

Keith J. Lee / Curriculum Vitae

Research Interests	High-performance computing in structural design; low-carbon structural systems; constructability and design complexity analysis; circular structural design.	
Academic Appointments	Massachusetts Institute of Technology , Cambridge, USA Department of Architecture Lecturer - 4.463: Building Technology Systems: Structures and Envelopes	present
Professional	JJJJound , Montréal, Canada Design Consultant: B/02 Bicycle BA Blacktop , North Vancouver, Canada Subsurface Grader	2019-2020 2012-2013, 2014
Education	MIT Department of Architecture Doctor of Philosophy in Architecture: Building Technology - Dissertation: <i>Geometric interpretations of structural demand for the analysis and reduction of design complexity</i> - Advisor: Professor Caitlin T. Mueller McGill University , Montréal, Canada Department of Civil Engineering and Applied Mechanics Master of Engineering in Structural Engineering - Thesis: <i>Moment-induced block shear failure in bolted flange plate connections</i> - Advisor: Professor Colin Rogers Bachelor of Engineering in Civil Engineering	2025 2020 2018
Teaching	MIT Department of Architecture Instructor - 4.181: OFFCUT/CUTOFF with L. Alkhatat, M. Aljomairi. Sitra/Muharraq, Bahrain. - 4.181: Digital Circularity: Tooling up for reuse with Odds & Mods with R.M. Blowes, C. Chaussabel, A.H. Kyaw, K-J Sørensen and C.T. Mueller. Cambridge, USA. - 4.S44: In Tension: The computational design, engineering, and fabrication of large scale sculptural rope networks with A. Beghini, A. Burke, J. Echelman, C.T. Mueller and N. Wang. Cambridge, USA. Teaching Assistant - 4.462: Introduction to Structural Design Instructor: John A. Ochsendorf - 4.450: Computational Structural Design and Optimization Instructor: Caitlin T. Mueller - 4.463: Building Technology Systems: Structures and Envelopes Instructor: Caitlin T. Mueller McGill Teaching Assistant	2025 2024 2023 2021, 2025 2022, 2024 2021

- CIVE318: Structural Engineering II 2019, 2020
Instructor: Colin Rogers
- CIVE385: Structural Steel and Timber Design 2018, 2019
Instructors: Amir Mofidi (2018), Sherif Kamel (2019)

*Peer-reviewed
Publications*

Lee, K.J. and Mueller, C.T. "Demand Space Analysis: Variational interpretation of structural demand for complexity-aware design" *Automation in Construction* (in preparation) 2025.

Lee, K.J., Mueller, C.T. and Huang, Y. "Differentiable assignment for circularity-driven structural design and optimization" *Structures* (in preparation) 2025.

Hong, C.S.H., **Lee, K.J.** and Mueller, C.T. "Reinforcement Learning for Generative Structural Design: Optimizing Truss-Based Cantilever Structures Without Predefined Topologies" *International Association of Shell and Spatial Structures Annual Conference* 2025.

Fontaine, A., Moldow, O.I., Blowes, R.M., **Lee, K.J.**, Sørensen, K-J and Mueller, C.T. "Stock-constrained design of pseudo-standard walls from stud offcuts" *International Association of Shell and Spatial Structures Annual Conference* 2025.

Lee, K.J., Huang, Y. and Mueller, C.T. "A differentiable structural analysis framework for high performance design optimization" *Structures* 2025.

Blowes, R.M., **Lee, K.J.**, Mayencourt, P., Kennedy, S. and Mueller, C.T. "A digital circularity approach to leverage waste lumber in dowel-laminated timber slabs" *International Conference on Structures and Architecture* 2024.

Alkhatay, L., **Lee, K.J.** and Mueller, C.T. "The Crown Jewels: Algorithmic design of rubble trusses for the Arabian Peninsula" *ACADIA* 2024.

Curth, A., Pearl, N., Wissemann, E., Cousin, T., Alkhatay, L., Jackow, V., **Lee, K.J.**, Moldow, O., Ismail, M.A., Mueller, C.T. and Sass, L. "EarthWorks: Zero Waste 3D Printed Earthen Formwork for Efficient Reinforced Concrete Construction" *Construction & Building Materials* 2024.

