

Qiuyu (Luca) Lu

Postdoctoral Researcher
Department of Mechanical Engineering
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Research Interests

My research draws inspiration from nature to develop novel technologies while also exploring ways to give back to nature and sustainably support ‘human-nature symbiosis.’ This commitment is embodied in three key areas: 1) Develop with Nature’s Power: I develop technologies inspired by natural phenomena, creating intelligent devices that reflect the wisdom of the natural world. 2) Deploy for Powering Nature: I explore how smart devices can benefit both humanity and ecosystems, powering nature in ways that are positive, restorative, and sustainable. 3) Design Empowered by AI: I integrate Generative AI to enhance the design of nature-inspired devices, optimizing their applications and democratizing prototyping, leading to impactful solutions for both humanity and nature.

Research Experience

University of California, Berkeley; Postdoctoral Researcher 2024 - Present

- Department of Mechanical Engineering and Berkeley Institute of Design. Advisor: Lining Yao
- Conduct experimental research on AI-enhanced design tools and theoretical research on the ecological morphing system.
- Help run the lab during Lining’s maternity leave after relocating from CMU, including setting up the lab and mentoring junior students.

Carnegie Mellon University, Postdoctoral Researcher 2021 - 2023

- Human-Computer Interaction Institute, School of Computer Science. Advisor: Lining Yao.
- Conduct research on sustainable adaptive systems, focusing on energy harvesting, actuation, and mechanical computation.

Massachusetts Institute of Technology, Visiting Ph.D. Student 2018 - 2019

- Tangible Media Group, Media Lab. Host: Hiroshi Ishii.
- Conduct research on tangible interfaces enabled by pneumatic sensing, actuation, and digital fabrication.

Education

Tsinghua University, Ph.D: Human-Computer Interaction, Advisor: Haipeng Mi 2020

Thesis: Design Methodology and Implementation Techniques for Fluid-Driven Tangible User Interfaces

Tsinghua University, M.A: Science & Design Interdisciplinary Program, Advisor: Haipeng Mi, Yuanchun Shi 2017

Tsinghua University, B.Eng., Mechanical Engineering 2014

Publications


I primarily publish in the field of Human-Computer Interaction, with top-tier venues like the ACM Conference on Human Factors in Computing Systems (**CHI**) and the ACM Symposium on User Interface Software Technology (**UIST**), which have annual acceptance rates of around 20-25% and are known for timely and impactful work.

  : Award  : Contribute as the Corresponding Author * : Equally Contribute

Paper: Published

- **Qiuyu Lu***, Semina Yi*, Mengtian Gan, Jihong Huang, Xiao Zhang, Yue Yang, Chenyi Shen, and Lining Yao. Degrade to Function: Towards Eco-friendly Morphing Devices that Function Through Programmed Sequential Degradation. ACM **UIST**, 2024.

 - Di Wu, Emily Guan, Yunjia Zhang, Hsuanju Lai, **Qiuyu Lu**, Lining Yao. Waxpaper Actuator: Sequentially and Conditionally Programmable Wax Paper for Morphing Interfaces. ACM **CHI**, 2024.

 - **Qiuyu Lu**, Tianyu Yu, Semina Yi, Yuran Ding, Haipeng Mi, Lining Yao. Sustainflatable: Harvesting, Storing and Utilizing Ambient Energy for Pneumatic Morphing Interfaces. ACM **UIST**, 2023. **Best Paper (Honorable Mention), Top 1.5%** of all submissions (7/487).

