

# Tianzhi He

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Virginia Polytechnic Institute and State University  
Department of Civil and Environmental Engineering  
315, Patton Hall, 750 Drillfield Dr.  
Blacksburg, VA 24060

Email: [tianzhi@vt.edu](mailto:tianzhi@vt.edu)  
Phone: +1 (540) 394-0742  
<https://tianzhihe.github.io>  
[www.linkedin.com/in/tianzhi-he/](https://www.linkedin.com/in/tianzhi-he/)

## Research Interests

Ambient Intelligence (AmI) & Smart Homes  
Conversational AI agents in smart homes  
Wearable sensors integration for user well-being  
Human-AI trust developments  
Mixed Reality (Virtual & Augmented Reality) for smart homes

## Education

**Virginia Polytechnic Institute and State University  
(Virginia Tech)**  
Doctor of Philosophy in Civil Engineering, May 2025 (Expected)  
Advisor: Dr. Farrokh Jazizadeh

Master of Science in Computer Science, May 2025 (Expected)  
Advisor: Dr. Yaxing Yao & Dr. Farrokh Jazizadeh

Master of Science in Civil Engineering, Jan 2021  
Advisor: Dr. Farrokh Jazizadeh

**Tongji University**  
Bachelor of Management, Jun 2019  
Advisor: Dr. Yilong Han

## Appointments

**Graduate Teaching Assistant**  
Virginia Tech, Virginia, USA, 2019 - 2024  
Support classes of CEE 4984/5060 – Building Information Modeling (BIM)  
and Integrated Practices

**Graduate Research Assistant**  
Virginia Tech, Virginia, USA, 2020 - 2024  
Develop research proposals, conduct experiments, analyze data, draft  
manuscripts for academic journals and conferences

**Facility Management Administration Intern**  
CBRE, Shanghai, China, 2018  
Support Standard Chartered bank building and branches property manage-  
ment projects

## Awards

**Vecellio CEM Outstanding Graduate Student**  
Virginia Tech, 2022

**Vecellio Fellowship**  
Virginia Tech, 2021

**Social Practice Scholarship**  
Tongji University, 2018

## Publications **Journal Publications**

J6) **He, T.**, Jazizadeh, F. (2024) “Occupants’ Energy-saving Behavioral Intention Prediction with Machine Learning Techniques in IoT-enabled Smart Homes” *Building and Environment* (Manuscript ready for submission)

J5) **He, T.**, Jazizadeh, F. (2024) “Can I Control Your Smart Home? Users’ Perspectives Towards Smart Home Automation with AI-powered Virtual Assistants” *Scientific Report* (Manuscript getting ready for submission)

J4) **He, T.**, Chen, K., Jazizadeh, F., Reichard, G. (2024) “Unmanned Aerial Vehicles (UAV)-based As-built Survey of Buildings” *Automation in Construction*, 161, 105323. (<https://doi.org/10.1016/j.autcon.2024.105323>)

J3) Chang, R., **He, T.**, Han, Y., Xue, R., Zhang, W. E. (2023). “Geographical Imbalance and Influential Characteristics of the Green Building Market.” *Journal of Construction Engineering and Management*, 149(10), 04023093. (<https://doi.org/10.1061/JCEMD4.COENG-12971>)

J2) **He, T.**, Jazizadeh, F., Arpan, L. (2022). “AI-powered Virtual Assistants Nudging Occupants for Energy Saving: Proactive Smart Speakers for HVAC Control.” *Building Research & Information*, 50.4: 394-409. (<https://doi.org/10.1080/09613218.2021.2012119>)

J1) Han, Y., **He, T.**, Chang, R., Xue, R. (2020). “Development Trend and Segmentation of the US Green Building Market: Corporate Perspective on Green Contractors and Design Firms.” *Journal of Construction Engineering and Management*, 146, no. 11: 05020014. ([https://doi.org/10.1061/\(ASCE\)CO.1943-7862.0001924](https://doi.org/10.1061/(ASCE)CO.1943-7862.0001924))

## **Conference Publications**

C5) **He, T.**, Jazizadeh, F. (2024). “LLM-Based Building Energy Management System with AI Assistant” *2024 ASCE International Conference on Computing in Civil Engineering (i3CE 2024)* (Manuscript Accepted)

C4) **He, T.**, Jazizadeh, F. (2023). “Trust in Human-AI Interaction: Review of Empirical Research on Trust in AI-powered Smart Home Ecosystems” *2023 ASCE International Conference on Computing in Civil Engineering (i3CE 2023)* (<https://ascelibrary.org/doi/abs/10.1061/9780784485224.064>)

## Publications

C3) **He, T.**, Jazizadeh, F. (2022). “Nudging Occupants For Energy-Saving through Voice-Based Proactive Virtual Assistants.” *Construction Research Congress 2022 (CRC 2022)* (<https://ascelibrary.org/doi/abs/10.1061/9780784483961.043>)

C2) **He, T.**, Jazizadeh, F. (2021). “Proactive Smart Home Assistants for Automation - User Characteristic-Based Preference Prediction with Machine Learning Techniques.” *2021 ASCE International Conference on Computing in Civil Engineering (i3CE 2021)* (<https://ascelibrary.org/doi/abs/10.1061/9780784483893.034>)

C1) **He, T.**, Chang, R., Han, Y., Yang, Z. (2020). “Exploring the Development Trends and Characteristics of the US Green Building Market.” *Construction Research Congress 2020 (CRC 2020)* (<https://ascelibrary.org/doi/abs/10.1061/9780784482858.098>)

## Proposal Experiences

**Wearable Sensors for Ambient Intelligence in Smart Homes: Unveiling the Divide Between Laboratory and Real-Life Performances**  
Grants in Aid for Research, Sigma Xi, Sep 2023

PI: Tianzhi He

Developed and submitted a comprehensive proposal for a wearable sensor integration project. The proposal is for a grant with graduate students as the solo PI.

