Riccardo Talami, PhD

Research Fellow in Building and Urban Performance Simulation and Optimization

National University of Singapore (NUS) and Singapore-ETH Centre

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Italian citizen and Singapore Permanent Resident (PR)

Research direction

Riccardo specializes in developing cross-scale computational methods, workflows, and tools that transform performance-based building and urban design. His work empowers building and urban stakeholders to shape sustainable, comfortable, smart, efficient, flexible, and climate-resilient built environments.

Interests

- Sustainable and Integrated Building Design
- Performance-based Building and Urban Design
- Building Performance Simulation and Optimization
- Computational Design
- Artificial Intelligence
- Numerical Optimization
- Design Exploration
- Multi-criteria Decision Making
- Design Uncertainty and Robustness Analysis
- Smart Built Environments
- HVAC Systems Design and Controls
- Daylighting
- Indoor Environmental Quality

Education

2019 – 2022

Loughborough, United Kingdom

Doctor of Philosophy (PhD) in Building Science/Building Engineering (Building Performance Optimization)

Loughborough University, School of Architecture, Building and Civil Engineering

Thesis title: The sequential design optimization of building performance.

Supervisors: Prof. Jonathan Wright and Dr. Bianca Howard

2014 - 2017

Venice, Italy and Berkeley, California

Master of Science in Architecture and Innovation (Sustainable Design)

University of California Berkely (UC Berkeley) and Università IUAV di Venezia (IUAV), Architecture and Innovation

Thesis title: Recent trends in radiant system technology for heating and cooling

Supervisors: Fred Bauman, PE (UC Berkeley), Prof. Piercarlo Romagnoni (IUAV) and Simone Cappelletti (STEAM Engineering)

2011 - 2014

Venice, Italy

Bachelor of Science in Architecture

Università IUAV di Venezia (IUAV), Architectural Science

Work Experience

- **Research Fellow** (2024 - current)
  Department of Architecture, College of Design and Engineering
  National University of Singapore - NUS and Singapore-ETH Centre (Singapore)
  Duties: Leading and collaborating on research projects related to Performance-based Design exploration and AI, Multi-criteria Decision Making and Results Interpretability, Robust Building Design Optimization, Urban Building Energy Modelling.

- **Research Fellow** (2022 - 2024)
  Department of the Built Environment, College of Design and Engineering
  National University of Singapore - NUS (Singapore)
  Duties: Led a team for research projects on Temperature Setpoints and Indoor Environmental Quality, and the development of online tools for practical applications. Collaborated on research projects related to Building Envelope Systems. Supervised final year students for research thesis and visiting scholars. Developed and published scientific papers. Managed the procurement for project expenses.

- **Doctoral Researcher** (2019 - 2022)
  School of Architecture, Building and Civil Engineering
  Loughborough University (Loughborough, United Kingdom)
  Duties: Researched on Building Performance Optimization. Developed and published scientific papers. Delivered lectures.

- **Co-Instructor and Teaching Assistant** (2017 - 2018)
  ASD - Architecture and Sustainable Design Pillar
  Singapore University of Technology and Design - SUTD (Singapore)

Duties: Developed coursework structure, teaching materials, and assignments. Delivered lectures, conducted weekly reviews and supervised final exams.

- **Research Assistant** (2017 - 2018)
  Design for Climate and Comfort Lab (DCC)
  Singapore University of Technology and Design - SUTD (Singapore)
  Duties: Developed and conducted independent research on Radiant Cooling Systems in the Tropics and Human Behaviour in office settings. Collaborated on research projects related to Daylighting in Buildings and Building Performance of Tropical Building Typologies. Developed and published scientific papers.

- **Student Researcher** (2016)
  Center for the Built Environment (CBE)
  University of California Berkely - UC Berkeley (United States)
  Duties: Researched on Radiant Cooling Systems, culminating in published scientific reports and the development of an online tool.

