

Leah M. Chong

Postdoctoral Associate / Massachusetts Institute of Technology

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Education

Ph.D. in Mechanical Engineering

Carnegie Mellon University, Pittsburgh, PA

August 2017 – May 2022

Dissertation: Role of Human Self-Confidence and Their Confidence in Artificial Intelligence in AI-Assisted Decision-Making in Engineering Design

Committee: Jonathan Cagan (Advisor), Kenneth Kotovsky (Advisor), Kosa Goucher-Lambert, Levent Burak Kara

M.S. in Mechanical Engineering

Carnegie Mellon University, Pittsburgh, PA

August 2017 – May 2020

B.S. in Mechanical Engineering

Rice University, Houston, TX

August 2013 – May 2017

Research Interests

Human-AI collaboration; human-centered engineering design; computational design methods; design cognition and decision-making; design theory and methodology; ethical design; creativity

Research Experience

Toyota Research Institute Human-Centered AI division
Intern

April 2024 – Present
Los Altos, CA

- Working with the Future Product Innovation team on investigating the novelty-surprise relationship in design and the generation of surprising designs using text-to-image models.

Ideation Lab (PI: Maria Yang)
Postdoctoral Associate

September 2022 – Present
Massachusetts Institute of Technology, Cambridge, MA

- Investigating novel human-centered methods for designers to better identify and empathize with user needs by leveraging various machine learning-based computer vision techniques.
- Studying pressing topics in human-AI collaboration in engineering design specifically regarding designers and consumers' trust and acceptance of AI, as well as AI-generated designs.
- Conducting timely research on the influence of generative design tools on the design process and designer behavior and decisions, especially when designing for qualitative design goals, such as aesthetics.

Design Computation and Digital Engineering (DeCoDE) Lab (PI: Faez Ahmed)
Research Collaborator

September 2022 – Present
Massachusetts Institute of Technology, Cambridge, MA

- Investigating new methods to enhance the usability of text-to-image generative models in engineering design contexts, such as improving the feasibility of generated images by text-to-image models.
- Studying design exploration strategies in using text-to-image generative AI that successfully yield designs that meet specific goals like feasibility, novelty, and aesthetics.

Integrated Design Innovation Group (IDIG) (PI: Jonathan Cagan)
Postdoctoral Researcher, Ph.D. Candidate

August 2017 – July 2022
Carnegie Mellon University, Pittsburgh, PA

- Conducted pressing human-centered research on human-AI collaboration in engineering design, particularly on how designers' confidence in AI and self-confidence are influenced by AI performance, AI feedback, and the number of AI teammates, and consequently affect their decisions.
- Explored a novel voting approach to human-AI joint decision-making and its influence on designers' confidence and decision-making.

- Investigated the potential of constraints to enhance designer creativity by studying the relationship between item constraints and designers' ideation effectiveness.

Robotics and Intelligent Systems (RiSYS) Lab (PI: Fathi Ghorbel)

Undergraduate Research Assistant

February 2015 – December 2016

Rice University, Houston, TX

- Modeled and designed physics-based micro-robotic systems such as a submersible in-line pump for an underwater inspection robot and a micro-robot locator.
- Conducted literature review and initial video analyses of the gait of foot drop patients for a project that developed robots that assist human gait training.

Publications

Journal Articles

Chong, L., Lo, I., Rayan, J., Dow, S., Ahmed, F., and Lykourantzou, I., 2024, "Prompting for Products: Investigating Design Space Exploration Strategies for Text-to-Image Generative Models," *Design Science*. (Under Review)

Saadi, J., Yang, M., and **Chong, L.**, "The Effect of Targeting Both Quantitative and Qualitative Objectives in Generative Design Tools on the Design Outcomes," *Research in Engineering Design*. (Under Review)

Chong, L., Kotovsky, K., and Cagan, J., 2024, "Human Designers' Dynamic Confidence and Decision-Making When Working with More than One Artificial Intelligence," *ASME Journal of Mechanical Design*, 146(8), pp. 081402. <https://doi.org/10.1115/1.4064565>.

