



# Kathryn G. Hinkelman (formerly Van Lieshout)

Ph.D. Candidate, Architectural Engineering • D.O.E. IBUILD Graduate Research Fellow

Pennsylvania State University  
khinkelman(at)psu(dot)edu

[sites.psu.edu/sbslab/people/katy-hinkelman](https://sites.psu.edu/sbslab/people/katy-hinkelman)  
[khinkelman.github.io](https://khinkelman.github.io)

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## RESEARCH INTERESTS

Energy systems (district, buildings), thermal-fluid science, modeling & simulation (Modelica), ecosystem biomimicry, design thinking, systems thinking, controls, environmental life cycle assessment

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## EDUCATION

### Pennsylvania State University

*expected May 2023*

Ph.D. Candidate, Architectural Engineering

Concentration in Mechanical | GPA: 4.0

Dissertation Title: *Modelica modeling of district energy systems with ecosystem biomimicry*

### University of California, Berkeley

*May 2015*

MS in Mechanical Engineering

Concentration in Design | GPA: 4.0

Thesis Title: *Environmental impact and indoor environmental quality assessment of Pinoleville Pomo Nation demonstration home: An implementation of life cycle assessment and culturally-inspired design*

### University of Denver

*Jun 2013*

BS in Mechanical Engineering

Summa Cum Laude, Phi Beta Kappa, Departmental Distinction | GPA: 3.97

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## SPONSORED RESEARCH PROJECTS

### Major contributor to proposal development:

EAGER: Collaborative Research: Modernizing Cities via Smart Garden Alleys with Application in Makassar City (Award No. CNS-2025459, 07/20-06/22).

- Sponsor: National Science Foundation. PI: Dr. Wangda Zuo. Amount: **\$175,000**.

Optimal Co-Design of Integrated Thermal-Electrical Networks and Control Systems for Grid-interactive Efficient District (GED) Energy Systems (Award No. DE-EE0009139, 06/20- 12/23)

- Sponsor: Department of Energy. PI: Dr. Wangda Zuo. Amount: **\$4,159,922**.

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## JOURNAL PUBLICATIONS

1. *(Under Review)* **K. Hinkelman**, Y. Yang, W. Zuo. "Engineering Applications and Design Methodologies for Ecosystem Biomimicry: An Interdisciplinary Review Spanning Cyber, Physical, and Cyber-Physical Systems." *Submitted to Bioinspiration & Biomimetics*.
2. Ildiri, Nasim, H. Bazille, Y. Lou, **K. Hinkelman**, W. Gray, W. Zuo. 2022. "Impact of WELL Certification on Occupant Satisfaction and Perceived Health, Well-being, and Productivity: A Multi-Office Pre- Versus Post-Occupancy Evaluation." *Building and Environment* 224: 109539. [10.1016/j.buildenv.2022.109539](https://doi.org/10.1016/j.buildenv.2022.109539).
3. **Hinkelman, Kathryn**, Saranya Anbarasu, Michael Wetter, Antoine Gautier, Wangda Zuo. 2022. "A Fast and Accurate Modeling Approach for Water and Steam Thermodynamics with Practical Applications in District Heating System Simulation." *Energy* 254:A 124227. [10.1016/j.energy.2022.124227](https://doi.org/10.1016/j.energy.2022.124227).
4. **Hinkelman, Kathryn**, Jing Wang, Wangda Zuo, Antoine Gautier, Michael Wetter, Chengliang Fan, Nicholas Long. 2022. "Modelica-Based Modeling and Simulation of District Cooling Systems: A Case Study." *Applied Energy* 311: 118654. [10.1016/j.apenergy.2022.118654](https://doi.org/10.1016/j.apenergy.2022.118654).

