Jiaqi Zhu

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Southern University of Science and Technology, Shenzhen City, Guangdong Province, China

EDUCATION

Huazhong University of Science and Technology (HUST) 09/2019-06/2022

- **Master of Engineering** in **Mechatronics**
- Advisor: Prof. Zhigang Wu
- Overall GPA: 89.74/100; Rank: **11**/100
- Scholarship: **China National Scholarship** for Graduates **(0.2%)**; **CASC Scholarship (1%)**; **Chiang Chen Scholarship(1%)** in 2019 and 2020; **First-class Academic Scholarship** in 2019, 2020, and 2021

Yanshan University (YSU) 09/2015-06/2019

- **Bachelor of Engineering** in **Mechanical Design and Manufacturing**
- Overall GPA: 3.74/4.5; Rank: **1**/88
- Scholarship: **China National Scholarship** for Undergraduates **(0.17%)**; **First-class Scholarship** seven times from 2015 to 2019

PROFESSIONAL EXPERIENCE

Southern University of Science and Technology (SUSTech) 07/2022-Present

- **Visiting Scholar** in **Department of Materials Science and Engineering**
- Supervisor: Prof. Chuanfei Guo, Prof. Zhigang Wu

RESEARCH INTERESTS

Soft robotics and stretchable electronics:

- Combining the soft and rigid structures to obtain high-performance robots
- Constructing softer, simpler and more efficient controller/computing system to replace the traditional rigid ones in some scenarios
- Developing high-performance and new-concept soft robotic skins to enable robotic perception and facilitate further fusion of sensing and robotic physical bodies

PUBLICATIONS

Full list: https://www.researchgate.net/profile/Jiaqi-Zhu-38

Journal Papers

1. **J. Zhu**, Z. Chai, H. Yong, Y. Xu, C. Guo, H. Ding, Z. Wu. Bio-inspired multi-modal multi-pose hybrid fingers for wide-range force, compliant and stable grasping. *Soft Robotics*, 2022.
2. **J. Zhu**, L. Lyu, Y. Xu, H. Liang, X. Zhang, H. Ding, Z. Wu. Intelligent soft surgical robots for next-generation minimally invasive surgery. *Advanced Intelligent Systems*, 2021, 3(5): 2100011. (Cover)
3. **J. Zhu**, M. Pu, W. Fei, H. Chen, Y. Xu, H. Ding, Z. Wu. Pneumatic and tendon actuation coupled muti-mode actuators for soft robots with broad force and speed range. *Science China Technological Sciences*, 2022.
4. **J. Zhu,** H. Chen, Z. Chai, H. Ding, Z. Wu. Curved-origami-based dual-mode hybrid gripper with wide-range tunable contact stiffness for universal and compliant grasping. *Soft Robotics.* (In preparation)
5. Y. Xu*, **J. Zhu***, H. Chen, H. Ding, Z. Wu. Magnetic liquid metal droplet enabled soft reconfigurable circulator for multifunctional control of soft robots. *Advanced Materials*. (Co-first author, In preparation)
6. B. Huang, Z. Chai, **J. Zhu**, Z. Wu. One-step soft templated selective milling-based circuit patterning for eco-friendly and high-throughput manufacturing of flexible electronics. *Advanced Materials Technologies*, 2022: 2200092.
7. Z. Chai, X. Ke, H. Chen, **J. Zhu**, H. Yong, J. Jiang, S. Zhang, C. Guo, Z. Wu. Anisotropic shear-sensitive tactile sensors with programmable elastomers for robotic manipulations. *ACS Applied Materials & Interfaces*, 2021, 13(43): 51426-51435.
8. Z. Chai*, L. Lyu*, M. Pu, X. Chen, **J. Zhu**, H. Liang, H. Ding, Z. Wu. An Individually Controlled Multitined Expandable Electrode Using Active Cannula-Based Shape Morphing for On-Demand Conformal Radiofrequency Ablation Lesions.

Advanced Intelligent Systems, 2021: 2100262. (Cover, Promoted on Advanced Science News)

9. X. Ke, J. Jiang, Z. Chai, H. Yong, **J. Zhu**, H. Chen, C. Guo, H. Ding, Z. Wu. Stiffness preprogrammable soft bending pneumatic actuators for high-efficient, conformal operation. *Soft Robotics*, 2021, 2(7): 1-28.

Conference Papers

10. **J. Zhu**, W. Fei, H. Ding, Z. Wu. Pressure and tendon actuation integrated three-finger soft gripper for wide force and speed range grasping. in: 2021 27th International Conference on Mechatronics and Machine Vision in Practice (*M2VIP*), Shanghai, China, 26-28 Nov. 2021, Proceedings of the IEEE, 2021: 682-687. (Oral)
11. Y. Xu, **J. Zhu**, H. Chen, Z. Wu. Manipulation of oxidized liquid metal in microfluidic chip for soft robotic system applications[C]. in: 2021 25th International Conference on Miniaturized Systems for Chemistry and Life Sciences (*MicroTAS*), Palm Springs, California, USA, 10-14 Oct. 2021, Chemical and Biological Microsystems Society, 2021. (Poster)
12. Z. Chai, X. Ke, H. Chen, **J. Zhu**, C. Guo, Z. Wu. Uniformly distributed self-filling micro-strips for high-performance pressure-sensitive sensor[C]. in: 2021 IEEE 16th International Conference on Nano/Micro Engineered and Molecular Systems (*NEMS*), Xiamen, China, 25-29 Apr. 2021, Proceedings of the IEEE, 2021: 1390-1393. (Oral)