Lee, K.J., Hirt, N.K. and Mueller, C.T., "Geometry, strength, and efficiency: Tracing the standardization of North American structural steel, 1888-present," *8th International Congress on Construction History*. 2024.

Donovan, I., Schnitzler, J., **Lee, K.J.**, Wongsittikan, P., Liu, E. and Mueller, C.T., "PixelFrame: A reconfigurable, precast, post-tensioned concrete structural system for a circular building economy," *International scientific conference on the Built Environment in Transition*. 2023.

Burke, A., **Lee, K.J.**, Echelman, J., Feldman, D. and Mueller, C.T., "FDMremote: Interactive inverse design of tensile structures with differentiable FDM," *International Association of Shell and Spatial Structures Annual Conference*. 2023.

Lee, K.J., Danhaive, R. and Mueller, C.T., "Spherical harmonic shape descriptors of nodal force demands for quantifying spatial truss connection complexity," *Architecture, Structures and Construction*. 2022.

Lee, K.J. and Mueller, C.T., "Adapting computational protein folding logic for growth-based, assembly driven spatial truss design," *International Association of Shell and Spatial Structures Annual Conference*. 2021.

Other Publications	Lee, K.J., Titova, A., Mueller, C.T. and Ochsendorf, J., “Achieving next-generation transportation infrastructure through lifecycle performance assessment, design excellence, and digital fabrication,” <i>Policy Perspectives on Infrastructure</i> . MIT School of Architecture and Planning. 2021.	
	Lee, K.J., “Influence and compromise in post-war Korean architecture,” <i>Imprint 02</i> . MIT Architecture. 2021.	
Applied Research & Design	Digital Circularity Computational approaches to circular structural design. with R.M. Blowes, C. Chaussabel, A.H. Kyaw, K-J Sørensen and C.T. Mueller	2023-Present
	Octet Spaceframes Truss design, fabrication, and assembly through reused scaffolding struts. with J. Arul and C.T. Mueller	2022-present
	Pixelframe Reconfigurable prestressed concrete structures. with I. Donovan, J. Schnitzler, P. Wongsittikan and C.T. Mueller Supported by Holcim and the MIT Climate and Sustainability Consortium	2022-present
	Programmable Mud : Library of Fire Low-carbon earthen construction. with E. Gascón Alvarez, A. Curth and C.T. Mueller Under construction	2023-Present
	Make/Shift: Algorithmic design for a circular material future Zero-waste timber offcut design. with J. Berglund-Brown, I. Donovan, K. Feickert, J. Schnitzler and C.T. Mueller Competition finalist	2023
	DigitalCircularityToolkit <i>Inventory-driven design</i>	2023-Present
Computational Design Tools	Asap.jl / AsapOptim.jl <i>Structural analysis and optimization</i>	2021-Present
	FDMremote <i>Inverse form-finding of tensile networks</i>	2022-2023
Awards	MIT	
	- MIT Research Support Committee Grant, \$90,000	2025-present
	- Avalon Travel Award, \$600	2022, 2024
	- TODA Travel Award, \$1000	2022, 2024
	McGill	
	- Graduate Excellence Award, \$5,000	2019
	- Engineering Undergraduate Student Master’s Award (MEUSMA), \$15,000	2018-2019
	- Hydro Québec Scholarship, \$20,000	2018-2019
	- Dean’s Honour List	2013-2019
	- Greville Smith Scholarship, \$40,000	2013-2017
	National Science and Engineering Research Council of Canada	
	- Alexander Graham Bell Scholarship - Master’s (CGS-M), \$35,000	2019

