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

Assistant Professor **Jan. 2024 - Present**
Arizona State University *Tempe, USA*

Postdoctoral Research Associate **Jan.- Dec. 2024**
Yale University *New Haven, USA*
Advisor: Prof. Rebecca Kramer-Bettigolio

Postdoctoral Fellow **Aug.–Dec. 2022**
Colorado State University *Fort Collins, USA*
Advisor: Prof. Jianguo Zhao

EDUCATION

Ph.D. Robotics and Control **2022**
Colorado State University *Fort Collins, USA*
Dissertation: Soft and Shape Morphing Robots Driven by Twisted-and-Coiled Actuators
Advisor: Prof. Jianguo Zhao

M.S. Mechanical Engineering **2017**
Dalian University of Technology *Dalian, China*
Thesis: Dynamic Simulation of a Nuclear Polar Crane with a Seismic Isolation Device
Advisor: Prof. Fuzheng Qu

B.S. Mechanical Engineering (with distinction) **2014**
Lanzhou University of Technology *Lanzhou, China*

HONOR AND SELECTED AWARDS

DARPA Riser (Class of 2022) 2022
Defense Advanced Research Projects Agency, USA

DSCD Rising Star 2022
ASME Dynamics System and Control Division, USA

Reviewer of the Year 2021 Award 2022
Smart Materials and Structures Journal, IOP

ICRA Traveling Award, ACC Traveling Award, CSU Traveling Award 2019, 2022

Finalist, Best Student Paper Award 2018
International Conference on Intelligent Robots and Systems (IROS) (Top 6 over 2,700+)

Scott Inaugural Graduate Fellowship 2017
Walter Scott, Jr. College of Engineering, CSU

Third Prize in National 3D Innovative Design Competition, China 2012

PUBLICATIONS

Journal Articles

19. Z. Chen, **J. Sun**, and J. Zhao, "Tuning Modules With Elastic Instabilities On-the-Fly for Reconfigurable Shapes and Motions," *IEEE/ASME Transactions on Mechatronics*, pp. 1–11, 2024

18. **J. Sun**, E. Lerner, B. Tighe, C. Middlemist, and J. Zhao, "Embedded shape morphing for morphologically adaptive robots," *Nature Communications*, vol. 14, no. 1, p. 6023, Sep. 2023

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, 2021 [PDF]

16. W. Wang, **J. Sun**, S. Vallabhuneni, 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*, vol. 9, no. 11, pp. 2863–2871, 2022 († Co-first author)[PDF]

15. **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]

14. **J. Sun** and J. Zhao, "An Adaptive Walking Robot With Reconfigurable Mechanisms Using Shape Morphing Joints," *IEEE Robotics and Automation Letters*, vol. 4, no. 2, pp. 724–731, Apr. 2019 [PDF]

13. 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*, vol. 27, no. 6, pp. 5243–5253, Dec. 2022 [PDF]

12. 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, May 2020 [PDF]

11. 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

10. **J. Sun**, B. Lin, L. A. Ramirez, E. Figueroa, R. Baines, B. Yang, E. Marroquin, and R. Kramer-Bottiglio, "Performance Enhancement of a Morphing Limb for an Amphibious Robotic Turtle," in *2024 IEEE 7th International Conference on Soft Robotics (RoboSoft)*, Apr. 2024, pp. 374–379

9. A. Singh, **J. Sun**, and J. Zhao, "Controlling the Shape of Soft Robots Using the Koopman Operator," in *2023 American Control Conference (ACC)*, May 2023, pp. 153–158

8. **J. Sun** and J. Zhao, "Modeling and Simulation of Soft Robots Driven by Embedded Artificial Muscles: An Example using Twisted-and-Coiled Actuators," in *2022 American Control Conference (ACC)*. Atlanta, GA, USA: IEEE, Jun. 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 International Conference on Robotics and Automation (ICRA)*. Philadelphia, PA, USA: IEEE, May 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)*, May 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. SPIE, Mar. 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)*. Montreal, QC, Canada: IEEE, May 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)*. Miami, FL, USA: IEEE, Dec. 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

1. H. Zhang, J. Zhao, and **J. Sun**, "Compliant Bistable Gripper for Aerial Perching and Grasping," Patent, May, 2019 [PDF]

INVITED TALKS AND PRESENTATION

Invited Talks

2. "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.

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

- **Reviewer** 2022, 2023 NSF
- **Associate Editor** of 2023 IEEE/RSJ International Conference on Robotics and Automation (ICRA) in soft robotics
- **Reviewer** (Reviewed 80+ 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-