Hu, M., Zhang, G., **Chong, L.**, Cagan, J., 2024, and Goucher-Lambert, K., 2024, "How Being Outvoted by AI Teammates Impacts Human-AI Collaboration," *International Journal of Human-Computer Interaction*, pp. 1–18. <https://doi.org/10.1080/10447318.2024.2345980>.

Chong, L., Raina, A., Goucher-Lambert, K., Kotovsky, K., and Cagan, J., 2023, "The Evolution and Impact of Human Confidence in Artificial Intelligence and in Themselves on AI-Assisted Decision-Making in Design," *ASME Journal of Mechanical Design*, 145(3), pp. 031401. <https://doi.org/10.1115/1.4055123>.

Zhang, G., **Chong, L.**, Kotovsky, K., and Cagan, J., 2023, "Trust in an AI Versus a Human Teammate: The Effects of Teammate Identity and Performance on Human-AI Cooperation," *Computers in Human Behavior*, 139, pp. 107536. <https://doi.org/10.1016/j.chb.2022.107536>.

Chong, L., Zhang, G., Goucher-Lambert, K., Kotovsky, K., and Cagan, J., 2023, "Data on Human Decision, Feedback, and Confidence During an Artificial Intelligence-Assisted Decision-Making Task," *Data in Brief*, 46, pp. 108884. <https://doi.org/10.1016/j.dib.2023.108884>.

Chong, L., Zhang, G., Goucher-Lambert, K., Kotovsky, K., and Cagan, J., 2022, "Human Confidence in Artificial Intelligence and in Themselves: The Evolution and Impact of Confidence on Adoption of AI Advice," *Computers in Human Behavior*, 127, pp. 107018. <https://doi.org/10.1016/j.chb.2021.107018>.

Peer-Reviewed Conference Papers

Chong, L., Rayan, J., Lykourantzou, I., Dow, S., and Ahmed, F., 2024 "CAD-Prompted Generative Models: A Pathway to Feasible and Novel Engineering Designs," ASME International Design Engineering Technical Conferences – Design Theory and Methodology Conference, Washington, DC, August 25-28, 2024.

Zhu, Q., **Chong, L.**, Yang, M., and Luo, J., 2024, "Reading Users' Minds from What They Say: An Investigation into LLM-based Empathic Mental Inference," ASME International Design Engineering Technical Conferences – Design Theory and Methodology Conference, Washington, DC, August 25-28, 2024.

Saadi, J., Yang, M., and **Chong, L.**, "Form Attributes to Measure and Understand Aesthetic Preferences," ASME International Design Engineering Technical Conferences – Design Theory and Methodology Conference, Boston, MA, August 20-23, 2023, 6, V006T06A018. <https://doi.org/10.1115/DETC2023-116601>.

Chong, L. and Yang, M., 2023, "AI vs. Human: The Public's Perceptions of the Design Abilities of Artificial Intelligence," Proceedings of the Design Society: International Conference on Engineering Design, Bordeaux, France, July 24-28, 2023, 3, pp. 495-504. <https://doi.org/10.1017/pds.2023.50>.

Chong, L., Raina, A., Goucher-Lambert, K., Kotovsky, K., and Cagan, J., 2022, “Collaborative Design Decision-Making with Artificial Intelligence: Exploring the Evolution and Impact of Human Confidence in AI and in Themselves,” ASME International Design Engineering Technical Conferences - Design Theory and Methodology Conference, St. Louis, MO, August 14-17, 2022, 6, V006T06A021. <https://doi.org/10.1115/DETC2022-88574>. **Best Paper Award Finalist**

Chong, L., Kotovsky, K., and Cagan, J., 2022, “Are Confidence Designers Good Teammates to Artificial Intelligence?: A Study of Self-Confidence, Competence, and Collaborative Performance,” Proceedings of the Design Society: DESIGN Conference, Virtual, May 23-26, 2022, pp. 1531-1540. <https://doi.org/10.1017/pds.2022.155>.