- ✉ - **Qiuyu Lu**, Haiqing Xu, Yijie Guo, Joey Yu Wang, Lining Yao. Fluidic Computation Kit: Towards Electronic-free Shape-changing Interfaces. ACM CHI, 2023.
- ✉ - Yuxin Peng, **Qiuyu Lu**. Fusing Drama Therapy and Cognitive Behavioral Therapy in a Virtual Reality Setting: An Innovative Strategy for Tackling Maladaptive Lifestyle Habits. ACM CHCHI, 2023
- 🏆 - Tianyu Yu, Mengjia Niu, Haipeng Mi, **Qiuyu Lu**. milliWare: Parametric Modeling and Simulation of Millifluidic Shape-changing Interface. ACM CHCHI, 2023. **Best Short Paper, Top 5%** of accepted papers.
- ✉ - **Qiuyu Lu**, Yejun Liu, and Haipeng Mi. MotionFlow: Time-axis-based Multiple Robots Expressive Motion Programming. ACM CSSE, 2020.
- **Qiuyu Lu**, Jifei Ou, João Wilbert, André Haben, Haipeng Mi, Hiroshi Ishii. milliMorph: Fluid-Driven Thin Film Shape-Change Materials for Interaction Design. ACM UIST, 2019.
- Haipeng Mi, Meng Wang, **Qiuyu Lu**, Yingqing Xu. Tangible user interface: origins, development, and future trends. SCIENTIA SINICA Informationis, 48(4), 390-405, 2018.
- **Qiuyu Lu**, Chengpeng Mao, Liyuan Wang, Haipeng Mi. LIME: Liquid Metal Interfaces for Non-Rigid Interaction. ACM UIST, 2016.
- **Qiuyu Lu***, Jiawei Fang*, Zhihao Yao*, Yue Yang, Shiqing Lyu, Haipeng Mi, Lining Yao. Enabling Generative Design Tools with LLM Agents for Building Novel Devices: A Case Study on Fluidic Computation Interfaces. arXiv:2405.17837
- **Qiuyu Lu**, Lydia Yang, Aditi Maheshwari, Hengrong Ni, Tianyu Yu, Jianzhe Gu, Advait Wadhvani, Andreea Danielescu, Lining Yao, Guttation Monitor: Wearable Guttation Sensor for Plant Condition Monitoring and Diagnosis. arXiv preprint arXiv:2302.04965.


Paper: Under Review

- **Qiuyu Lu**, Semina Yi, Tucker Raegrant, Tianyu Yu, Dinesh Paterl, Lining Yao. Ecological Morphing Systems: Vision, Applications, and Technical Framework.
- **Qiuyu Lu**, Jiawei Fang, Zhihao Yao, Yue Yang, Shiqing Lyu, Lily Yang, Haipeng Mi, Lining Yao. Enabling Generative Design with LLM Agents for Mechanical Computation Devices. Submitted to ACM CHI, 2025.
- Yuecheng Peng, Mako Miyatake, Tyler L Peng, **Qiuyu Lu**, Yue Yang, Lining Yao. BioTube: Designing and Fabricating Biodegradable Hollow Tubular Devices Through Progressive Crosslinking Alginate. Submitted to ACM CHI, 2025
- Hila Mor, Pujita Tangirala, Chia-Jung Kuo, Wai Han, **Qiuyu Lu**, Katherine W Song, Eric Paulos. Gossamer: Designing Moiré Materials for Multi-Property Tunable Interfaces. Submitted to ACM CHI, 2025
- ✉ - Yaning Li, Ziqian Yu, Chengjun Li, Yuexi Chen, Yue Yang, Ziyao He, Bob Tianqi Wei, Tingyu Cheng, Zeyu Yan, Di Wu, Tianyu Yu, Yuecheng Peng, Eldy S. Lazaro Vasquez, Dinesh K. Patel, Huaishu Peng, Nivedita Arora, Aditi Maheshwari, Teng Han, Josiah Hester, Andreea Danielescu, Pedro Lopes, Vikram Iyer, Guanyun Wang, Lining Yao, **Qiuyu Lu**, Meng Li. Shaping Ecological HCI through Materials Design and Fabrication: A Review and Future. Submitted to ACM TOCHI.