Teaching Experience

Courses

- BPS5229 Data Science for the Built Environment
  Role: **Teaching Assistant** (2025)
  National University of Singapore - NUS (Singapore)
- Department of Architecture
  Role: **M.Arch. Dissertation Invited Guest Reviewer** (2024)
  National University of Singapore - NUS (Singapore)
- Department of Built Environment
  Role: **M.Sc. "Passive Systems" course Invited Guest Reviewer** (2024)
  National University of Singapore - NUS (Singapore)
- Center for the Energy Resilience and the Built Environment (ERBE)
  Role: **Invited Lecturer** (2021)
  Loughborough University (United Kingdom)
- Center for the Energy Resilience and the Built Environment (ERBE)
  Role: **Invited Lecturer** (2020)
  Loughborough University (United Kingdom)
- 20.112 Sustainable Design Option Studio 2
  Role: **Teaching Assistant** (2018)
  Singapore University of Technology and Design - SUTD (Singapore)
- 20.112 Sustainable Design Option Studio 3
  Role: **Teaching Assistant** (2018)
  Singapore University of Technology and Design - SUTD (Singapore)
- 20.111 Sustainable Design Option Studio 1

Role: **Teaching Assistant** (2018)
Singapore University of Technology and Design - SUTD (Singapore)

- 20.223 History, Theory and Culture 3: Contemporary Architecture Between Technology, Science and Culture
  Role: **Co-Lecturer** (2017)
  Singapore University of Technology and Design - SUTD (Singapore)

Supervision

- Xudong Jia Master Student (2023 - 2024)
- Ilyas Dawoodjee Research Engineer (2023 - 2024)
- Xinhao Hu Visiting PhD Candidate (2023 - 2024)
- Glenda Cheng Undergraduate Dissertation (2023 - 2024)
- Sabrina Tay Undergraduate Dissertation (2023)
- Shirlynn Koh Undergraduate Dissertation (2023)
- Thomas Firsich Visiting Master Student (2023)

Guest Lectures

- Center for the Energy Resilience and the Built Environment (ERBE)
  Title: Performance-based building design in visual coding environments (2021)
  Loughborough University (United Kingdom)
- Center for the Energy Resilience and the Built Environment (ERBE)
  Title: The role of Parametric Design, Building Performance Simulation and Optimization in Performance-based building design (2020)
  Loughborough University (United Kingdom)

Service

Reviewing

- **Reviewer for Journal of Architectural Engineering** (2024 - Current)
- **Reviewer for Building Simulation 2023: 18th Conference of IBPSA** (August 2022 - September 2023)
  4-6 September 2023, Shanghai (China) - Hybrid
- **Reviewer for Building Simulation 2021: 17th Conference of IBPSA** (August 2020 - September 2021)
  1-3 September 2021, Bruges (Belgium)
- **Reviewer for Building Simulation and Optimization 2020** (September 2019 - September 2020)
  21-22 September 2020, Loughborough (UK)
- **Reviewer for Building Simulation 2019: 16th Conference of IBPSA** (August 2018 - September 2019)
  2-4 September 2019, Rome (Italy)

Associations and Memberships

- **Committee Member - Electronic Communications -** *International Building Performance Simulation Association* **(IBPSA-Singapore)** (2024 - Current)
- **Professional Committee Member** - *International Building Performance Simulation Association* **(IBPSA-Singapore)** (2024 - Current)
- **Student Member -** *International Building Performance Simulation Association* **(IBPSA-United Kingdom)** (2019 - 2022)

Presentations

- **Hierarchical decomposition approaches for building design** (2025)
  BUDS Research Lab at the National University of Singapore (Singapore)
- **Performance-based building and urban design** (2024)
  BUDS Research Lab at the National University of Singapore (Singapore)
- **Examining Different Placement Strategies for Indoor Environmental Quality Sensors in Office Environments** (2024)
  Building Robotics Lab at the National University of Singapore (Singapore)
- **Energy savings from dynamic temperature setpoints and setbacks** (2023)
  Funding agency at the National University of Singapore (Singapore)
- **Multi-criteria robustness assessment of a sequential whole-building design optimization** (2021)
  IBPSA Conference in Bruges (Belgium)
- **A comparison between sequential and simultaneous whole-building design optimization for building performance** (2020)
  IBPSA - UK Conference in Loughborough (UK)
- **The sequential design optimization of building performance** (2020)
  Funding agency at Loughborough University (UK)
- **Sensitivity of design parameters on energy, system and comfort performances for radiant cooled office buildings in the tropics.** (2019)
  IBPSA Conference in Rome (Italy)
- **The sequential design optimization of building performance** (2019)
  Doctoral Seminar at Loughborough University (UK)

