

JIEFENG SUN

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RESEARCH

- **Robot Design:** Artificial Muscles; Soft Robots; Soft Sensors; Reconfigurable Robots;
- **Modeling and Control:** Physics-based Modeling; Machine Learning-based Modeling and Control; Human-robot Interaction;

ACADEMIC POSITIONS

Postdoctoral Research Associate <i>Yale University</i> Advisor: Prof. Rebecca Kramer-Bettigolio	Jan. 2023 - present <i>New Haven, USA</i>
Postdoctoral Fellow <i>Colorado State University</i> Advisor: Prof. Jianguo Zhao	Aug.–Dec. 2022 <i>Fort Collins, USA</i>

EDUCATION

Ph.D. Robotics and Control <i>Colorado State University</i> Dissertation: Soft and Shape Morphing Robots Driven by Twisted-and-Coiled Actuators Advisor: Prof. Jianguo Zhao	2022 <i>Fort Collins, USA</i>
M.S. Mechanical Engineering <i>Dalian University of Technology</i> Thesis: Dynamic Simulation of a Nuclear Polar Crane with a Seismic Isolation Device Advisor: Prof. Fuzheng Qu	2017 <i>Dalian, China</i>
B.S. Mechanical Engineering (with distinction) <i>Lanzhou University of Technology</i>	2014 <i>Lanzhou, China</i>

HONOR AND SELECTED AWARDS

DARPA Riser (Class of 2022) <i>Defense Advanced Research Projects Agency, USA</i>	2022
DSCD Rising Star <i>ASME Dynamics System and Control Division, USA</i>	2022
Reviewer of the Year 2021 Award <i>Smart Materials and Structures Journal, IOP</i>	2022

ICRA Traveling Award, ACC Traveling Award, CSU Traveling Award	2019, 2022
Finalist, Best Student Paper Award <i>International Conference on Intelligent Robots and Systems (IROS) (Top 6 over 2,700+)</i>	2018
Scott Inaugural Graduate Fellowship <i>Walter Scott, Jr. College of Engineering, CSU</i>	2017
Third Prize in National 3D Innovative Design Competition, China	2012

PUBLICATIONS

Journal Articles

18. **J. Sun**, E. Lerner, B. Tighe, C. Middlemist, and J. Zhao, “Embedded and versatile shape-morphing structures enabled adaptive robots,” *Science Robotics (Under Review)*, 2022
17. **J. Sun** and J. Zhao, “Physics-based modeling of twisted-and-coiled actuators using cosserat rod theory,” *IEEE Transactions on Robotics*, vol. 38, no. 2, pp. 779–796, 2022 [\[PDF\]](#)
16. **J. Sun**, B. Tighe, Y. Liu, and J. Zhao, “Twisted-and-coiled actuators with free strokes enable soft robots with programmable motions,” *Soft Robotics*, vol. 8, no. 2, pp. 213–225, 2021 [\[PDF\]](#)
15. **J. Sun** and J. Zhao, “An adaptive walking robot with reconfigurable mechanisms using shape morphing joints,” *IEEE Robotics and Automation Letters (RAL)*, vol. 4, no. 2, pp. 724–731, 2019 [\[PDF\]](#)
14. S. Spiegel, **J. Sun**, and J. Zhao, “A hybrid wheeling and jumping robot using tensegrity wheels and bi-stable mechanism,” *IEEE/ASME Transactions on Mechatronics (Under review)*
13. W. Wang†, **J. Sun†**, S. Vallabhuni, B. Pawlowski, H. Vahabi, K. Nellenbach, A. C. Brown, F. Scholle, J. Zhao*, and A. K. Kota*, “On-demand, remote and lossless manipulation of biofluid droplets,” *Materials Horizons*, 2022 († Co-first author) [\[PDF\]](#)
12. H. Hsiao, **J. Sun**, H. Zhang, and J. Zhao, “A mechanically intelligent and passive gripper for aerial perching and grasping,” *IEEE/ASME Transactions on Mechatronics*, 2022 [\[PDF\]](#)
11. Y. Tang, Y. Chi, **J. Sun**, T.-H. Huang, O. H. Maghsoudi, A. Spence, J. Zhao, H. Su, and J. Yin, “Leveraging elastic instabilities for amplified performance: Spine-inspired high-speed and high-force soft robots,” *Science Advances*, vol. 6, no. 19, p. eaaz6912, 2020 [\[PDF\]](#)
10. B. Pawlowski, **J. Sun**, J. Xu, Y. Liu, and J. Zhao, “Modeling of soft robots actuated by twisted-and-coiled actuators,” *IEEE/ASME Transactions on Mechatronics*, vol. 24, no. 1, pp. 5–15, 2018 [\[PDF\]](#)