Late-Breaking Work, Poster, Workshop, and Demo

- **Qiuyu Lu**. Degrade to Upgrade: Harnessing Programmed Degradation for Sustainable, Evolving Interactive Devices. Concept Paper. Preprints, 2024
- ✉ - Yujia Liu*, Qihang Shan*, Zhihao Yao, and **Qiuyu Lu**. KeyFlow: Acoustic Motion Sensing for Cursor Control on Any Keyboard. Poster. ACM UIST, 2024.
- **Qiuyu Lu***, Jiawei Fang*, Zhihao Yao*, Yue Yang, Shiqing Lyu, Haipeng Mi, and Lining Yao. Large Language Model Agents Enabled Generative Design of Fluidic Computation Interfaces. Poster. ACM UIST, 2024.
- **Qiuyu Lu**, Semina Yi, and Lining Yao. 2024. DeMorph: Morphing Devices Functioning via Sequential Degradation. Demo. ACM UIST, 2024.
- Tianyu Yu, Yang Liu, Yujia Liu, **Qiuyu Lu**, Teng Han, and Haipeng Mi. 2024. FlexEOP: Flexible Shape-changing Actuator using Embedded Electroosmotic Pumps. Demo. ACM UIST, 2024.
- **Qiuyu Lu**, Andreea Danielescu, Vikram Iyer, Pedro Lopes, Lining Yao. Ecological HCI: Reflection and Future. Special Interest Group. ACM CHI, 2024
- Emily Guan, Di Wu, **Qiuyu Lu**, Lining Yao. Design and Simulation Tool for Sequentially and Conditionally Programmable

Waxpaper Morphing Interfaces. Interactivity. ACM CHI, 2024.

- **Qiuyu Lu**, Yi Zhang, Jingtian Fu, Naixuan Du, Yingqing Xu. Color Singer: Composing Music via the Construction of LEGO Blocks with Various Colors. Video Showcase. ACM CHI, 2024.
- **Qiuyu Lu**, Lydia Yang, Aditi Maheshwari, Hengrong Ni, Tianyu Yu, Jianzhe Gu, Advait Wadhvani, Haiqing Xu, Andreea Danielescu, Lining Yao. Guttation Sensor: Wearable Microfluidic Chip for Plant Condition Monitoring and Diagnosis. Late-Breaking Work. ACM CHI, 2024.
- **Qiuyu Lu**, Jifei Ou, Lining Yao, Hiroshi Ishii. milleCrepe: Extending Capabilities of Fluid-driven Interfaces with Multilayer Structures and Diverse Actuation Media. Late-Breaking Work. ACM CHI, 2024.
- **Qiuyu Lu**, Semina Yi, Tianyu Yu, Yuran Ding, Haipeng Mi, Lining Yao. Demonstrating Sustainflatable: Harvesting, Storing and Utilizing Ambient Energy for Pneumatic Morphing Interfaces. Demo. ACM UIST, 2023.
- Di Wu*, **Qiuyu Lu***, Hsuanju Lai, Yunjia Zhang, Lining Yao. Demonstrating Waxpaper Plus: Sequentially and Conditionally Programmable Morphing Wax Fabrics. Interactivity. ACM CHI, 2023.
- **Qiuyu Lu**, Danqing Shi, Yingqing Xu, and Haipeng Mi. MetaLife: Interactive Installation Based on Liquid Metal Deformable Interfaces. Interactivity. ACM CHI, 2020.
-  - **Qiuyu Lu**, Qiuheqi Zhong, Chengpeng Mao, Yejun Liu, Sirui Tan, Haipeng Mi. ZOOO: A Multi-animatronics Stage to Enhance Children's Creativity for Storytelling. Poster. ACM CHCHI, 2016. **Best Poster, Top 5% (1/22)** of accepted posters.

Research Funding

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| 2023 - Present | SCC-PG: Understanding the Technical and Social Challenges and Opportunities of Physically and Digitally Augmented Community Gardens.
The US National Science Foundation (NSF), \$150K
Role: Co-author , Senior Researcher. Initiated the proposal and led the application drafting . |
| 2022 | Center for Shared Prosperity's Research-to-Practice Grant
Carnegie Mellon University, \$10K
Role: Co-advisor. Supported students in this funding applications and guided their research efforts. |
| 2021 - Present | CAREER: Interactive Morphing Materials.
The US National Science Foundation (NSF), \$566K
Role: Core Researcher. Carried out research on sustainable and ecological morphing systems. |
| 2018 - 2023 | Contactless Interaction.
Funded by Alibaba Group. \$685K
Role: Core Researcher. Led the research effort until year 2021 |
| 2016 - 2021 | Large Format High-Resolution Touch Devices.
National Key R&D Program: \$2.4M
Role: Co-author , Core Researcher. Assisted in application drafting and was responsible for developing physical interaction control widgets. |
| 2015 - 2017 | Research on the Theory and Key Technology of Self-driven Touchable User Interface.
National Natural Science Foundation of China, \$35K
Role: Core Researcher. Responsible for the development of non-rigid interfaces. |