**Pathway Towards Users' Trust in AI-empowered Proactive Smart Home Ecosystems: Understanding Influential Factors and Features**  
Research Grant, Commonwealth Cyber Initiative (CCI), Sep 2022

PI: Dr. Farrokh Jazizadeh, Co-PI: Dr. Carlos Evia

Contributed to the drafting of the research proposal with its major sections, emphasizing innovative approaches to secure trust between users and the smart environments within the Cyber-Physical Security context.

**Smarter and Healthier Buildings: AI-powered Smart Interfaces for Indoor Environmental Quality toward Occupants' Health and Well-being**  
VT 4-VA Collaborative Research Project, 4-VA, Oct 2021

PI: Dr. Farrokh Jazizadeh, Co-PI: Dr. Arsalan Heydarian

Conducted extensive literature reviews to establish the research gap and formulated research questions that address significant challenges in developing AI-powered smart interfaces for occupants' health and well-being. The funded project has led to publications in the Journal of Building Research & Information and i3CE conference presentations.

## Research Experiences

**Human-Centered Ambient Intelligence with AI Agents**  
2022-2024

Developed comprehensive research on wearable technologies and human-AI interaction, utilizing mixed methods to assess user engagement and the efficacy of AI Agents in smart environments.

Research Experiences	<b>Unmanned Aerial Vehicles (UAV)-based As-built Survey of Buildings</b> 2020-2023 Conducted a systematic literature review and led a UAV-based case study on building surveys to examine the impact of various factors on model performances, analyzed data to optimize survey methodologies, and proposed a data schema for future research.
	<b>Human-Building Interaction with Voice-based Proactive Smart Home Assistants</b> 2019-2021 Developed a conceptual framework for voice-based Smart Home Assistants in IoT smart buildings, conducting user studies and employing machine learning models to enhance proactive interactions for energy conservation and user experience.
	<b>Systematic Analysis of U.S. Green Construction Companies</b> 2018-2019 Conducted in-depth data analysis of U.S. green construction companies using k-means clustering and spatial autocorrelation techniques to categorize market strategies and analyze industry trends.
Teaching	<b>CEE 4984 (Building Information Modeling and Integrated Practices)</b> Teaching Assistant & Section Instructor, 2021-2024 - Assisted in developing tailored assignments leveraging professional software (e.g., Revit, Navisworks) to enhance students' understanding of the Building Information Modeling (BIM) process. - Innovated the curriculum by designing modules on reality capture and laser scanning techniques, integrating practical hands-on experiences with Matterport and FARO Laser Scanner. Provided lectures with comprehensive instructional guides to bolster students' mastery of the subject matter and its application in real-world scenarios.
	<b>CEE 5060 (Built Environment Information Modeling and Processing)</b> Teaching Assistant & Section Instructor, 2021-2024 - Pioneered the integration of virtual reality applications into the curriculum, leading a team of graduate students to create extensive tutorials on Recap Pro and Unity to enrich the learning experience. - Led the design and implementation of a series of group-based VR design review sessions for class final projects, coordinating with university resources for multiple VR headsets borrowing. Scheduled and organized design-review sessions for students, receiving positive feedback from students.
	<b>Future Professoriate Certificate</b> Certified Member, 2024 - Enrolled in the Future Professoriate Graduate Certificate Program, as part of the Transformative Graduate Education initiative, aiming to innovate higher education training and leadership. Engaged with advanced academic and pedagogical concepts through core courses including Preparing the Future Professoriate, Pedagogical Practices in Contemporary Contexts.

Mentorship	<b>Esteban Amezquita Radillo</b> Graduate Research Project, 2022 Title: Towards Immersive Virtual Environments using 360 Cameras for Human Building Interaction Studies
	<b>Kshipra Gandhi</b> Graduate Research Project, 2022 Title: Understanding Human Interactions with Virtual Environments and Their Associated Tools
Invited Talks	<b>Building Information Modeling (BIM): Trends and Future for the AEC Industry</b> CEE Undergraduate Seminar, Virginia Tech, Mar 2024
	<b>Human-Building Symbiotic Communication with Voice-based Proactive Smart Home Assistants</b> CEE Graduate Seminar, Virginia Tech, Aug 2021
	<b>Introduction and New Technologies in Civil Engineering</b> STEM Outreach Activity, Blacksburg High School, Oct 2018
Professional Membership	The American Society of Civil Engineers (ASCE) <i>Student Member, 2021-Present</i> Data Sensing And Analysis Committee, ASCE <i>Student Member, 2022-Present</i> Visualization, Information Modeling, and Simulation Committee, ASCE <i>Student Member, 2023-Present</i>
	Sigma Xi <i>Member, 2023-Present</i> VCEMP Graduate Student Council, Virginia Tech <i>Member, 2020-Present</i> University Students' Union, Tongji University <i>Vice President, 2018-2019</i> School of Economics and Management Students' Union, Tongji University <i>Vice President, 2018-2019</i>
Reviewer	<b>[JCEM]</b> Journal of Construction Engineering and Management: 2021-2024 <b>[JME]</b> Journal of Management in Engineering: 2024 <b>[CRC]</b> Construction Research Congress: 2022 <b>[I3CE]</b> International Conference on Computing in Civil Engineering: 2022-2024
Languages and Skills	Mandarine Chinese (native), English (advanced), Spanish (Basic) Python (Numpy, Scikit-learn, TensorFlow, Keras, Pandas), Java, MATLAB, SPSS Autodesk Revit, AutoCAD, Recap Pro, Recap Photo, Navisworks, Unity