Demi L. Fang

Pronounced "DEE-mee FAHNG" | she/her/hers
camd.northeastern.edu/people/demi-fang/

Email:
D.Fang@northeastern.edu

Mailing:
Northeastern University
360 Huntington Ave – 271HU, Suite 200
Boston, MA 02115

Office:
271 Huntington Ave
Boston, MA 02115

Dr. Fang's research addresses the intersections of **data-driven design**, the **human experience of structural design**, and **environmental impacts of structural systems**. As an educator, Dr. Fang is passionate about teaching the future generation of designers a first-principles approach to the statics of structures and computational workflows to streamline design processes, empower creativity, and reduce emissions at early stages of design.

ACADEMIC APPOINTMENT

Northeastern University, Boston, MA

- School of Architecture (College of Arts, Media and Design)
  - **Tenure-Track Assistant Professor**, *July 2025 –*
  - Postdoctoral Research Associate, *August 2024 – June 2025*
- Affiliate Appointment in Civil & Environmental Engineering, *August 2024 -*

EDUCATION

Massachusetts Institute of Technology (MIT), Cambridge, MA

- **PhD in Building Technology**, Department of Architecture, *May 2024*
  Thesis: "System-level design of low-carbon structures", supervised by Prof. Caitlin Mueller
- **Master of Science in Building Technology** (SMBT), Department of Architecture, *June 2020*
  Thesis: "Timber joinery in modern construction: Mechanical behavior of wood-wood connections"
- **Master of Science in Computational Science & Engineering** (SM CSE), Schwarzman College of Computing, *May 2024*
  Thesis: "Informing decision-making in single-objective, mixed-variable design problems"
- Kaufman Teaching Certificate, Teaching & Learning Lab, *June 2023*
- Japan Society for the Promotion of Science (JSPS) Summer Fellow **[C8, OR2]**, *2022*
- MIT Presidential Graduate Fellowship recipient, *2017, 2022*

Princeton University, Princeton, NJ

- **Bachelor of Science in Engineering**, highest honors, Structures track, Department of Civil & Environmental Engineering, *June 2017*
  Thesis: "Assessing the stability of unreinforced masonry arches and vaults: A comparison of analytical and numerical strategies", supervised by Prof. Sigrid Adriaenssens **[J1]**. Recognized at the departmental (Calvin Dodd MacCracken Senior Thesis Award) and School of Engineering (David W. Carmichael Prize) levels.
- Certificate in Musical Performance, violin, Department of Music, *June 2017*
- MIT Summer Research Program participant, *2016*

(continued)

PUBLICATIONS [Google Scholar]

Peer-reviewed journal publications

[J5] Fang, Demi, Patrick Kenny, and Caitlin Mueller. "Material Efficiency as a Key Opportunity to Reduce Embodied Carbon in Structural Systems: Data Insights from 226 Fully Designed Projects." *Journal of Structural Engineering* 152, no. 2 (December 1, 2025): 04025275. https://doi.org/10.1061/JSENDH.STENG-14451.

[J4] Smith, Margaret S.I., **Demi Fang**, Caitlin Mueller, and Josephine Carstensen. "Reducing embodied carbon with material optimization in structural engineering practice: Perceived barriers and opportunities." *Journal of Building Engineering* (October 15, 2024): 109943. https://doi.org/10.1016/j.jobe.2024.109943.

[J3] Fang, Demi, Nathan Brown, Catherine De Wolf, and Caitlin Mueller. "Reducing Embodied Carbon in Structural Systems: A Review of Early-Stage Design Strategies." *Journal of Building Engineering* 76 (October 1, 2023): 107054. https://doi.org/10.1016/j.jobe.2023.107054.

[J2] Fang, Demi, and Caitlin Mueller. "Mortise-and-Tenon Joinery for Modern Timber Construction: Quantifying the Embodied Carbon of an Alternative Structural Connection." *Architecture, Structures and Construction* 3 (December 21, 2021): 11-24. https://doi.org/10.1007/s44150-021-00018-5.