Conference Proceedings

9. A. Singh, **J. Sun**, and J. Zhao, “Fast modeling and shape control of soft robots with koopman operator,” in *2023 American Control Conference (ACC)*. IEEE, Invited Paper, submitted
8. **J. Sun** and J. Zhao, “Modeling and simulation of soft robots driven by artificial muscles: an example using twisted-and-coiled actuators,” in *2022 American Control Conference (ACC)*. IEEE, 2022, pp. 2911–2916 (Invited Paper) [\[PDF\]](#)

7. H. Hsiao, F. Wu, **J. Sun**, and J. Zhao, “A novel passive mechanism for flying robots to perch onto surfaces,” in *2022 IEEE International Conference on Robotics and Automation (ICRA)*. IEEE, 2022, pp. 1183–1189 [\[PDF\]](#)
6. **J. Sun**, B. Tighe, and J. Zhao, “Tuning the energy landscape of soft robots for fast and strong motion,” in *2020 IEEE International Conference on Robotics and Automation (ICRA)*. IEEE, 2020, pp. 10 082–10 088 [\[PDF\]](#)
5. **J. Sun** and J. Zhao, “Integrated actuation and self-sensing for twisted-and-coiled actuators with applications to innervated soft robots,” in *2020 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*. IEEE, 2020, pp. 8795–8800 [\[PDF\]](#)
4. **J. Sun**, B. Pawlowski, and J. Zhao, “Soft manipulators with programmable motion using twisted-and-coiled actuators (conference presentation),” in *Electroactive Polymer Actuators and Devices (EAPAD) XXI*, vol. 10966. International Society for Optics and Photonics (SPIE), 2019, p. 109660Q [\[PDF\]](#) [\[Video\]](#)
3. H. Zhang, **J. Sun**, and J. Zhao, “Compliant bistable gripper for aerial perching and grasping,” in *2019 International Conference on Robotics and Automation (ICRA)*. IEEE, 2019, pp. 1248–1253 [\[PDF\]](#)
2. B. Pawlowski, **J. Sun**, and J. Zhao, “Dynamic modeling of soft manipulators actuated by twisted-and-coiled actuators,” in *2018 IEEE Conference on Decision and Control (CDC)*. IEEE, 2018, pp. 409–414 [\[PDF\]](#)
1. **J. Sun**, B. Pawlowski, and J. Zhao, “Embedded and controllable shape morphing with twisted-and-coiled actuators,” in *2018 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*. IEEE, 2018, pp. 5912–5917 (**Best Student Paper Award Finalist**) [\[PDF\]](#)

Patents

2. H. Zhang, J. Zhao, and **S. Jiefeng**, “Compliant bistable gripper for aerial perching and grasping,” Sep. 29 2020, US Patent 10,787,259 [\[PDF\]](#)
1. F. Qu, T. Sun, and **S. Jiefeng**, “An experimental crane for college labs,” Sep. 2017, issued by National Intellectual Property Administration, PRC. CN ZL201510528289.9

PROPOSAL DRAFTING EXPERIENCE

3. In preparation: writing a proposal as a **CO-PI** with Prof. Jianguo Zhao: “Mechanical and Control Co-design of Soft Robots driven by Artificial Muscles”. **National Science Foundation, FRR.(\$0.5M)**. I am drafting the whole proposal under the supervision of Prof. Jianguo Zhao.
2. Drafted a grant proposal led by Prof. Jianguo Zhao and Prof. Jie Yin: “Adaptive, Rapid, and Multifunctional Soft Robots (ARM SoRo) with Reconfigurable Shapes and Motions Enabled by Tunable Elastic Instabilities””. **National Science Foundation, CMMI. (\$0.7M). Status: funded, 2021**. I provided 50% preliminary results and drafted 25% of the proposal.
1. Drafted a grant proposal led by Prof. Jianguo Zhao: “Embedded and Continuous Shape Morphing using Twisted-and-Coiled Artificial Muscle”. **National Science Foundation,**

CRII: RI (\$0.2M). Status: funded, 2018. I provided 80% preliminary results and drafted 30% of the proposal.

INDUSTRIAL EXPERIENCES

Dalian Huarui Heavy Industry (Dalian, China)

Jun. 2015 – Jun. 2016

- *Intern - Project: An experimental crane for college labs*

TEACHING EXPERIENCE

- **Co-instructor** - *Colorado State University*
MECH 564: Fundamentals of Robot Mechanics and Controls. Developed new curriculum [Course Website](#). Spring, 2022.
MECH 568: Bio-inspired Robotics. Taught lectures about soft robots and models. Fall, 2021.
- **Teaching Assistant** - *Colorado State University*
MECH 564: Fundamentals of Robot Mechanics and Controls. Spring, 2020, 2021.
- **Teaching Assistant** - *Dalian University of Technology*
Hydraulic Transmission and Control, Spring, 2016.