Chong, L., Goucher-Lambert, K., Kotovsky, K., and Cagan, J., 2022, “Empirically Understanding the Impact of Item Constraints on Designer Ideation,” 2020 Design Computing and Cognition Conference, Virtual, December 14-16, 2020, pp. 3-19. https://doi.org/10.1007/978-3-030-90625-2_1.

Jin, Y. G., **Chong, L.**, and Cho, H. K., 2012, “Designing a Robotics-Enhanced Learning Content for STEM Education,” 2012 9th International Conference on Ubiquitous Robots and Ambient Intelligence, Daejeon, Korea, November 26-28, 2012, pp. 433-436. <https://doi.org/10.1109/URAI.2012.6463032>.

Works in Progress

Chong, L., Schelhaas, B., Zhu, Q., and Yang, M., “Expediting Designers’ User Research Process: Identifying Unarticulated User Needs from Observational Videos using Pose Estimation.”

Chong, L., and Yang, M., “Do We Trust Artificial Intelligence to Design?: Designers and Consumers’ Perceptions of the Design Abilities of Artificial Intelligence.”

Funding

MIT-Google Grant

Title: Learning latent human needs for real-world generative design of physical systems

PIs: Maria Yang, Caitlin Mueller, Funding amount: \$115,000, Funding period: June 1, 2023 to May 31, 2024

- Contributed substantially to the writing of the proposal.
- Working with industry partners to conduct research with both theoretical and practical impact.

Awards & Honors

ASME Design Theory and Methodology Best Paper Award Finalist

August 2022

(Top 5 papers based on reviewer nominations)

Title: Collaborative Design Decision-Making with Artificial Intelligence: Exploring the Evolution and Impact of Human Confidence in AI and in Themselves

Carnegie Mellon University Mechanical Engineering Milton Shaw Ph.D. Research Award

March 2022

(Selected by the faculty and postdoc judges at a Ph.D. Research Symposium poster session)

Carnegie Mellon University Presidential Fellowship

September 2017

Rice President’s Honor Roll

May 2016

VEX Robotics Competition Judges’ Choice Award

November 2015

Teaching Experience

Introduction to Design (2.00)

Fall 2023

Co-Instructor

Massachusetts Institute of Technology, Cambridge, MA

- Core undergraduate class based on hands-on team projects that emphasize creativity and human-centered design.
- Teaching weekly lectures and lab sessions, coordinating and designing two projects with real users, and leading and managing the teaching team (teaching assistants and team lab instructors).

Team Lab Instructor

Fall 2022

- Instructor evaluation score: 7.0/7.0
- Coached student design teams of freshmen and sophomores in mechanical engineering through two team projects and graded their performance.

Numerical Methods in Engineering (24-703)

Fall 2019

Teaching Assistant

Carnegie Mellon University, Pittsburgh, PA

- Led weekly office hours and a C++ programming workshop and assisted the instructor with in-class exercises and project team meetings.

Engineering Design II – Conceptualization and Realization (24-441)

Spring 2018

Teaching Assistant, Chief Technical Officer

Carnegie Mellon University, Pittsburgh, PA

- Provided technical help to students during project team meetings and machine shop sessions and held weekly office hours to answer questions about the design process and concepts, computer-aided design (CAD) methods, and engineering analysis.

Mentoring Experience

Qihao Zhu, Ph.D. visiting student at Massachusetts Institute of Technology *November 2023 – Present*

Booker Schelhaas, Master's student at Massachusetts Institute of Technology *June 2023 – Present*

I-Ping Lo, Master's student at Utrecht University *June 2023 – September 2023*

Jana Saadi, Ph.D. student at Massachusetts Institute of Technology *September 2022 – September 2023*

Krystal Montgomery, Undergraduate student at Massachusetts Institute of Technology *Spring 2023*

Presentations

Conferences

"Form Attributes to Measure and Understand Aesthetic Preferences," ASME International Design Engineering Technical Conferences – Design Theory and Methodology Conference, Boston, MA, August 20-23, 2023.

