Zefang Li (he/him/his)

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EDUCATION

Carnegie Mellon University (CMU) Pittsburgh, PA Aug. 2021- May 2023
Master of Science in Mechanical Engineering - Research
- **GPA: 3.98/4.0 Advisors: Prof. Carmel Majidi, Dr. Gina Olson**

U of Michigan-Shanghai Jiao Tong U (SJTU) Joint Institute Shanghai, China Sept. 2017-Aug. 2021
Bachelor of Engineering in Mechanical Engineering, Minor in Computer Science
- **GPA: 3.71/4.0 Ranking: 1/43**

AERA OF EXPERTISE

Research Interests: Soft robotics, Wearable electronics, 3D printing.

Experimental Research
- Experienced in synthesis of liquid crystal elastomer (LCE), and design of LCE materials.
- Material characterization: Differential scanning calorimetry, Dynamic mechanical analysis, ZEISS confocal microscope, GelSight probe, Instron test machine.
- Experienced in fabrication: 3D printing (Hyrel and Voltera for direct ink writing, Formlabs, Objet), laser cutting, molding, planetary mixing, stencil printing.

Simulation/Computation
- CAD/CAM: SOLIDWORKS, EAGLE, AutoCAD.
- Programming: MATLAB, Python, C/C++, R; Machine Learning, Digital control, Signal filtering and processing.

RESEARCH EXPERIENCES

Soft Machines Lab, CMU Aug. 2021-present
MS Researcher, advised by Prof. Carmel Majidi and Dr. Gina Olson

Liquid Crystal Elastomer for Programmable Surface Texture Actuation
- Developed mechanisms that generate wrinkles under electrical stimuli using liquid crystal elastomer (LCE).
- Designed and tested LCE of different mechanical properties, tested different Ag-Ga-In-SIS inks for direct ink writing.
- Fabricated and tested a soft 6-button braille for displaying lower case English characters by displaying wrinkles.

Wirelessly Navigating Soft Robots in Pipes
- Designed and fabricated Ag-Ga-In-SIS conductive heating elements for soft robots via direct ink writing.

Development of Liquid Crystal Elastomer Actuator
- Design LCE formulations and build actuators with low nematic-isotropic phase transition temperature to achieve higher energy efficiency and safety for human-computer interaction.

Mechanics and Robustly Efficient Computation of Evolving Solids Laboratory, SJTU May 2020-May 2021
Research Assistant, advised by Prof. Yongxing Shen

Elastic Solution of Composite Rings
- Derived analytical solutions for different composite flywheel systems under centrifugal loading condition.
- Assisted finite element analysis on the composite flywheel systems using Abaqus.

Active Materials and Intelligent Structure Laboratory, SJTU May 2018-May 2021
Research Assistant, advised by Prof. Yanfeng Shen

Design and Manufacturing of Soft Strain Gauge
- Designed and manufactured a strain gauge based on liquid metal by method of molding and 3D printing.
- Conducted experiments to acquire dynamic strain of the strain gauge and processed its vibrational signal data.

Manufacturing and Testing of Piezoelectric Composite Materials
- Assisted manufacturing of composite material with PVDF and PZT.
- Assisted polarization of composite piezoelectric material.

Development of Impact Monitoring System for Battery Packages
- Built machine learning models on piezoelectric sensor signal features for predicting impact position and energy.

PUBLICATIONS (*: equal contribution)

- **Zefang Li**, Gina Olson, Dinesh K. Patel, Lining Yao, Carmel Majidi, "Electronically Controlled Liquid Crystal Elastomer for Programmable Surface Texture Actuation," submitted to Advanced Intelligent Systems, under revision.
- Yiwen Song*, **Zefang Li***, Jingxian Wang, Mason Zadan, Kushaan Misra, Carmel Majidi, Swarun Kumar, "Low-temperature LCE-based Soft Robot Actuated by Wireless Heating," manuscript in preparation.
- Yiwen Song, Mason Zadan, Kushaan Misra, **Zefang Li**, Jingxian Wang, Carmel Majidi, Swarun Kumar, "Navigating Soft Robots through Wireless Heating," accepted by ICRA 2023.
- Xufei Suo*, Tingkang Wang*, **Zefang Li**, Yongxing Shen, "Elastic Solution for a Rotating Bi-material Ring with Thermal Mismatch," *Mechanics Research Communications*, Volume 113, 2021, 103695, ISSN 0093-6413.

AWARDS & HONORS

MechE MS Summer Research Fellowship	May 2022
Outstanding Teaching Assistant Award, 2019-2020 academic year	June 2021
Outstanding Graduate of Shanghai	May 2021
SJTU B-Class Undergraduate Scholarship for Academic Excellence, 2019-2020 academic year	Nov. 2020
SJTU Undergraduate Academic Progress Scholarship, 2018-2019 academic year	Nov. 2019
SJTU B-Class Undergraduate Scholarship for Academic Excellence, 2018-2019 academic year	Nov. 2019
University of Michigan - Shanghai Jiao Tong University Joint Institute Volunteer Spirit Scholarship	Mar. 2018
First Prize in 30th Chinese Chemistry Olympiad (Preliminary contest)	Sept. 2016

COURSE DESIGNS

Soft Piezoelectric Force Sensor for Cardiac Catheter Ablation Sept. 2021-Jan. 2022
Team leader, instructed by Prof. Cameron Riviere

- Developed a soft force sensor of diameter of 3 mm for a cardiac catheter using soft materials and piezoelectric discs.
- Achieved closed-loop control of the catheter setup using the soft piezoelectric sensor.

Non-contact Thickness Measuring Device for Coating Process in Battery Manufacturing (Undergraduate Capstone Project) May 2021-Aug. 2021
Team Leader

- Led a team of 4 to design, manufacture, and assemble a prototype of a non-contact thickness measuring device that measures battery electrode coating of around 155 μm thick with resolution of ± 0.5 μm and costs less than 100,000 RMB. Designed and assembled the prototype.

TEACHING

Carnegie Mellon University Pittsburgh, PA Aug. 2022-Dec. 2022
Course Assistant

- Work as course assistant for the course "**Machine Learning and Artificial Intelligence for Engineers**".
- Hold recitations and weekly office hours. Set up quiz questions. Grade homework and exams.

Gelfand Outreach Saturday Series Classes, Carnegie Mellon University Pittsburgh, PA Oct. 2022
Outreach Teacher

- Co-taught the class "Engineering Materials for Soft Robotics" for grade 7-9 students.
- Designed a curriculum of hands-on activities with soft material and shape-memory actuators.

University of Michigan-Shanghai Jiao Tong University Joint Institute Shanghai, China Feb. 2019-Aug. 2020
Teaching Assistant

- Worked as teaching assistant for the courses "**Modeling, Analysis and Control of Dynamic Systems**," "**Introduction to Dynamics and Vibrations,**" and "**Branding and Brand Management**".
- Held weekly recitations and office hours. Graded homework and exams.
- Awarded with Basic Teaching Assistant Certificate and Outstanding Teaching Assistant Award.

Haikou Central Elementary School Eryuan, China Dec. 2017-Jan. 2018
Volunteer Teacher

- Designed interactive teaching plans and taught local pupils of grade 2 to 6 English and math.

STANDARD TESTS

• TOEFL iBT:	R30/L30/S23/W27	Total: 110	Obtained: Dec. 26, 2021
• GRE:	V156; 72%/Q170; 96%/AW4.0; 55%	Total: 326	Obtained: July 19, 2020