5. Huang, Sen, Jing Wang, Yangyang Fu, Wangda Zuo, **Kathryn Hinkelman**, Raymond M. Kaiser, Dong He, Draguna Vrabie. 2021. "An open-source virtual testbed for a real Net-Zero Energy Community." *Sustainable Buildings and Society* 75: 103255. [10.1016/j.scs.2021.103255](https://doi.org/10.1016/j.scs.2021.103255).
6. Fan, Chengliang, **Kathryn Hinkelman**, Yangyang Fu, Wangda Zuo, Sen Huang, Chengnan Shi, Cary Faulkner, Xiaoqing Zhou. 2021. "Open-Source Modelica Models for the Control Performance Simulation of Chiller Plants with Water-side Economizer." *Applied Energy* 299. [10.1016/j.apenergy.2021.117337](https://doi.org/10.1016/j.apenergy.2021.117337).
7. Ye, Yuniang, **Kathryn Hinkelman**, Yingli Lou, Wangda Zuo, Gang Wang, Jian Zhang. 2021. "Evaluating the Energy Impact Potential of Energy Efficiency Measures for Retrofit Applications: A Case Study with U.S. Medium Office Buildings." *Building Simulation*. [10.1007/s12273-021-0765-z](https://doi.org/10.1007/s12273-021-0765-z).
8. Ye, Yuniang, **Kathryn Hinkelman**, Jian Zhang, Wangda Zuo, and Gang Wang. 2019. "A Methodology to Create Prototypical Building Energy Models for Existing Buildings: A Case Study on U.S. Religious Worship Buildings." *Energy and Buildings* 194: 351–65. [10.1016/j.enbuild.2019.04.037](https://doi.org/10.1016/j.enbuild.2019.04.037).
9. Lu, Xing, **Kathryn Hinkelman**, Yangyang Fu, Jing Wang, Wangda Zuo, Qianqian Zhang, and Walid Saad. 2019. "An Open Source Modeling Framework for Interdependent Energy-Transportation-Communication Infrastructure in Smart and Connected Communities." *IEEE Access* 7: 55458–76. [10.1109/ACCESS.2019.2913630](https://doi.org/10.1109/ACCESS.2019.2913630).
10. **Van Lieshout, Kathryn G**, Joy G Anderson, Kevin B Shelburne, and Bradley S Davidson. 2014. "Intensity Rankings of Plyometric Exercises Using Joint Power Absorption." *Clinical Biomechanics* 29: 918–22. [10.1016/j.clinbiomech.2014.06.015](https://doi.org/10.1016/j.clinbiomech.2014.06.015).

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#### PEER-REVIEWED CONFERENCE PUBLICATIONS

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1. **Hinkelman, Kathryn**, Wangda Zuo, Jing Wang, Sen Huang, Michael Wetter. 2022. "Ecosystem-Level Biomimicry for the Built Environment: Adopting Systems Ecology Principles for the Control of Heterogeneous Energy Systems." *The 5th International Conference on Building Energy and Environment*. Montreal, Canada.
2. Anbarasu, Saranya, **Kathryn Hinkelman**, Wangda Zuo. 2022. "Tracing the Dependency of Water and Energy in Smart and Connected Communities through a Multi-Domain Modeling Framework." *The 5th International Conference on Building Energy and Environment*. Montreal, Canada.
3. **Hinkelman, Kathryn**, Saranya Anbarasu, Michael Wetter, Antoine Gautier, Baptiste Ravache, Wangda Zuo. 2022. "Towards Open-Source Modelica Models for Steam-Based District Heating Systems." *The 1st International workshop on Open Source Modelling and Simulation of Energy Systems*. Aachen, Germany.
4. **Hinkelman, Kathryn**, Jing Wang, Chengliang Fan, Wangda Zuo, Antoine Gautier, Michael Wetter, Nicholas Long. 2021. "A Case Study on Condenser Water Supply Temperature Optimization with a District Cooling Plant." *The 14th International Modelica Conference*. Linköping, Sweden. [10.3384/ecp21181587](https://doi.org/10.3384/ecp21181587).
5. **Hinkelman, Kathryn**, Sen Huang, Jing Wang, Wangda Zuo. 2019. "Enhancing the Implementation of a First-order Equivalent Thermal Parameter Model to Enable Accurate and Robust Building Thermal Response Prediction." *Building Simulation Conference*. Rome, Italy.
6. Ye, Yuniang, **Kathryn Hinkelman**, Jian Zhang, Yulong Xie, Wangda Zuo. 2019. "A Methodology to Determine Energy Savings Impact of Building Energy Code Upgrades: A Case Study on Small Offices." *Building Simulation Conference*. Rome, Italy.
7. **Van Lieshout, Kathryn G**, Cindy Bayley, Sarah O Akinlabi, Lisa von Rabenau, and David Dornfeld. 2015. "Leveraging Life Cycle Assessment to Evaluate Environmental Impacts of Green Cleaning Products." In *Procedia CIRP*, 29:372–77. Sydney, Australia. [10.1016/j.procir.2015.02.063](https://doi.org/10.1016/j.procir.2015.02.063).