[J1] Fang, Demi L., Rebecca K. Napolitano, Tim L. Michiels, and Sigrid M. Adriaenssens. "Assessing the Stability of Unreinforced Masonry Arches and Vaults: A Comparison of Analytical and Numerical Strategies." *International Journal of Architectural Heritage* 13, no. 5 (May 16, 2018): 648–62. https://doi.org/10.1080/15583058.2018.1463413.

Peer-reviewed industry publications

[I1] Fang, Demi, Mel Chafart, Martín Torres, and Jonathan M. Broyles. *SE 2050 Commitment Program: 2023 Data Analysis and Findings Report*. Edited by Lauren Wingo, Zachary Chabot, and Eric Borchers. ASCE Technical Report. American Society of Civil Engineers, 2025. https://doi.org/10.1061/9780784485927.

Peer-reviewed conference publications

[C11] Fang, Demi, David Fannon, and Matthew Eckelman. "Bottom-up Estimates of Floor Area and Embodied Carbon Patterns in the US Building Stock." In *IOP Conference Series: Earth and Environmental Science* 1554 (November 2025): 012120. Presented in Zürich, Switzerland, 2025. https://doi.org/10.1088/1755-1315/1554/1/012120.

[C10] Fang, Demi, Peter Wang, Sophia V. Kuhn, Michael A. Kraus, and Caitlin Mueller. 2024. "Trans-Typology Design Space Exploration: Using Gradients to Inform Decision-Making in the Design of Spanning Structures." Paper presented at International Association for Shell and Spatial Structures (IASS), Zurich, Switzerland. *Proceedings of the International Association for Shell and Spatial Structures (IASS) Symposium*. https://app.iass2024.org/files/IASS_2024_Paper_613.pdf.

[C9] Fang, Demi, Sophia V. Kuhn, Walter Kaufmann, Michael A. Kraus, and Caitlin Mueller. "Quantifying the Influence of Continuous and Discrete Design Decisions Using Sensitivities." In *Advances in Architectural Geometry* 2023. Presented in Stuttgart, Germany, 2023. https://doi.org/10.1515/9783111162683-031.

[C8] Fang, Demi, Juliana Berglund-Brown, Dylan Iwakuni, and Caitlin Mueller. "Carbon and Craft: Learning from the Deconstruction, Relocation, and Reuse of a Traditional Japanese House's Timber Structure." In *Journal of Physics: Conference Series*. Presented in Lausanne, Switzerland, 2023.

(continued)

[C7] Fang, Demi, and Caitlin Mueller. "Flow-Informed Topology Design: Evaluating the Conformity of Structural Topologies with Vector Fields." In *Proceedings of the International Association for Shell and Spatial Structures (IASS) Symposium*. Presented virtually in Surrey, UK, 2021.

[C6] Fang, Demi, Alpha Arsano, Nathan Brown, Christoph Reinhart, and Caitlin Mueller. "Design Space Exploration for High-Performance Greenhouse Design." In *Proceedings of the International Association for Shell and Spatial Structures (IASS) Symposium*. Presented in Barcelona, Spain, 2019.

[C5] Devin, Austin F, Masaaki Miki, **Demi Fang**, Jonathan Baranowski, Jingwen Wang, and William F Baker. "Superposed Functions as Airy Stress Functions for Form-Finding of Funicular Shell Structures." In *Proceedings of the International Association for Shell and Spatial Structures (IASS) Symposium*, 2019.

[C4] Fang, Demi, Julieta Moradei, Jan Brütting, Aliz Fischer, Daniel K Landez, Benshun Shao, Nick Sherrow-Groves, Corentin Fivet, and Caitlin Mueller. "Modern Timber Design Approaches for Traditional Japanese Architecture: Analytical, Experimental, and Numerical Approaches for the Nuki Joint." In *Proceedings of the International Association for Shell and Spatial Structures (IASS) Symposium*. Barcelona, Spain, 2019.

