

Keith J. Lee / Curriculum Vitæ

RESEARCH INTERESTS	High-performance computing in structural design; low-carbon structural systems; constructability and complexity; circular structural design.	
ACADEMIC APPOINTMENTS	Massachusetts Institute of Technology , Cambridge USA	
	Postdoctoral Associate <i>Department of Civil and Environmental Engineering</i> Advisor: Caitlin T. Mueller	2026-PRESENT
	Lecturer <i>Department of Architecture</i> 4.463 Building Technology Systems: Structures and Envelopes	2025
PROFESSIONAL	Forma Systems , Cambridge USA Head of Structural Design and Computation	2025-PRESENT
	JJJJound , Montréal Canada Design Consultant: B/02 Bicycle	2019-2020
	BA Blacktop , North Vancouver Canada Subsurface Grader	2012-2013, 2014
EDUCATION	MIT <i>Department of Architecture</i>	
	Doctor of Philosophy in Architecture: Building Technology • Dissertation: <i>Geometric interpretations of structural demand for the analysis and reduction of design complexity</i> • Advisor: Caitlin T. Mueller	2025
	McGill University , Montréal Canada <i>Department of Civil Engineering and Applied Mechanics</i>	
	Master of Engineering • Thesis: <i>Moment-induced block shear failure in bolted flange plate connections</i> • Advisor: Colin Rogers	2020
	Bachelor of Engineering	2018
TEACHING	MIT <i>Department of Architecture</i>	
	Instructor	
	• 4.463 Building Technology Systems: Structures and Envelopes with H. Samuelson	2025
	• 4.181 OFFCUT/CUTOFF with L. Alkhayat and M. Aljomairi. Sitra, Bahrain.	2025
	• 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	2024
	• 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	2023
	Teaching Assistant	

- 4.462 Introduction to Structural Design 2021, 2025
Instructor: J. Ochsendorf
- 4.450 Computational Structural Design and Optimization 2022, 2024
Instructor: C.T. Mueller
- 4.463 Building Technology Systems: Structures and Envelopes 2021, 2023
Instructor: C.T. Mueller

McGill

Department of Civil Engineering and Applied Mechanics

Teaching Assistant

- CIVE318 Structural Engineering II 2019, 2020
Instructor: C. Rogers
- CIVE385 Structural Steel and Timber Design 2018, 2019
Instructors: A. Mofidi (2018), S. 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.

Nathansohn, N., Tibbits, S., **Lee, K.J.** and Mueller, C.T. “Reviving Icelandic vernacular: Computational optimization of raw basalt stone arches” *CAADRIA* 2026.

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., 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.

Alkhayat, 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., Alkhayat, L., Jackow, V., **Lee, K.J.**, Moldow, O.I., 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” <i>Architecture, Structures and Construction</i> 2022. Lee, K.J. and Mueller, C.T. “Adapting computational protein folding logic for growth-based, assembly driven spatial truss design” <i>International Association of Shell and Spatial Structures Annual Conference</i> 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>MIT Policy perspectives on infrastructure</i> 2021. Lee, K.J. “Influence and compromise in post-war Korean architecture” <i>MIT Architecture: Imprint 02</i> 2021.	
APPLIED RESEARCH & DESIGN	Pixelframe 2022 - PRESENT Reconfigurable pre-stressed concrete systems. with I. Donovan, J. Schnitzler, P. Wongsittikan and C.T. Mueller. Supported by Holcim and the MIT Climate and Sustainability Consortium Octahedral-Tetrahedral Spaceframes 2022 - PRESENT Reconfigurable spatial truss system design with reused scaffolding struts. with J. Arul. Programmable Mud 2023 - 2025 Low-carbon earthen construction. with E. Gascón Alvarez, A. Curth, and C.T. Mueller. Under construction. Digital Circularity/Odds & Mods 2023 - 2025 Computational approaches to circular structural design. with R.M. Blowes, C. Chaussabel, A.H. Kyaw, K-J Sørensen and C.T. Mueller. Make/Shift: Algorithmic design for a circular material future 2023 Zero-waste timber offcut design. Competition finalist. with J. Berglund-Brown, I. Donovan, K. Feickert, J. Schnitzler and C.T. Mueller	
COMPUTATIONAL DESIGN TOOLS	DigitalCircularityToolkit 2023 - PRESENT Grasshopper plugin for circular design. Asap.jl/AsapOptim.jl 2021 - PRESENT Structural analysis and gradient-based optimization. FDMremote 2022 - 2023 Grasshopper plugin for inverse form-finding of equilibrium networks.	
AWARDS	MIT • MIT Research Support Committee Grant, \$90,000 2025 - 2026 • Avalon Travel Award, \$600 2022, 2024 • TODA Travel Award, \$1,000 2022, 2024 McGill • Graduate Excellence Award, \$5,000CAD 2019 • Engineering Undergraduate Student Master’s Award (MEUSMA), \$15,000CAD 2018 - 2019 • Hydro Québec Scholarship, \$20,000CAD 2018 - 2019 • Greville Smith Scholarship, \$40,000CAD 2013 - 2017 National Science and Engineering Research Council of Canada • Alexander Graham Bell Scholarship - Master’s (CGS-M), \$35,000CAD 2019	