Training

Conferences

- **International Conference on Resilient Systems**
  28-30 August 2024, Singapore
- **Building Simulation 2023: 18th Conference of IBPSA**
  4-6 September 2023, Shanghai (China)

- **Building Simulation 2021: 17th Conference of IBPSA**
  1-3 September 2021, Bruges (Belgium)
- **Building Simulation and Optimization (BSO) 2020**
  21-22 September 2020, Loughborough (UK)
- **Building Simulation 2019: 16th Conference of IBPSA**
  2-4 September 2019, Rome (Italy)

Workshops

- **Grasshopper Level 2 course from McNeel** (2021)
  Online
- **Grasshopper Level 1 course from McNeel** (2021)
  Online
- **Teaching - advanced module 2** (2021)
  Loughborough University (UK)
- **Teaching - basic module 1** (2020)
  Loughborough University (UK)
- **Certified Peer Reviewer Course from Elsevier** (2020)
  Online
- **Exploring Structures and Features of Research Articles** (2019)
  Loughborough University (UK)
- **Exploring Research Article Abstracts** (2019)
  Loughborough University (UK)
- **Exploring Research Article Introduction** (2019)
  Loughborough University (UK)
- **Exploring Research Article Methods Sections** (2019)
  Loughborough University (UK)
- **Exploring Research Article Discussion Sections** (2019)
  Loughborough University (UK)
- **Exploring Research Article Methods Sections** (2019)
  Loughborough University (UK)
- **Exploring Research Article Results Sections** (2019)
  Loughborough University (UK)
- **Finding resources for your literature review and beyond** (2019)
  Loughborough University (UK)

Events

- **Doctoral College Summer Showcase** (2020)
  Loughborough University (UK)
- **Research conference 2019 – Visibility and Impact** (2019)
  Loughborough University (UK)
- **Doctoral College Summer Showcase** (2019)
  Loughborough University (UK)

Projects

2024 - Current
Singapore
AI-driven frameworks for Computational Building Performance Design
Singapore - ETH Centre, National University of Singapore (NUS)
The research develops computational frameworks for multi-criteria decision marking and quick design explorations in building performance design.
Role: Project Leader
In Collaboration with: *Dr. Alberto Costa, Senior Researcher at Singapore-ETH Centre, Prof. Rudi Stouffs, Assoc. Professor at NUS, Prof. Clayton Miller, Assoc. Professor at NUS.*

2024 - Current
Singapore
Problem decomposition approaches in Building Design
Concordia University (Canada), National University of Singapore (NUS), Singapore-ETH Centre
The research investigates the application of decomposition approaches in building design to reduce problem complexity.
Role: Collaborator
In Collaboration with: *Nima Bonyadi, PhD Research Assistant at Concordia University.*

2024 - Current
Singapore
The role of Archetypes in Urban Building Energy Modelling
Singapore - ETH Centre, National University of Singapore (NUS)
The research improves accuracy and detail of conventional archetypes for urban performance simulation studies.
Role: Project Leader
In Collaboration with: *Wanyu Pei, PhD student at NUS and Researcher at Singapore-ETH Centre.*

2024 - Current
Singapore
The impact of thermal inertia in mitigating energy disruptions
Singapore - ETH Centre, National University of Singapore (NUS)
The research investigates the potential of building thermal mass to mitigate urban energy disruptions.
Role: Collaborator
In Collaboration with: *Andrea Bartolini, Postdoctoral Researcher at Singapore-ETH Centre.*

2024 - Current

Singapore

Whole life carbon assessment of urban building stock

Singapore - ETH Centre, National University of Singapore (NUS)

The research proposes a framework for conducting city-scale WLCA, integrating both embodied and operational carbon assessments to evaluate the circularity potential of urban building stock.