[C3] Fang, Demi, Caitlin Mueller, Jan Brütting, Corentin Fivet, and Julieta Moradei. "Rotational Stiffness in Timber Joinery Connections: Analytical and Experimental Characterizations of the Nuki Joint." In *Structures and Architecture: Bridging the Gap and Crossing Borders*, edited by Paulo J.S. Cruz, 229–36. Lisbon, Portugal: CRC Press, 2019. https://doi.org/10.1201/9781315229126-28.

[C2] Fang, Demi, and Caitlin Mueller. "Joinery Connections in Timber Frames: Analytical and Experimental Explorations of Structural Behavior." In *Proceedings of the International Association for Shell and Spatial Structures (IASS) Symposium*. Presented in Cambridge, MA, USA, 2018.

[C1] Fang, Demi, Sigrid Adriaenssens, Hannah V. Bands, and Edward M. Segal. "The Digital Engineering Classroom: Collaborative Structural Design Space and Supplementary Educational Material." In *Proceedings of the International Association for Shell and Spatial Structures (IASS) Symposium*. Amsterdam, 2015.

Non-peer-reviewed outreach publications ----------

[OR4] Broyles, Jonathan, Mel Chafart, Martín Torres, and **Demi Fang.** "Data Insights From Over 500 Building Projects for Low-Carbon Structures." *STRUCTURE Magazine*, December 2024. https://www.structuremag.org/article/data-insights-from-over-500-building-projects-for-low-carbon-structures/.

[OR3] SE 2050 Subcommittee. "Design Guidance for Reducing Embodied Carbon in Structural Systems." *SE2050.org*, July 2023. https://se2050.org/resources-overview/structural-materials/lean-design-guidance/.

[OR2] Fang, Demi. "A New Home for an Old Home: A Story of Structural Reuse." *Medium*, August 2023. https://medium.com/@demifang21/a-new-home-for-an-old-home-a-story-of-structural-reuse-2b55d5c1d4c9.

[OR1] Fang, Demi, and Caitlin Mueller. "Parametric Structural Design for High-Performance Buildings." *STRUCTURE Magazine*, August 2021. https://www.structuremag.org/article/parametric-structural-design-for-high-performance-buildings/.

(continued)

CONFERENCE PRESENTATIONS

Fang, Demi. 2025. "Bottom-up Estimates of Floor Area and Embodied Carbon Patterns in the US Building Stock." Conference. Sustainable Built Environment Conference, Zürich, Switzerland, June. **[C11]**

Fang, Demi. 2024. "Trans-Typology Design Space Exploration: Using Gradients to Inform Decision-Making in the Design of Spanning Structures." Conference. International Association for Shell and Spatial Structures (IASS), Zürich, Switzerland. **[C10]**

Fang, Demi. 2023a. "Quantifying the Influence of Continuous and Discrete Design Decisions Using Sensitivities." Conference. Advancements in Architectural Geometry, Stuttgart, Germany, October. **[C9]**

Fang, Demi. 2023b. "Carbon and Craft: Learning from the Deconstruction, Relocation, and Reuse of a Traditional Japanese House's Timber Structure." Conference. CISBAT, Lausanne, Switzerland. **[C8]**

Fang, Demi. 2021. "Flow-Informed Topology Design: Evaluating the Conformity of Structural Topologies with Vector Fields." Conference. International Association for Shell and Spatial Structures, Surrey, UK [virtual]. **[C7]**

Fang, Demi. 2019. "Design Space Exploration for High-Performance Greenhouse Design." Conference. International Association for Shell and Spatial Structures, Barcelona, Spain. **[C6]**

Fang, Demi. 2018. "Joinery Connections in Timber Frames: Analytical and Experimental Explorations of Structural Behavior." Conference. International Association for Shell and Spatial Structures, Cambridge, MA, USA, July. **[C2]**

PROJECTS AND COMPETITIONS

Pluma, *2020*

Parametrically designed and optimized the design of solar tensile sculpture communicating energy efficiency in the built environment. Recognized at the International Association for Shell and Spatial Structure's 2020 Design Competition. 2022 grant recipient for fabrication on MIT campus by the Council for the Arts at MIT. With E. Gascon, M. Ismail, P. Mayencourt, Prof. C. Mueller, and R. Weber.