INVITED TALKS AND PRESENTATION

Invited Talks

3. “Physics-Based Modeling of Twisted-and-Coiled Actuators for Programmable Soft Robots”, *ASME-DSCD rising star talk*, Modeling, Estimation and Control Conference, Jersey City, Oct. 2022.
2. “Soft and Shape Morphing Robots Enabled by Twisted-and-Coiled Actuators”, *Faculty Candidate Talk*, University of Louisville, Aug. 2022.
1. “Soft and Shape Morphing Robots Enabled by Twisted-and-Coiled Actuators”, *MEMS Seminar*. Yale University, Jul. 2022.

Conference Presentation

8. “Modeling and simulation of soft robots driven by artificial muscles”. *2022 American Control Conference (ACC)*. Atlanta, USA. June 2022.
7. “Physics-based modeling of twisted-and-coiled actuators using Cosserat rod theory” *IEEE International Conference on Robotics and Automation (ICRA)*. Philadelphia, USA. May 2022.
6. “A Mechanically Intelligent and Passive Gripper for Aerial Perching and Grasping”, *2nd International Conference on Embodied Intelligence (ICEI)*. Virtual . Mar 2022.
5. “Integrated actuation and self-sensing for twisted-and-coiled actuators with applications to innervated soft robots”, *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*. Virtual. Oct. 2020.
4. “Tuning the energy landscape of soft robots for fast and strong motion”, *IEEE International Conference on Robotics and Automation (ICRA)*. Virtual. May 2020.

3. “Versatile and controllable shape morphing using twisted-and-coiled actuators”, *APS March Meeting*. Denver, USA. Mar. 2020.
2. “Soft manipulators with programmable motion using twisted-and-coiled actuators”, *SPIE: Electroactive Polymer Actuators and Devices (EAPAD) XXIV conferences*. Denver, USA. May 2019.
1. “An adaptive walking robot with reconfigurable mechanisms using shape morphing joints”, *IEEE International Conference on Robotics and Automation (ICRA)*. Montreal, Canada. May 2019.

MEDIA COVERAGE (SELECTED)

1. **Popular Science magazine:** [This robot’s delicate touch scoops up liquid droplets](#) (11/25/2022)
2. **TechXplore:** [Artificial muscle made of sewing thread enables new motions for soft robots](#) (07/13/2020)
3. **Science Daily:** [Inspired by cheetahs, researchers build fastest soft robots yet.](#) (05/08/2020)
4. **Engadget:** [Soft robots can now run like cheetahs and swim like marlins](#) (05/08/2020)
5. **Phys.org:** [These robots are small, shape-shifting, and they adapt to their surroundings.](#) (03/06/2019)
6. **TechXplore:** [Shape-morphing joints allow these small robots to ace obstacles](#) (02/20/2019)
7. **Futurism:** [See a Robot Melt its Own Bones To Avoid Obstacles: That’s Pretty Metal](#) (02/13/19)
8. **HighTechdeck:** [Adaptive Robot Melts & Solidifies Its Bones on the Fly to Avoid Obstacles](#) (02/13/2019)
9. **IEEE Spectrum:** [Robot Melts Its Bones to Change How It Walks.](#) (02/12/2019)

PROFESSIONAL ACTIVITIES

- **Panel Reviewer** for the 2023 NSF GRFP (Graduate Research Fellowship Program)
- **Associate Editor** of 2023 IEEE/RSJ International Conference on Robotics and Automation (ICRA) in soft robotics
- **Reviewer** (Reviewed 70+ papers from 18 journals and international conferences.)
 - **Journals:** IEEE Transactions on Robotics (T-RO); IEEE/ASME Transactions on Mechatronics (T-Mech); Bioinspiration & Biomimetics (B&B); Smart Materials and Structures (SMS) ; Sensors and Actuators: A. Physical (SNA); IEEE/RSJ Robotics and Automation Letters (RA-L); IEEE Transactions on Industrial Electronics (T-IE); IEEE Access;

- **International Conferences:** IEEE/RSJ International Conference on Robotics and Automation (ICRA) 2018-; IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) 2019-; IEEE/ASME International Conference on Advanced Intelligent Mechatronics(AIM) 2018-; American Control Conference (ACC) 2021-; IEEE International Conference on Soft Robotics (RoboSoft) 2019-

MENTORING, LEADERSHIP AND ACTIVITIES

- **Student Research Mentor:** Clint Middlemist (Jan. 2021 –), Sydney Spiegel (Aug. 2019 -), Jolan von Plutzner (Jan. – Mar. 2018), Brandon Tighe (Jun. 2018 – May 2022), Feiyu Wu (Aug. 2020 –)
- **Vice Chair of the Pingpong Association at Dalian University of Technology** (Jul. 2015 - Jul. 2016): Responsible for organizing competitions for over 200 students
- **Team Leader** in 5th National 3D Innovative Design Competition, China