	Undergraduate Summer Research Award (USRA), \$7,000CAD	2016, 2018
	Fonds de Recherche Québec Nature et Technologies Bourse de Recherche de Première Cycle (BRPC), \$2,000CAD	2016, 2018
EXHIBITIONS	From Liquid to Stone: A reconfigurable concrete tectonic against obsolescence with I. Donovan, E. Liu, C.T. Mueller, J. Schnitzler and P. Wongsittikan. Venice Biennale. Programmable Mud with A. Curth, E.G. Alvarez and C.T. Mueller. Venice Biennale.	2025 2025
INVITED REVIEWS	1.562 Structural Design Project I Instructor: Paul Richardson MIT Civil and Environmental Engineering, Cambridge USA GSD 01201 - Third Semester Core: Architectural Design Coordinator: Eric Höweler Harvard Graduate School of Design, Cambridge USA 4.153 Architectural Design Core Studio III Coordinator: J. Yolande Daniels MIT Architecture, Cambridge USA 4.462 Introduction to Structural Design Instructor: J. Ochsendorf MIT Architecture, Cambridge USA 4.463 Building Technology Systems: Structures and Envelopes Instructor: C.T. Mueller MIT Architecture, Cambridge USA 4.041 Advanced Product Design Instructor: Xavi L. Aguirre MIT Architecture, Cambridge USA ARCH 448 Structural Systems in Architecture II Instructor: Jonathan Dessi-Olive Kansas State University, Manhattan USA	2025 2025 2022-2024 2021-2024 2023 2021
INVITED TALKS	Computational Structural Optimization I/II Stanford CEE 280: Advanced Structural Analysis. Stanford USA. Digital Circularity OFFCUT/CUTOFF. Muharraq Bahrain. The Crown Jewels: Algorithmic design of rubble trusses for the Arabian Peninsula ACADIA2024. Banff Canada. Digital Circularity: Algorithmic approaches to large-scale reuse Tecnológico de Monterrey. Santiago de Querétaro Mexico. Structural analysis and optimization MIT 4.450 Computational Structural Design and Optimization. Cambridge USA. Differentiable assignment for circularity-driven structural design and optimization ACM SIGGRAPH Symposium on Geometry Processing. Cambridge USA. A differentiable assignment algorithm for high performance, inventory-driven structural design EPFL (in)visible reuse Research Symposium. Lausanne Switzerland.	2025 2025 2024 2024 2024 2024 2023

	Structural Steel	2021 - 2024
	MIT 4.463 Building Technology Systems: Structures and Envelopes. Cambridge USA.	
	Introduction to the Finite Element Method	2022
	MIT 4.450 Computational Structural Design and Optimization. Cambridge USA.	
	Pixelframe: Concrete structures against obsolescence	2022
	MIT Climate & Sustainability Consortium Symposium. Cambridge USA.	
	Reducing embodied energy with novel building structures	2022
	Groupe Bouygues - MIT Industrial Liason Program. Cambridge USA.	
	The similarity of forces in equilibrium: A geometric approach	2022
	Foster + Partners. London UK.	
	Spherical harmonic shape descriptors of nodal force demands for quantifying spatial truss connection complexity	2022
	5 th International Conference on Structures & Architecture. Aalborg Denmark.	
	Adapting computational protein folding logic for growth-based, assembly driven spatial truss design	
	2021	
	International Association of Shell and Spatial Structures Annual Conference. Surrey UK.	
	Complexity & similarity in structural design	2021
	MIT Architecture SMArchS Colloquium. Cambridge USA.	
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 Wongsittikan (SM Building Technology)	2022 - 2024
	• Jerome Arul (SM Engineering and Management)	2022 - 2023
	• Adam Burke (SMArchS Building Technology)	2022
	• Alena Titova (MArch)	2021
	Undergraduate Research Opportunity Program (UROP)	
	• Yanjun (Emily) Liu	2022 - 2023
	• Collin Wen	2022
	• Azariah (Azu) Beyene	2022
	McGill	
	Summer Undergraduate Research in Engineering (SURE)	
	• Leilah Y.K. Sory	2020
	• Jacob Burke	2019
	• Mairvat Abdulhamid	2019
SERVICE	Admissions Committee	2024
	MIT Architecture - Building Technology	
	Stride into STEM: Generative Structural Design	2022
	Altair - Instructor	
	Engineering Independence: Concrete Architecture in the Global South	2021
	MIT Architecture - Symposium Organizer	

PATENTS	Pixelframe 2023 <i>Reconfigurable precast concrete construction system for buildings designed through algorithmic engineering with inventory constraints</i> Serial No. 63/499,222 Provisional.
WORKFLOW	Languages English (native), French (proficient), Korean (proficient) Computation • Programming: Julia, C#, Python, Matlab • CAD: Rhinoceros3D/Grasshopper • Engineering: Abaqus/CAE, Karamba3D • Typesetting: LaTeX, Typst • Design: Adobe Suite Structural Laboratory/Construction • Hydraulic actuators/controllers (MTS) • Measurement: LVDTs, string potentiometers, strain gauges, DAQ systems (Strainsmart, MTS) • General powered/non-powered construction equipment • Qualifications (Canada): Construction safety, forklift operation, bridge crane operation, working at heights, WHMIS
REFERENCES	Caitlin T. Mueller (Associate Professor, MIT) John Ochsendorf (Professor, MIT) Sheila Kennedy (Professor, MIT) Guy Nordenson (Professor, Princeton) Colin Rogers (Professor, McGill) Contact information available upon request.

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