The Conversation Bench, *2019*

Designed a no-waste seat fabricated with one sweep of a robotic arm, with a design team. Installed at the Chicago Athletic Association for the Chicago Architecture Biennial. With M. Rauber, R. Attraya, K. Vansice, and S. Duncan.

AWARDED INTERNAL RESEARCH FUNDING

Awards below listed in reverse chronological order of award start period.

Partial Co-op Funding, Educational Innovation Operations, Northeastern University

- *Awarded position:* "Data analyst of sustainability in the US building stock"
- *Amount awarded:* $6400 ($10/hr/wk for 4-month award period, 40 hrs/wk)
- *Award period:* January 2026 through April 2026 (4 months)
- *Team roles:* **Demi Fang as sole supervisor** to the undergraduate co-op hire Tanvi Agarwal.

(continued)

Partial Co-op Funding, Educational Innovation Operations, Northeastern University

- *Awarded position:* "Data analyst for sustainability in architectural structures"
- *Amount awarded:* $8400 ($10/hr/wk for 6-month award period, 35 hrs/wk)
- *Award period:* July 2026 through December 2025 (6 months)
- *Team roles:* **Demi Fang as sole supervisor** to the undergraduate co-op hire Lang Shao.

PhD Summer Research Assistant (SRA) Award, College of Arts, Media and Design, Northeastern University

- *Awarded proposal:* "A Multi-Dimensional Approach to Carbon and Environmental Impacts of Buildings in Vulnerable Communities"
- *Amount awarded:* PhD student research stipend FY26 for four summer months
- *Award period:* May 2025 through August 2025 (4 months)
- *Team roles:* Alpha Arsano (PI); **Demi Fang (co-PI);** Carlos Sandoval Olascoaga (co-PI). Supervision of CAMD PhD student Anna Ibru.

Undergraduate Research Opportunity (URO) Award, College of Arts, Media and Design, Northeastern University

- *Awarded proposal:* "Transforming computational design at Northeastern University's School of Architecture: A review of pedagogical approaches"
- *Amount awarded:* $1500
- *Award period:* January 2025 through March 2025
- *Team roles:* **Demi Fang as sole supervisor** to the undergraduate part-time research assistant Kwan To Ryan Chan **[WP1]**.

TEACHING

ARCH 5230 Structural Systems, Northeastern University School of Architecture

- *Spring 2026*: 55 students (10 graduate; 45 undergraduate), 3 teaching assistants
- *Fall 2025:* 7 students (5 graduate; 2 undergraduate), 1 teaching assistants

ARCH 2240 Architectonic Systems, Northeastern University School of Architecture

- *Spring 2026:* 19 students (3 graduate; 16 undergraduate), no teaching assistants
- *Spring 2025:* 11 students (all undergraduate), no teaching assistants

RESEARCH SUPERVISION OF GRADUATE STUDENTS

- Anna Ibru (PhD Interdisciplinary Design and Media), Northeastern University, *Summer 2025*. Co-supervised by Alpha Arsano (PI) and Carlos Sandoval Olascoaga (co-PI). See "AWARDED INTERNAL RESEARCH FUNDING."

RESEARCH SUPERVISION OF UNDERGRADUATE STUDENTS

- Tanvi Agarwal (B.S. Computer Science), Northeastern University, *Spring Co-op (Jan-April) 2026*. Partially funded by Northeastern University (see "AWARDED INTERNAL RESEARCH FUNDING").
- Lang Shao (B.S. Data Science and Mathematics), Northeastern University, *Fall Co-op (July-December) 2025*. Partially funded by Northeastern University (see "AWARDED INTERNAL RESEARCH FUNDING").