Role: Collaborator

In Collaboration with: *Pradeep Alva, PhD student at NUS and Researcher at Singapore-ETH Centre.*

2024 - Current

Singapore

AI-driven frameworks for urban environments

Singapore - ETH Centre, National University of Singapore (NUS)

The research develops frameworks for urban natural and built environments based on their performance.

Role: Collaborator

In Collaboration with: *Pegah Eshraghi, PhD student at Shahid Beheshti University.*

2023 - 2024

Singapore

Exploring novel cooling technologies for building façades

National University of Singapore (NUS)

The research provides a framework for the synergistic integration of vertical greenery systems (VGS), heat-reflective paints, and façade shading systems.

Role: Collaborator

In Collaboration with: *Iqbal Shah, PhD student at NUS.*

2023 - 2024

Singapore

Human-centric Indoor Environmental Quality (IEQ) sensing

National University of Singapore (NUS)

The research explores optimal positioning of IEQ sensing devices from an occupant-centric perspective in office settings, aiming to identify sensor placements that most accurately reflect the environmental conditions experienced by occupants.

Role: Project Leader

2023 - 2024

Singapore

Optimizing HVAC temperature setpoints for energy efficiency

National University of Singapore (NUS)

The research evaluates the energy-saving potential of dynamically adjusting room temperature setpoints and setbacks of HVAC systems based on varying outdoor weather and indoor occupancy conditions.

Role: Project Leader

2019 - 2022

Loughborough, United Kingdom

The sequential design optimization of building performance

Loughborough University

The research proposes a sequential approach for multi-objective design optimization of building geometry, fabric, HVAC system and controls, advancing performance-based building design. It evaluates its effectiveness, reliability, and efficiency.

Role: Project Leader

In Collaboration with: *Prof. Jonathan Wright, Loughborough University, and Dr. Bianca Howard, Columbia University.*

2017 - 2018

Singapore

Comparing laboratory and field studies of occupant lighting experience

Singapore University of Technology and Design (SUTD)

The research investigates if laboratory conclusions related to visual discomfort and lighting quality are applicable to real building conditions. This is achieved by comparing 40 laboratory post-occupancy evaluation responses to 40 field responses in actual office workspaces in Singapore.

Role: Collaborator

In Collaboration with: *Dr. J. Alstan Jakubiec, Assist. Professor at Toronto University.*

2017 - 2018

Singapore

Subjective and measured evidence for residential lighting metrics in the tropics

Singapore University of Technology and Design (SUTD)

The research presents a comprehensive study methodology to craft statistically valid subjective models based on predictive lighting simulation data. This is done by comparing measured and simulated lighting levels in 17 residential housing units in Singapore against the subjective opinions of 35 participants who reside in the units.

Role: Collaborator

In Collaboration with: *Dr. J. Alstan Jakubiec, Assist. Professor at Toronto University.*

2017 - 2018

Singapore

Radiant Cooling Systems in the Tropics

Singapore University of Technology and Design (SUTD)

The research aims to support early-design decisions when integrating radiant cooling systems in architectural design. It identifies key design parameters influencing energy consumption, system operation, and thermal comfort in the tropics, providing guidelines for focusing design efforts on impactful variables.

Role: Project Leader

In Collaboration with: *Dr. J. Alstan Jakubiec, Assist. Professor at Toronto University.*

2017 - 2018

Singapore

Sustainable Futures: Cooling

Singapore University of Technology and Design (SUTD)

The project investigates human behaviors through long-term observational field studies in commercial and residential spaces, analyzing air-conditioning, window shading, and lighting use. The findings inform predictive models and influence building design decisions.