	- Undergraduate Summer Research Award (USRA), \$7,000	2018
	- USRA, \$6,500	2016
	Fonds de Recherche Québec Nature et Technologies	
	- Bourse de Recherche de Première Cycle (BRPC), \$2,000	2018
	- BRPC, \$2,000	2016
<i>Exhibitions</i>	From Liquid to Stone: A reconfigurable concrete tectonic against obsolescence with I. Donovan, E. Liu, C.T. Mueller, J. Shnitzler and P. Wongsittikan. Venice Biennale.	2025
	Programmable Mud with A. Curth, E.G. Alvarez and C.T. Mueller. Venice Biennale.	2025
<i>Invited reviews</i>	4.462 Introduction to Structural Design Instructor: John A. Ochsendorf. MIT Architecture, Cambridge USA	2022-2024
	4.463 Building Technology Systems: Structures and Envelopes Instructor: Caitlin T. Mueller. MIT Architecture, Cambridge USA	2021-2024
	4.041 Advanced Product Design Instructor: Xavi L. Aguirre. MIT Architecture, Cambridge USA	2023
<i>Invited Talks</i>	Digital Circularity OFFCUT/CUTOFF, Muharraq Bahrain	2025
	The Crown Jewels: Algorithmic design of rubble trusses for the Arabian Peninsula ACADIA2024, Banff Canada	2024
	Digital Circularity: Algorithmic approaches to large-scale reuse Tecnológico de Monterrey, Santiago de Querétaro Mexico	2024
	Structural analysis and optimization MIT Architecture, 4.450 Lecture, Cambridge USA	2024
	Differentiable assignment for circularity-driven structural design and optimization ACM SIGGRAPH Symposium on Geometry Processing, Cambridge, USA	2024
	A differentiable assignment algorithm for high performance, inventory-driven structural design (in)visible reuse Research Symposium, EPFL, Lausanne Switzerland	2023
	Structural steel MIT Architecture, 4.463 Lecture, Cambridge USA	2021-24
	Introduction to the Finite Element Method MIT Architecture, 4.450 Lecture, Cambridge USA	2022
	Pixelframe: concrete structures against obsolescence MIT Climate & Sustainability Consortium Symposium, Cambridge USA	2022
	Reducing embodied energy with novel building structures Groupe Bouygues, MIT ILP, Cambridge USA	2022

	The similarity of forces in equilibrium: a geometric approach Foster + Partners, London UK	2022
	Spherical harmonic shape descriptors of nodal force demands... 5 th International Conference on Structures & Architecture, Aalborg DK	2022
	Adapting computational protein folding logic... International Association of Shell and Spatial Structures Annual Conference, Surrey UK	2021
	Complexity & similarity in structural design MIT Architecture, SMArchS Colloquium, Cambridge USA	2021
Academic Advising	MIT	
	Thesis reader	
	- Jenna Schnitzler (SM Building Technology)	2024
	- Inge Donovan (SM Building Technology)	2024
	Research mentor	
	- Karl-Johan Sørensen (SMArchS Computation)	2023-2024
	- Natasha Hirt (SM Building Technology)	2023-2024
	- Jenna Schnitzler (MArch)	2022-2024
	- Inge Donovan (MArch)	2022-2024
	- Pitipat (Paul) Wongsittikan (SM Building Technology)	2022-2024
Service	- Jerome Arul (SM Engineering and Management)	2022-2023
	- Adam Burke (SMArchS Building Technology)	2022
	- Alena Titova (MArch)	2021
	Undergraduate (Undergraduate Research Opportunities Program - UROP)	
	- Yanjun (Emily) Liu	2022-2023
	- Collin Wen	2022
	- Azariah (Azu) Beyene	2022
	McGill	
	Undergraduate (Summer Undergraduate Research in Engineering - SURE)	
	- Leilah Y.K. Sory	2020
Patents	- Jacob Burke	2019
	- Mairvat Abdulhamid	2019
	Admissions committee	2024
	MIT Architecture - Building Technology, Cambridge USA	
	Stride into STEM: Generative Structural Design	2022
	Altair, Instructor, Boston USA	
	Engineering Independence: Concrete Architecture in the Global South	2021
	MIT Architecture, symposium organizer, Cambridge USA	
	Pixelframe	2023
	Reconfigurable precast concrete construction system for buildings designed through algorithmic engineering with inventory constraints	
	Serial No. 63/499,222	
	Provisional	

Workflow

Languages

- English (native), French (proficient), Korean (proficient)

Computation

- Julia, C#, Python, Matlab, L^AT_EX

Structural Laboratory/Construction

- Hydraulic actuators/controllers (MTS), LVDTs, string potentiometers, strain gauges, DAQ systems (StrainSmart, MTS), general powered/non-powered construction equipment
- Qualifications (Canadian certifications): ASP construction safety, forklift operation, bridge crane operation, working at heights, WHMIS

References

Caitlin T. Mueller (Associate Professor, MIT)
Guy Nordenson (Professor, Princeton University)
John A. Ochsendorf (Professor, MIT)
Colin Rogers (Professor, McGill)

Contact information available upon request.