(continued)

- Roman Shipley (B.S. Arch. 2028, Minor in Civil Engineering), Northeastern University, *Summer 2025 – present*
- Kwan To Ryan Chan (B.S. Arch. 2026), Northeastern University, *Spring 2025, Spring 2026*. Partially funded by the Undergraduate Research Opportunity Award (see "AWARDED INTERNAL RESEARCH FUNDING").
- Anna Sophia Bakshi (B.S.C.E. Arch. Studies 2027), Northeastern University, *Spring 2025*
- Raphael Semeria (B.S.C.E. Arch. Studies 2027), Honors Directed Study, Northeastern University, *Spring 2025*

SERVICE TO THE INSTITUTION

Graduate advisor, Northeastern University School of Architecture, *Fall 2025 - present*
Graduate admissions, Northeastern University School of Architecture, *application reviewer, 2025*
Undergraduate admissions, Northeastern University College of Arts, Media and Design, *portfolio and application reviewer, 2025-2026*

Northeastern University School of Architecture faculty committees

- Faculty committee on Artificial Intelligence, *Fall 2025 - present*
- PhD committee, *Fall 2025 - present*

Internal guest critic

- ARCH 5140 Comprehensive Design Studio, Northeastern University School of Architecture, *Spring 2025 and 2026*. Invited by Michelle Lee, Cadence Bailey, Prof. David Fannon.
- ARCH 5230 Structural Systems, Northeastern University School of Architecture, *Fall 2024*. Invited by Prof. Michelle Laboy.

SERVICE TO THE DISCIPLINE

Structural Engineers 2050 Commitment Program (SE 2050), American Society of Civil Engineers (ASCE)'s Structural Engineering Institute (SEI), *committee member, 2022 - present*

Active member of the Resources, Database, and Data Science working groups.
Co-authored white papers on 1) quantifying embodied carbon and 2) strategies for reducing structural embodied carbon in design **[OR3]**, providing resources for signatory firms on how to improve performance on future projects.
Co-led data analysis and visualization pipelines of projects in the database to make design recommendations and suggest benchmarks for the industry at large **[I1], [OR4]**.

International Conference of Structures and Architecture (ICSA) special session, *co-chair, 2025*

Organized authors and abstracts into a special session proposal titled "The Next Generation of Embodied Carbon Reduction Strategies" for the 2025 conference in Antwerp, Belgium.

"Is Ise Circular?" Symposium, Princeton University, *roundtable moderator, September 2024*

Chaired and moderated a roundtable titled "Craft, Tools, and Transmission." Curated a conversation among guests Prof. Sigrid Adriaenssens, carpenter Adam Zgola, and artist Martin Puryear (withdrawn due to emergency).

Invited talks

- **"Structural Futures in a Warming World"**
    - Guest presentation, Arup Boston, lunch talk for AANHPI month. Invited by Maggie Smith and Luc Chabot, *May 2025*.
    - Guest presentation, Princeton University Department of Civil and Environmental Engineering. Invited by Prof. Sigrid Adriaenssens, *September 2024*.

(continued)

- **"Strategies for Low-Carbon Structural Design"**
    - Guest lecture, CIVE 4767: Senior Design Project Structural, Northeastern University Department of Civil & Environmental Engineering. Invited by Prof. Andrew T. Myers, *January 2025 and 2026*.
    - Guest lecture, 48-324: Structural Design 1, Carnegie Mellon School of Architecture. Invited by Prof. Juney Lee, *February 2024*.
    - Guest speaker, Research in Infrastructure Group (RIG) at HNTB. Invited by Dr. Peter Wang and Ted Zoli, III, PE, *June 2023*.
    - Guest lecture, 4.440/4.462/1.056: Introduction to Structural Design, MIT Department of Architecture. Invited by Prof. John Ochsendorf, *April 2022 and April 2023*.
    - Guest lecture, ARCH 5305: Building Systems Integration, University of North Carolina at Charlotte School of Architecture. Invited by Prof. Liz McCormick, *October 2021 and September 2022*.
- **"Data-Driven Insights for Design Decision-Making"**
    - Guest speaker, Applied Research + Development at Foster + Partners. Invited by Marios Tsiliakos, *November 2023*.