Role: Collaborator

In Collaboration with: *Dr. J. Alstan Jakubiec, Assist. Professor at Toronto University.*

2016

California, United States

Optimizing Radiant Systems for Energy Efficiency and Comfort

University of California, Berkeley (UC Berkeley) - Center for the Built Environment

This project improved the understanding of radiant heating and cooling systems, developing guidelines, tools, and resources for system designers. It also contributed to a database of over 400 commercial buildings globally, displayed on an online interactive map.

Role: Collaborator

In Collaboration with: Fred Bauman, PE

Products and Tools development

Indoor Environmental Quality sensor package v.2.0 (2023 - 2024)

Designed and assembled 40 Arduino-based sensor packages that monitor 9 Indoor Environmental Quality metrics continuously: Carbon dioxide, Particulate matter, Total volatile organic compound, Illuminance, Temperature, Humidity, and Sound continuously. Prototype and 3D printed 40 sensor enclosures with reduced dimensions. Introduced fast-charging battery and Wi-Fi connection.

Indoor Environmental Quality sensor package v.1.0 (2023 - 2024)

Designed and assembled 20 Raspberry-pi-based sensor packages that monitor 9 Indoor Environmental Quality metrics continuously: Carbon dioxide, Particulate matter, Total volatile organic compound, Illuminance, Temperature, Humidity, and Sound. Prototype and 3D printed 20 boltless sensor enclosures for easy assembly and maintenance.

Optimal Temperature Setpoint Tool (2023 - 2024)

The Optimal Temperature Setpoint Tool allows users to identify the optimal temperature setpoint based on occupancy rates, patterns, and outdoor air temperature values. **[link]**

CBE Radiant Systems Map (2016)

The CBE Radiant Systems Map displays a database of over 400 commercial buildings using radiant cooling and heating in the world as online interactive map. The tool has obtained 20,000 views so far. **[link]**

Core Skills

Transferrable Skills

- Excellent journal, conference paper, and technical report writing skills
- Ability to work in a team and independently
- Good presentation and communication skills (verbal and written)
- Ability to work in a multidisciplinary and multicultural environment
- Ability to work on several projects simultaneously, with clear deadlines and under pressure

Software and Technical

- Energy Analysis: Energy Plus (Conventional, Design Builder and Open Studio Interfaces), ArchSim and Honeybee plug-ins for Grasshopper
- Energy Certification: Master Clima 11300
- Solar and Environmental Analysis: Ecotect, Climate Consultant
- Daylight Analysis: Radiance (DIVA and Ladybug interfaces)
- Parametric Modeling: Rhinoceros/Grasshopper
- Statistics and Data Science: R
- Programming: Python, Java
- Environmental Sensors: HOBO products, DustTrak™ DRX Aerosol Monitor 8534, XL2 Audio and Acoustic Analyzer, VelociCalc Multi-Function Ventilation Meter 9565, RAE Systems ppbRAE 3000+ Portable Handheld VOC Monitor, Testo Luxmeter
- Microcontrollers: Raspberry Pi, Arduino
- Architecture/Engineering Drafting and Modeling: AutoCAD, ArchiCAD, Revit, SketchUp, Rhinoceros
- Graphic and Editing: Photoshop, Illustrator, InDesign
- General: Microsoft Office package

Certifications/Courses

- Certified Peer Reviewer Course from Elsevier, January 8-9, 2020
- Grasshopper Level 1 course from McNeel, 12 hours, January 25-29, 2021
- Grasshopper Level 2 course from McNeel, 18 hours, January 25-29, 2021

Languages

- English: Full Professional Proficiency
- Italian: Native Proficiency
- French: Elementary Proficiency
- Spanish: Elementary Proficiency

Awards

- **UK Engineering and Physical Sciences Research Council Scholarship**, Engineering and Physical Sciences Research Council (2019 - 2022)

- **Winner of Best Poster Award** for “Subjective and Measured Evidence for Residential Lighting Metrics in the Tropics” (in collaboration with Jakubiec, J. Alstan; Srisamranrungruang, Thanyalak; Kong, Zhe; Quek, Geraldine), 16th International IBPSA Conference (2019).

Publications

Journal papers: 5, Conference papers: 4, Reports: 1, Thesis: 2.