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#### PEER-REVIEWED POSTER SESSIONS

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1. **Hinkelman, Kathryn**, Xing Lu, Wangda Zuo, Yangyang Fu, Jing Wang, Yingchen Zhang. "Multi-domain Modeling Framework for Future Smart and Connected Communities." *21st Century Energy Transition Symposium*, Denver, CO, April 1-2, 2019.

2. **Van Lieshout, Kathryn G**, Owen RW Dennis, Joy G Anderson, Kevin B Shelburne, Bradley S Davidson. "Intensity rankings of plyometric exercises using joint power absorption." *American College of Sports Medicine Annual Meeting*, Indianapolis, IN, May 28-June 1, 2013.

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#### PRESENTATION SESSIONS & INVITED TALKS

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1. "A Fast and Accurate Modeling Approach for Water and Steam Thermodynamics with Practical Applications in District Heating System Simulation." *The 2022 Building Performance Analysis Conference and SimBuild*, Seminar 5: Open Source Modeling for District Energy Systems, Chicago, IL, September 14, 2022.
2. "Ecosystem-Level Biomimicry for the Built Environment: Adopting Systems Ecology Principles for the Control of Heterogeneous Energy Systems." *The 5th International Conference on Building Energy and Environment*, Montreal, Canada, July 28, 2022.
3. "Virtual Testbed for Optimized Planning of Smart, Sustainable, and Connected Communities." *The 2022 IEEE Power & Energy Society General Meeting*, Denver, CO, July 19, 2022.
4. "From Furnaces to Forests: Innovations in Modeling and Simulation for the Transition of Legacy District Energy Systems to Integrated Biomimetic Designs." *Research Seminar*, Department of Mechanical Engineering & Mechanics, Drexel University, Virtual, December 20, 2021.
5. "A Case Study on Condenser Water Supply Temperature Optimization with a District Cooling Plant." *The 14<sup>th</sup> International Modelica Conference*, Virtual, September 23, 2021.
6. "Modeling and Simulation of District Cooling Systems with Modelica." *IBPSA-USA Denver Chapter: Student Presentations*, Virtual, May 20, 2021.
7. "A Modeling Framework to Evaluate Energy, Transportation, and Communication Interdependence in Smart and Connected Communities." *The American Modelica Conference*, Virtual, September 22-24, 2020.
8. "A Modeling Framework to Evaluate Energy, Transportation, and Communication Interdependence in Smart and Connected Communities." *IBPSA-USA Denver Chapter: Student Presentations*, Golden, CO, November 21, 2019.
9. "Enhancing the Implementation of a First-order Equivalent Thermal Parameter Model to Enable Accurate and Robust Building Thermal Response Prediction." *Building Simulation Conference*. Rome, Italy, September 2-4, 2019.
10. "A Modeling Framework to Evaluate Energy, Transportation, and Communication Interdependence in Smart and Connected Communities." *Intelligent Building Operations Workshop*, Boulder, CO, August 7-9, 2019.
11. "Leveraging life cycle assessment to evaluate environmental impacts of green cleaning products." *22nd CIRP Conference on Life Cycle Engineering*, Sydney, Australia, April 7-9, 2015.

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#### TECHNICAL REPORTS (NOT PEER-REVIEWED)

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1. **Van Lieshout, Kathryn G**. 2015. "Environmental impact and indoor environmental quality assessment of Pinoleville Pomo Nation demonstration home: An implementation of life cycle assessment and culturally-inspired design." Master's Thesis. *University of California, Berkeley*.
2. Final Report (co-authored with Alice Agogino (PI) and student team). 2015. "Advanced UX Development Based on Innovative Technology: Integrating UX Design with the Internet of Things." Samsung Electronics Co., Ltd. DMC R&D Center.
3. Agogino, Alice (PI). **Kathryn Van Lieshout**, Chandrayee Basu, Kyunam Kim, Julien Caubel, Elizabeth Cheng, Aparna Dhinakaran. 2014. "Model Predictive Smart Lighting Commissioning System for Emerging Demand Management." Energy Innovations Small Grant Program: Final Report. California Energy Commission.