External guest critic

- Building Technology Systems: Structures and Envelopes, MIT Department of Architecture, *Fall 2021, 2023, 2024*
- Architecture Design Core Studio III, MIT Department of Architecture, *Fall 2022*
- Introduction to Structural Design, MIT Department of Architecture, *Fall 2021*
- Computational Structural Design and Optimization, MIT Department of Architecture, *Fall 2020*
- Engineering Design, Hofstra University Civil Engineering, *Fall 2020*

Grant reviewer

- National Science Foundation (NSF), review panelist, *2025*

Peer reviewer

- Sustainable Built Environment conference Scientific Committee, *February – March 2025*
- CAAD Futures conference, *February – March 2025*
- International Conference of Structures and Architecture (ICSA) special session *2025*
- *Environmental Science & Technology,* ACS Publications, *2025 - present*
- *Journal of Cleaner Production*, Elsevier, *2024 - present*
- *Journal of Building Engineering*, Elsevier, *2023 – present*

SERVICE TO THE COMMUNITY/PUBLIC

Japan Society of Boston "Green Approaches to Japanese Woodworking and Bath Culture," *panel moderator, December 16, 2025.* https://www.japansocietyboston.org/event-details/green-approaches-to-japanese-woodworking-and-bath-culture

(continued)

PROFESSIONAL MEMBERSHIPS

Structural Engineering Institute (SEI) of the American Society of Civil Engineers (ASCE), member, *2025 - present*

International Association for Shell and Spatial Structures (IASS), member, *2024 - present*

Building Technology Educators' Society (BTES), member, *2024 – present*

Structural Engineers 2050 Commitment Program (SE 2050) Committee (see also SERVICE AND PROFESSIONAL DEVELOPMENT), member, *2022 - present*

EMPLOYMENT HISTORY

Thornton Tomasetti, Boston, MA

Structures and embodied carbon intern, June 2023 - August 2023

Compiled, cleaned, and analyzed in-house data on emissions in structures. Interpreted and leveraged data insights to support and challenge rules of thumb for low-carbon structural design **[J5]**. Encouraged the firm to continue its leadership in collecting high-quality embodied carbon data.

Skidmore, Owings & Merrill LLP (SOM), Chicago, IL

Structures and computational design intern, February 2019 - December 2019

Contributed to various in-house research efforts, such as: diversity and equity in structural design; surrogate modeling for urban daylighting simulations; proposing a new mathematical framework for compressive shell design **[C5]**.

Taught workshops to students and colleagues (see "TEACHING AND ADVISING").

Robert Silman and Associates, New York, NY

Structural engineering intern, June 2017 - August 2017

PRESS

Hudson, Elizabeth. "Welcome Fall 2024 New Faculty." College of Arts, Media and Design (CAMD), August 17, 2024. https://camd.northeastern.edu/news/welcome-fall-2024-new-faculty/.

MIT School of Architecture + Planning. "Exploring Traditional Japanese Woodworking for Building Sustainability," October 12, 2023. https://sap.mit.edu/news/exploring-traditional-japanese-woodworking-building-sustainability.

Skidmore, Owings & Merrill. "Explore the Future of Building Design and Technology with SOM at the 2019 Chicago Architecture Biennial," September 6, 2019. https://www.som.com/news/explore-the-future-of-building-design-and-technology-with-som-at-the-2019-chicago-architecture-biennial/.

Chicago Athletic Association. "SOM Installation: Conversation Bench," September 2019. https://chicagoathleticevents.com/tc-events/conversation-bench/.

MIT News | Massachusetts Institute of Technology. "Mass Timber: Thinking Big about Sustainable Construction," August 7, 2018. https://news.mit.edu/2018/mass-timber-sustainable-construction-0807.