Exhibition and Demo

- MetaLife, Interactive Art Installation, **Ars Electronica** Festival and six other exhibitions:
- Fireflies, New Media Art Installation, **Milan Triennale** 21st.
- LIME, Liquid Metal Non-Rigid Interface, UIST Demo, 2016.
- milliMorph, Shape-Changing Thin Film Interface, MIT Member Meeting 2019 spring.
- WaxPaper Plus, Biodegradable Paper Actuator, CHI Demo, 2023.
- Sustainflatable, Energy Harnessing Technology for Pneumatic Morphing Interfaces, UIST Demo, 2023.
- DeMorph, Morphing Devices Functioning vis Sequential Degradation, UIST Demo, 2024.

- FlexEOP, Electroosmotic Soft Shape-changing Interface, UIST Demo, 2024.

Professional Service

Organizer: ACM UIST'2024 Ask-Me-Anything Chair, ACM DIS'2023 Video Chair.

Program Committee Member: ACM UIST'2024, ACM TEI'2025, ACM CHCHI'2023, 24.

Session Chair: ACM UIST'24 Session Chair, ACM CHI'24 Session Chair,

Reviewer: 62 reviews. ACM CHI'2023, 24, 25; ACM UIST'2022, 24; ACM DIS'2023, 24; ACM IUI'2023; ACM TEI'2023, 24, 25; ACM HAI'2017; ACM HRI'2024; ACM CHCHI'2018, 23; IEEE Ro-Man'2022; IEEE VR' 2023.

Selected Keynote:

- MetaLife: Programmable Material Based Interaction Design. Ars Electronica, Austria, 2016.
- Anti-Disciplinary Interaction Design Innovation. Shanghai Jiao Tong University, China, 2019.
- Robot Art and Programmable Materials. Tsinghua University, China, 2020.
- Future Human-Computer Interface: Form and Paradigm. School of Art, Zhejiang University, China, 2020.
- Leveraging Fluidic Morphing Matter to Design Novel Interfaces. Carnegie Mellon University, PA, USA, 2022.
- Morphing Air and Computational Fluid. Nike Global Headquarters, OR, USA, 2023 (co-speaker).
- Sustainable Interface: Energy Harnessing & Mechanical Computation. Tsinghua University, China, 2023.
- Morphing Materials and Sustainable Design. Whipsaw Inc, CA, USA, 2024.

Teaching Experience

- **Smart Hardware Interaction Foundation**, Tsinghua University, 2019. Course Designer, Teaching Assistant.
- **Interaction Technology**, Tsinghua University, 2015, 2017, 2020. Co-Instructor.
- **Tangible Interface Design**, Tsinghua University, 2017. Co-Instructor.
- **05-499/899 Inclusive Tangible and Material Interfaces**, Carnegie Mellon University, 2022. Co-Instructor.
- **05-499/899 Sustainable Design: Materials, Artifacts and Computational Tools**, Carnegie Mellon University, 2022. Guest Lecturer.

Patents

Guide mechanism of tactile image for the blind	ZL201520456072.7	1st Inventor
Magnetron refreshing matrix tactile display	ZL201520456074.6	3rd Inventor
Tactile image dot matrix for the blind	ZL201520456696.9	4th Inventor
Two-dimensional drive platform for tactile image dot matrix	ZL201520455225.6	4th Inventor

Honor and Awards

2023	Best Paper Honorable Mention, ACM UIST	2016	Honorable Mention, International Tangible Interaction Design and Innovation Exhibition
2023	Best Short Paper, ACM CHCHI	2015	Best Hardware Innovation, ACM UIST
2017	Outstanding Graduates, Tsinghua University	2015	The Zhang Dingli Scholarship
2016	National Scholarship	2014	Scholarship of Academic Excellence
2016	Best Poster, ACM CHCHI	2013	Scholarship of Excellent Service

Public Service and Volunteering

I have been actively contributing to promoting diversity and equality for minorities, as well as working to make educational resources more accessible beyond higher education.

For the version with the complete content, please contact me at qiuyulu@berkeley.edu.

Mentoring Experience

Mentored 28 undergraduate and master's students.

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References

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