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## PROFESSIONAL EXPERIENCE

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### Research Assistant

*May 2019 – Present*

Sustainable Buildings and Societies Laboratory with Dr. Wangda Zuo University of Colorado Boulder & Pennsylvania State University

- [Developer](#) for the [Modelica Buildings Library](#), a popular open-source library with dynamic simulation models for building and district energy and control systems
- [International collaborator](#) with IBPSA Project 1 Task 1 (Modelica Libraries) and Task 3 (Application & Dissemination), standardizing testing frameworks & advancing computational modeling & simulation capabilities for urban-scale energy systems
- Developer for the [IBPSA Modelica Library](#), a library that is used at the core of 4 major Modelica libraries

### MEP Engineer

*Jul 2015 – Jul 2018*

The Boulder Engineering Company, Boulder, CO

- Designed HVAC, power, and lighting systems for multi-family residential and commercial building projects, including restaurants, breweries, manufacturing, and medical office buildings
- Developed complete construction documents for rooftop PV systems totaling over 500 KW
- Created, evaluated, and refined new office standards through transition to 100% Revit usage
- Independently designed and coordinated entire MEP systems for office projects from schematic design through construction administration

### Graduate Student Researcher

*Jan 2014 – May 2015*

Berkeley Energy and Sustainable Technologies Lab with Professor Agogino, University of California, Berkeley

- Quantified potential energy savings from closed-loop daylighting systems for demand response
- Managed 7 design teams (38 students) on developing innovative design concepts for the Internet of Things

### Undergraduate Research Assistant

*Jun 2012 – Jul 2013*

Biomechanics Lab with Professor Davidson, University of Denver

- Spearheaded first-time research collaboration between the Engineering and Athletics Departments
- Detailed experiment, collected data, analyzed results, and presented research in quantifying plyometric intensity for sports rehabilitation

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## TEACHING EXPERIENCE

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### Teaching Assistant

*Spring 2019*

AREN 4317: Architectural Engineering Design, University of Colorado Boulder

- Provided technical support for designing mechanical HVAC and hydronic systems
- Independently taught lectures on Building Information Modeling (BIM) and interdisciplinary collaboration
- Coordinated meetings/assignments/presentations/grades for 37 students, 15 industry mentors, & 5 faculty

### Teaching Assistant

*Fall 2018*

AREN 3540: Illumination I, University of Colorado Boulder

- Supported 41 upper-level undergraduate students through technical foundations of light
- Held office hours, graded assignments, and developed supplemental course material for instructor

### Graduate Student Instructor

*Spring 2014*

ME 110: Intro to New Product Development, University of California, Berkeley

- Guided 14 interdisciplinary teams through design process from ideation to functional prototype
- Coordinated semester finale showcase presentation with academic and industry professionals

### Graduate Student Instructor

*Fall 2013*

ME 107: Mechanical Engineering Laboratory, University of California, Berkeley

- Independently supervised 20 students on a mechanical system dynamics laboratory experiment
- Held weekly lab sections and assisted students on homework assignments

### Academic Tutor

*Jan 2011 – Jun 2012*

Athletics and Recreation, University of Denver

- Tutored university athletes in subjects of Differential Equations, Calculus, and Engineering Concepts
- Reviewed class material & explained concepts that were missed due to athletic travel

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## SELECT RESEARCH PROJECTS

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### **Biomimetic Integrated Community Energy and Power System (BICEPS)**

*Aug 2021 – Present*

Sponsored by DOE IBUILD Graduate Research Fellowship

- The goal of this project is to leverage biomimicry of mature natural ecosystems such as redwood forests to design and control heterogeneous community energy systems, including thermal-fluid, electrical, and biofuel networks. We adopt an advanced control method and integrate nature-based solutions using exergy and ecological network analysis to realize sustainable and resilient energy systems.

### **Modernizing Cities via Smart Garden Alleys with Application in Makassar City**

*Jul 2020 – Present*

Sponsored by NSF (Award CNS-2025459) and DOS, PI: Dr. Wangda Zuo, University of Colorado Boulder

Collaboration with Virginia Tech, Universitas Gadjah Mada (Indonesia), and Institut Teknologi Bandung (Indonesia)

- The goal of this research is to catalyze the transformation of Makassar City's garden alleys into smart environments by deploying a sensor network at representative green allies and conventional allies to collect data related to air quality, microclimates, and other factors; to analyze the heterogeneous data using machine learning techniques; and to then share the data and its insights with city representatives and specific communities within the city.