"AI vs. Human: The Public's Perceptions of the Design Abilities of Artificial Intelligence," International Conference on Engineering Design (ICED), Bordeaux, France, July 24-28, 2023.

"Collaborative Design Decision-Making with Artificial Intelligence: Exploring the Evolution and Impact of Human Confidence in AI and in Themselves," ASME International Design Engineering Technical Conferences (IDETC), St. Louis, MO, August 14-17, 2022.

"Are Confidence Designers Good Teammates to Artificial Intelligence?: A Study of Self-Confidence, Competence, and Collaborative Performance," DESIGN Conference, Virtual, May 23-26, 2022.

"Empirically Understanding the Impact of Item Constraints on Designer Ideation," Design Computing and Cognition (DCC) Conference, Virtual, December 14-16, 2020.

"Designing a Robotics-Enhanced Learning Content for STEM Education," International Conference on Ubiquitous Robots and Ambient Intelligence (URAI), Daejeon, Korea, November 26-28, 2012.

Invited Talks

Emerging Technologies and Methods for Early Stage Product Design and Development, ASME International Design Engineering Technical Conferences (IDETC) Workshop, Boston, MA, August 20, 2023.

Women's Technology Program (WTP) in Mechanical Engineering Showcase, Massachusetts Institute of Technology, Cambridge, MA, August 1, 2023.

Professional & Service Activities

Professional Associations

Design Society

April 2023 – Present

National Postdoctoral Association
American Society of Mechanical Engineers
Society of Women Engineers

September 2022 – Present
June 2018 – Present
August 2013 – Present

Reviewer Activities

Journals: ASME Journal of Mechanical Design

Conferences: ASME IDETC Design Theory and Methodology Conference, International Conference on Engineering Design (ICED), DESIGN Conference

Professional Service Activities

PhD Forum, International Conference on Engineering Design (ICED)
Junior Expert

July 24, 2023
Bordeaux, France

University Service and Involvement Activities

Mechanical Engineering Graduate Student Organization
Secretary, Member

August 2018 – May 2022
Carnegie Mellon University, Pittsburgh, PA

Korean Graduate Student Association
Member

August 2017 – May 2022
Carnegie Mellon University, Pittsburgh, PA

Korean International Student Association
Member

August 2013 – May 2017
Rice University, Houston, TX

Design for America
Project Lead, Member

August 2014 – May 2017
Rice University, Houston, TX

Robotics Club
Head of Internal Relations, Member

August 2015– December 2015
Rice University, Houston, TX

Outreach Activities

Women's Technology Program (WTP) in Mechanical Engineering
Project Mentor

Summer 2023
Massachusetts Institute of Technology, Cambridge, MA

Camp Oakhurst Service Trip: Fostering Community and Erasing Stereotypes Surrounding Disabilities

March 2015
Oakhurst, NJ

Certificates & Training

NSF Workshop for Extreme Design

August 2023
Boston, MA

Kaufman Teaching Certificate

Spring 2023
Massachusetts Institute of Technology, Cambridge, MA

2021 Teaching and Learning Summit

October 2021
Carnegie Mellon University, Pittsburgh, PA

Eberly Center Teaching Seminars

January 2018 – October 2021
Carnegie Mellon University, Pittsburgh, PA

Key Attended Seminars: Supporting Ourselves and Our Students: Navigating Mental Health in the Classroom, Teaching Inclusively: Leveraging Diversity and Promoting Equity in Your Classroom, Guiding Attention and Memory to Build Knowledge, Grading and Delivering Feedback on Quantitative/Writing Assignments

Skills

Programming Languages: Python, C/C++

Software: MATLAB, SolidWorks, Microsoft Office, Adobe Suite, ACT-R

Languages: English (Native), Korean (Native)