From Data to Decisions: A Journey Through Thermal Comfort, AI, and Sustainable Buildings

Dr. Hongshan Guo
Department of Architecture
The University of Hong Kong

July 3, 2025

About Me

- Started as an engineering undergrad curious about people and buildings
- Turned PhD obsession into real-world tools for climate resilience
- I love: thermal imaging, city data, and solving puzzles that matter

What is Research, Really?

It's not just lab coats and microscopes

Research is: Asking big questions **no one knows the answer to yet**
And building tools, models, or arguments to explore those questions.

What is Research, Really?

It's not just lab coats and microscopes

Research is: Asking big questions **no one knows the answer to yet**
And building tools, models, or arguments to explore those questions.

- For me? It means using data, physics, and AI to fix how buildings behave.

My Academic Journey

- BEng in Mechanical/Architectural Engineering @ HIT
- MSc in Mechanical Engineering @ Columbia CMU
- PhD in Architecture @ Princeton: *Thermal Comfort in Naturally Ventilated Buildings*
- Data Scientist @ BNY Mellon & now Assistant Professor @ HKU

My Three Research Pillars

- **Thermal Comfort** – how people feel hot/cold around the world
- **Building Controls** – smarter thermostats that use AI
- **Urban Analysis** – thermal drones + maps for city-scale retrofits

Let's Take a Quick Poll

Question: What would make you feel too hot in this room?

- Temperature?
- Humidity?
- Who you're sitting next to?
- Your clothing?

Use your phone or QR to vote! [Insert Mentimeter code]

Surprising Discoveries

- Simple optimized models (like PMV grid search) can beat fancy AI in speed
- Mean Radiant Temperature (MRT) ¿ Air Temp for comfort prediction
- We can predict comfort using just 4 sensors + 2 demographics

What's Next in Building Science?

Tech Horizons

- Real-time feedback loops
- Multi-modal sensing
- Federated learning

Social Impact

- Climate equity
- Energy access
- Healthier buildings

How You Can Get Involved

- **Curious?** Start reading or join small research projects
- **Good at coding/design?** Help us prototype tools and apps
- **Have a question?** Email or chat with us
- **Want a challenge?** Apply for RA/PhD/internship opportunities

Thank You!

Questions? Ideas? Thoughts?

Contact: hongshan@hku.hk Website: [Your Research Site] Computational Building Science Lab