### **Support for District Energy Simulation with Modelica**

*Jan 2019 – Present*

Collaboration with the NREL and LBNL, University of Colorado Boulder

- The goal of this project is to create a new software analysis platform that leverages the Modelica language to enable developers of community-scale construction projects to effectively evaluate and optimize district heating and cooling systems.

### **BIGDATA: Collaborative Research: IA: Big Data Analytics for Optimized Planning of Smart, Sustainable, and Connected Communities**

*Oct 2018 – Present*

Sponsored by the NSF (Awards IIS-1802017 & IIS-1633363), PI: Dr. Wangda Zuo, University of Colorado Boulder

- The goal of this project is to develop a new planning framework for smart, connected and sustainable communities that allows meeting such zero energy, zero outage, and zero congestions goals by optimally deciding on how, when, and where to deploy or upgrade a community's infrastructure.

### **Assessing Sustainability of Homes with the Pinoleville Pomo Nation**

*Oct 2013 – May 2015*

Master's Project with Dr. Alice Agogino and Dr. Daniel Kammen, University of California, Berkeley

- Designed a culturally inspired indoor environmental quality monitoring tool for tribal residents
- Developed and tested the mechanical, electrical, and software systems for the PV-powered sensors
- Evaluated the life cycle impacts of the home with geothermal heat pumps and grid-tied PV system

### **Retrofitting Commercial Buildings with Smart Lighting Systems**

*Jan 2014 – Oct 2014*

Sponsored by the California Energy Commission, while at University of California, Berkeley

- Computed potential energy savings from using a smart lighting system for demand response
- Performed an LCA of the smart lighting sensors and assessed the effective environmental payback

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## LEADERSHIP

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### **Conference Chair**

Intelligent Building Operations (IBO) Workshop, University of Colorado Boulder

*Aug 7, 2019*

- Session chair for *Modeling and Assessment Tools*

### **Collegiate Athlete**

*Aug 2009 – Nov 2012*

Division I Women's Soccer Team, University of Denver

- Balanced intensive athletic duties of regular practice, games, and travel with a difficult course load
- Gained leadership qualities through coaching clinics and motivating teammates on and off the field
- Regular starter and leader to the team, finishing 22<sup>nd</sup> in the nation in senior season

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## AWARDS & SCHOLARSHIPS

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IBUILD Graduate Research Fellowship (2 times)

*2021-2023*

*U.S. Department of Energy, Energy Efficiency and Renewable Energy, Building Technologies Office*

Gordon D. Kissinger Graduate Research Fellowship, Pennsylvania State University

*2022*

Harvey and Geraldine Brush Graduate Fellowship in Engineering, Pennsylvania State University	2022
Marlene & Joseph Borda Architectural Engineering Graduates Fellowship, Pennsylvania State University	2022
P.E.O. Scholar Award	2021
International Building Performance Simulation Association (IBPSA) Project 1 Scholarship Recipient	2019
The Link Foundation Energy Fellowship Program Honorable Mention	2019
Colorado Engineering Council Silver Medal & Certificate of Merit	2013
Pioneer Award (“the <b>highest honor</b> given to undergraduate students” at the University of Denver)	2013
Mechanical Engineering Departmental Distinction, University of Denver	2013
Taylor Achievement Award, Ortho Transmission, LLC	2013
Hornbeck Scholar (7 quarters), University of Denver	2010-2013
Dean’s List (8 quarters), University of Denver	2010-2013
A University of Denver Scholar-Athlete of the Year (4 years)	2009 – 2013
NSCAA Scholar All-West Region Team	2012
Second Team All-WAC Selection	2012
Academic All-American First Team, Division I Women’s Soccer	2011
Preseason All-Sun Belt Conference Team	2011
Sun Belt Conference Commissioner’s List (all 3 seasons)	2009 – 2011
SBC All-Conference First Team	2010
DU Invitational All-Tournament Team	2009
CS360's Primetime Performers of the Week (9/15)	2009

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#### PROFESSIONAL ASSOCIATIONS

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ASHRAE: American Society of Heating, Refrigerating and Air-Conditioning Engineers	2017 – Present
IBPSA: International Building Performance Simulation Association	2019 – Present