Publications are available at: https://scholar.google.com/citations?user=EmFyzowAAAAJ&hl=en.

Upcoming publications: Undergoing peer-review: 4, In process/Writing-up: 5

Publications (detailed)

Journals

- Bonyadi, N., **Talami, R.**, and Lee. B. 2025. Breaking-down Building Design Problems with Decomposition Approaches: A review. *Developments in the Built Environment, Under Review.*
- Eshraghi, P., Dehnavi, A. N., Mirdamadi, M., **Talami, R.**, and Zomorodian Z. S. 2025. An AI-driven framework for rapid and localized optimizations of urban open spaces. *Smart and Sustainable Built Environment, Under Review, preprint available at https://arxiv.org/abs/2501.08019.*
- Eshraghi, P., **Talami, R.**, Dehnavi, A. N., Mirdamadi, M. and Zomorodian Z. S. 2025. Adopting Explainable-AI to investigate the impact of urban morphology design on energy and environmental performance in dry-arid climates. *Advances in Building Energy Research, Under Review, preprint available at https://arxiv.org/abs/2412.12183.*
- **Talami, R.**, Hu, X., Dawoodjee, I. and Ghahramani, A. 2025. Examining Different Placement Strategies for Indoor Environmental Quality Sensors in Office Environments. *Science and Technology for the Built Environment, Under Review.*
- **Talami, R.**, Wright, J., and Howard, B. 2025. Evaluating the effectiveness, reliability and efficiency of a multi-objective sequential optimization approach for building performance design. *Energy and Buildings, 329, 115242.*
- Shah, I., Su, X., **Talami, R.** and Ghahramani, A. 2024. Enhancing Building Envelopes: Parametric Analysis of Shading Systems for Opaque Facades and Their Comparison with Cool Paints. *Energy and Built Environment.*
- **Talami, R.**, Dawoodjee, I. and Ghahramani, A., 2024. Demystifying energy savings from dynamic temperature setpoints under weather and occupancy variability. *Energy and Built Environment, 5(6)*, 878-888
- **Talami, R.**, Dawoodjee, I. and Ghahramani, A., 2023. Quantifying Energy Savings from Optimal Selection of HVAC Temperature Setpoints and Setbacks across Diverse Occupancy Rates and Patterns. *Buildings, 13(12)*, 2998

- **Talami, R.** and Jakubiec, J.A., 2020. Early-design sensitivity of radiant cooled office buildings in the tropics for building performance. *Energy and Buildings*, *223*, 110177

Conferences

- **Talami, R.**, Wright, J. and Howard, B., 2021. Multi-criteria robustness assessment of a sequential whole-building design optimization. In *Proceedings of the 17th IBPSA International conference,1-3 September 2021, Bruges (Belgium)*.
- **Talami, R.**, Wright, J. and Howard, B., 2020. A comparison between sequential and simultaneous whole-building design optimization for building performance. In *Proceedings of the Building Simulation and Optimization Conference, Loughborough, UK, September 21-22*.
- **Talami, R.** and Alstan Jakubiec, J., 2019, September. Sensitivity of design parameters on energy, system and comfort performances for radiant cooled office buildings in the tropics. In *Proceedings of the 16th IBPSA International conference, 2-4 September 2019, Rome (Italy)*.
- Jakubiec, J.A., Srisamranrungruang, T., Kong, Z., Quek, G. and **Talami, R.**, 2019. Subjective and measured evidence for residential lighting metrics in the tropics. *Proceedings of the 16th IBPSA International conference, 2-4 September 2019, Rome (Italy)*.

Thesis

- **Talami, R.**, 2022. The sequential design optimization of building performance. (Doctoral dissertation, Loughborough University).
- **Talami, R.**, 2017. Recent trends in hydronic radiant system technology for heating and cooling. (Master dissertation, University of California Berkeley/IUAV University of Venice).

Reports

- **Talami, R.**, Karmann, C., Bauman, F., Schiavon, S. and Raftery, P., 2017. Recent trends in radiant system technology in North America.