Mingchen Li

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INTRO

I am a PhD student at The Hong Kong University of Science and Technology, specializing in natural language interaction for intelligent building operation systems (BuildingGPT). My research focuses on two key areas: (1) leveraging semantic models, such as Brick Schema, to integrate diverse data types in the building domain, and (2) enabling seamless interaction between large language models (LLMs) and semantic models for advanced building algorithm rapid deployment.

Prior to joining HKUST, I completed my master's degree at Tianjin University, where I specialized in generative design for passive buildings. I also gained practical experience as a Python development engineer during a nearly two-year internship at the China Academy of Building Research (CABR), focusing on software development. Additionally, I worked as a BIM designer for three months at the Tianjin University Design Institute, contributing to BIM architectural design tasks.

At HKUST, I am the primary full-stack developer of **BuildingGPT** , a large language model driven chatbot to query building data using natural language, with results showcased in **Demo1** and **Demo2**. To date, I have published four JCR Q1 papers as either the sole first author or co-first author.

EDUCATION

2023.09 till now	**Hong Kong University of Science and Technology**	*Ph.D. in Civil Engineering*

- ➢ Designed and developed both the front-end and back-end algorithms for the BuildingGPT system, with results showcased in **Demo1** and **Demo2**.
- ➢ Published four JCR Q1 papers in renowned journals, including *Applied Energy*, *Energy and Buildings*, *Journal of Building Engineering*, and *Nature Scientific Data*.

2020.09-2023.06	**Tianjin University**	*M.Phil. in Smart Building*

- ➢ GPA: 86/100 (Comprehensive ranking 1st in 2022)
- ➢ Achievements: Chuxin scholarship; First scholarship; Second scholarship; Merit Student; 2021 BIM Technology Application Innovation Labor Competition Domestic Software Group, First Prize (**Leader**); The best work of the first domestic BIM application 100 universities invitations, First Prize (**Leader**); 2021pkpm-BIM Application Excellent Case BIM Teaching Group, Third Prize (**Leader**); 2021 Active Sustainable Award, Second Prize
- ➢ Related Courses: Machine Learning Algorithms and Applications (96/100); Introduction to Intelligent Buildings (92/100); Parametric modeling in design (advanced) (92/100)
- ➢ Vice chairman, BIM University Student Union

2016.09-2020.06	**China University of Mining & Technology, Beijing**	*Bachelor in urban Underground Space Engineering*

- ➢ GPA: 84/100 (Comprehensive ranking within the top 5)
- ➢ Achievements: Second scholarships (twice); Third scholarship; New Media Competition on the campus, Second Prize; Back to the school's alma mater, First Prize; Undergraduate graduation design "Beijing Metro Line 12 Heping West Bridge Station Design", First Prize

PROFESSIONAL INTERNSHIP

2020.12-2022.09	**China Academy of Building Research, Python development engineer**	**Beijing, China**

- ➢ Primary developer of "pyp3d_tunnel" Python library for the project
- ➢ Key developer of interactable tools based on Bimbase and PYP3D libraries
- ➢ Technical support and consultant in several competitions

2021.06 – 2021.09   **Tianjin University Research Institute of Architectural Design and   Tianjin, China Urban Planning Co., Ltd. (AATU), BIM Designer**
- ➢ Led the three-person team to develop the BIM model of architecture, structure, and mechanical system
- ➢ Won the first prize in the 2021 BIM Technology Application Innovation Labor Competition

KEY SKILLS

Professional Software:	**Autodesk Revit & Dynamo** (BIM design)
	Autodesk CAD (Architectural drawing)
	Rhino & Grasshopper (Parametric modeling and building performance analysis)
	Draw.io & Origin (Plotting figure)
Building Performance Simulation Software:	**Ladybug & Radiance** (Daylight simulation)
	Honeybee & EnergyPlus (Energy consumption & thermal simulation)
Programming Language:	**Python** (Large language model, machine learning, sensitivity analysis, multi-objective optimization, plotting, data analysis, python library development, front-end development, and software development)
	JavaScript & TypeScript (3D engine interaction, front-end development, web application development, and interactive visualizations)
	R (Sensitivity analysis, plotting, and data analysis)
	MATLAB (data analysis, multi-objective optimization and plotting)
	Latex (Thesis layout)

SOFTWARE COPYRIGHT

1. **Li, M.**, Guo, J., A Building Design Decision Support System Based on Deep Learning and User-Defined Weights. Chinese Software Copyright Registration Number: 2022SR1363742

PUBLICATION

Google Scholar Citation: 34; h-index: 4; i10-index: 2

(#: contribute equally; *: corresponding author)

First Author

1. **Li, M.**, Wang, Z., Chang, H., Wang, Z., & Guo, J. (2024). A novel multi-objective generative design approach for sustainable building using multi-task learning (ANN) integration. *Applied Energy*, 376, 124220.
2. **Li, M.**, Wang, Z., Qu, Y., Chui, K. M., & Leung-Shea, M. (2024). A multi-year campus-level smart meter database. *Scientific Data*, *11*(1), 1284.
3. **Li, M.**, Wang, Z., Fierro, G., Man, C. H. C., So, P. M. P., & Leung, K. F. C. (2024). Developing an automatic integration approach to generate brick model from imperfect building information modelling. *Journal of Building Engineering*, *97*, 110697.
4. **Li, M.**, Wang, Z., BuildingGPT: Query Building Semantic Data Using Large Language Models and Vector-Graph Retrieval-Augmented Generation. (Under Review)

Co-first Author

5. Wang, D.[#], **Li, M.**[#], Guo, M., Shi, Q., Zheng, C., Li, D., ... & Wang, Z. (2023). Modelling variable refrigerant flow system for control purpose. *Energy and Buildings*, *292*, 113163.

Corresponding Author

6. Guo, J., Zhou, J., **Li, M.***, & Lu, S. (2023). Based on ANN and many-objective optimization to improve the performance and economy of village houses in Chinese cold regions. *Journal of Building Performance Simulation*, *16*(5), 526-536.

7. Guo, J., Wang, Z., **Li, M.***, & Jin, Y. (2023). Uncertainty quantification and sensitivity analysis of energy consumption in substation buildings at the planning stage. *Journal of Building Performance Simulation*, *16*(3), 327-345.

8. Guo, J., **Li, M.***, Jiang, Z., Wang, Z., & Zhou, Y. (2022). Optimized design of floor plan and components of prefabricated building with energy-cost effect. *Applied Sciences*, *12*(8), 3740.

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