancient architectures** at Yuelu Academy.
- Proposed a systematic and scientific working model for **the data collection and correction** of ancient architectural colors.
- Utilized 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, † Equal contribution)

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- [J1] K. Liu, Y. Chen, L. Xu\*, X. Zhang, Z. Wang, H. Li\*, Y. Yang, H. You, D. Li, "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] 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.
- [J3] 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.
- [J4] 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. DOI:10.1038/s41597-025-04704-7
- [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)*
- [P1] 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 \(2023\)](https://arxiv.org/abs/2312.00411)
- [P2] 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 \(2023\)](https://arxiv.org/abs/2411.02183).
- [U1] K. Liu, J. Tang, H. Yu, L. Xu\*, "An Automated Planning Approach for Urban Land Use Based on Multi-Objective Reinforcement Learning." *(Invention Patent, Under Review, Work at PKU)*
- [I1] 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. 2025, Work at PKU)*
- [I2] K. Liu, Y. Liang\*, Y. Chen, Y. Huang, "Controllable Streetscape Synthesis Perception-Aware Diffusion Models for Human-Centric Urban Design with Geospatial Constraints." *(In Preparation, Expected Jan. 2026, Work with MIT)*
- [I3] K. Liu, W. Lu\*, L. Wu, Y. Zou, H. An, Y. Zhuang, "Safety Risks, Mitigation Strategies, and Future Research Directions in Offsite Modular Integrated Construction Manufacturing: A Systematic Review" *(In Preparation, Expected Nov. 2025, Work at HKU)*

## Selected Honors

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2025	Outstanding Graduate Award (TOP 5%)	Peking University
2024	Outstanding Scientific Research Award (TOP 1%, 1 Student Each Year In College)	Peking University
2023	Merit Student (3 Students Each Year In College)	Peking University
2023	Scientific Innovation Award Scholarship (3 Students Each Year In College)	Peking University
2023	1st Prize (TOP 1%) of 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 Leader Award	Hunan University

## Internship & Activities

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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
Intern at AI Innovation and Research Institute	Turenscape Company
Trained the Stable Diffusion model for AI rendering of landscape design schemas.	Jun. 2023 - Sep. 2023
Rural Revitalization Workshop Organizer	Peking University
Led 50 members from 20 universities to conduct field research and public welfare construction in rural.	Jul. 2023

## Skills

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- Coding** Python, Sql, L<sup>A</sup>T<sub>E</sub>X  
**Software** SPSS, GIS (ArcGIS, QGIS), Adobe (PS, AI, AU), Modelling (CAD, Sketch Up, Unity)

## References

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- **Master's Advisor:** Liyan Xu, Associate Professor, Peking University, [xuliyan@pku.edu.cn](mailto:xuliyan@pku.edu.cn)
- **Vice Dean and Advisor:** Dihua Li, Associate Professor, Peking University, [dihuali@pku.edu.cn](mailto:dihuali@pku.edu.cn)
- **Research Advisor:** Yuebing Liang, Assistant Professor, Tsinghua University, [ybliang@mit.edu](mailto:ybliang@mit.edu)
- **Undergraduate Advisor:** Yao Shen, Professor, Deputy Dean, Hunan University, [shenyao@hnu.edu.cn](mailto:shenyao@hnu.edu.cn)