PATENTS

Full list: http://www.soopat.com/Home/Result?SearchWord=朱嘉淇

23 China Invention Patents (12 have been licensed)

11 China Utility Model Patents/China Software Copyright (all have been licensed)

Recent Patents

1. Zhigang Wu, **Jiaqi Zhu**, Qin Jiang, Xingxing Ke. Soft manipulator for nucleic acid sampling. *PatentNo. 202010244081.5*
2. **Jiaqi Zhu**, Yi Xu, Zhigang Wu, Han Chen, Luning Geng. A liquid-metal-based microfluidic chip for logic control of soft robots. *PatentNo. 202110921103.1*
3. Zhigang Wu, **Jiaqi Zhu**, Ziqi Jin. A soft material 3D printer leveling device with both manual and automatic modes. *PatentNo. 202010354351.8*
4. Zhigang Wu, **Jiaqi Zhu**, Ziwei Zhu. A platform automatic cleaning device for soft material 3D printer. *PatentNo. 202010354237.5*
5. Zhigang Wu, **Jiaqi Zhu**, Chen Sun, Yi Xu, Ziwei Zhu. An electromagnetically driven rigid-soft coupling endoscope. *PatentNo. 202010448505.X*
6. Zhigang Wu, **Jiaqi Zhu**, Ziwei Zhu, Yi Xu. A simple controller for soft endoscope. *PatentNo. 202010449604.X*
7. Zhigang Wu, **Jiaqi Zhu**, Ziwei Zhu. A rigid-soft coupled pneumatic robotic gripper. *PatentNo. 202010478821.1*
8. Zhigang Wu, **Jiaqi Zhu**, Haochen Yong, Bingkang Huang. A power-generating speed bump based on staggered hydraulic drive. *PatentNo. 202011175366.4*
9. Zhigang Wu, **Jiaqi Zhu**, Han Chen. A bionic finger with multiple compliant switching poses. *PatentNo. 202110599328.X*
10. Zhigang Wu, Bingkang Huang, **Jiaqi Zhu**. A template-cutting-based roll-to-roll patterned flexible electronic manufacturing equipment. *PatentNo. 202010329321.1*
11. Zhigang Wu, Bingkang Huang, **Jiaqi Zhu**. A chip sorting equipment. *PatentNo. 202010462005.1*
12. Zhigang Wu, Zhiping Chai, Xingxing Ke, **Jiaqi Zhu**. Design and fabrication of a soft pressure sensor with convex hemispheric structure. *PatentNo. 202010554658.2*
13. Zhigang Wu, Bingkang Huang, **Jiaqi Zhu**. High-Throughput fabrication of thin film bending actuator. *PatentNo. 202010900993.3*
14. Zhigang Wu, Zhiping Chai, Xingxing Ke, **Jiaqi Zhu**. Design and fabrication of a soft sensor with tangential force anisotropic response. *PatentNo. 202110509009.5*
15. Zhigang Wu, Han Chen, **Jiaqi Zhu**, Yi Xu, Zhiping Chai. A curved-origami-based hybrid gripper with variable contact stiffness. *PatentNo. 202210540724.X*
16. Zhigang Wu, Zhisheng Xia, **Jiaqi Zhu**. Friction-locking-based joint stiffness change method. *PatentNo. 202210523193.3*

SELECTED HONORS AND AWARDS

Postgraduate Period

- China National Scholarship for Graduates **(0.2%)**
- Chiang Chen Scholarship **(1%)** in 2019 and 2020
- First-class Academic Scholarship **(12%)** in 2019, 2020, and 2021
- Merit Students **(10%)** in 2020 and 2021
- 1st price in 2020 National Post-Graduate Robotic Innovation Design Competition **(0.6%, Leader)**
- 1st price in iCANX SUMMIT 2022 Outstanding Student Paper **(4%, First-author)**
- 2nd price in 2020 National Post-Graduate Mathematical Contest in Modeling **(15%)**
- 2nd price in 2020 National Post-Graduate Competition of Energy Equipment Innovation Design **(9%, Leader)**
- 2nd price in 2021 Competition of Soft Robot Innovation Design **(Ranked second in 20+ groups, Leader)**
- Top 0.25% in 2020 HUAWEI Code Craft **(Obtained the HUAWEI Computer-based Test-exempt Card)**
- 3rd price in 2020 National Post-Graduate Competition of Energy Equipment Innovation Design **(18%)**

Undergraduate Period

- China National Scholarship for Undergraduates **(0.17%)**
- Provincial Most Outstanding Student **(10 people in the province, 1 people in whole school)**
- First-class Scholarship **(1.7%)** seven times from 2015 to 2019
- 1st price in 2018 National College Mechanical Innovation Competition **(0.05%, Leader)**
- Creativity Award of 2018 China Good Design Award **(30 group in China, Leader)**
- 1st price in 2017 National College Mechanical Products Digital Design Competition **(1%, Leader)**
- 1st price in 2017 National College Advanced Mapping Technology and Product Information Modeling Competition **(2%, Individual award)**

SELECTED RESEARCH EXPERIENCE

Ultra-Flexible Electronics Lab, Southern University of Science and Technology 07/2022-Present

Supervised by Prof. Chuanfei Guo and Prof. Zhigang Wu

Project Co-leader, **Soft Prosthetic Hand with Integrated Soft Sensor**

- Constructed a soft prosthetic hand system based on pneumatic actuation, which can well imitate the diverse poses of human hand and has an overall weight of 500g.
- Proposed a new type of soft capacitive sensor, which for the first time eliminate the sensing signal hysteresis caused by the soft material viscous property.
- Closely interlinked the interfaces inside the soft sensor and between the sensor and the soft finger based on topological interlink principle, to realize the integration of soft system with actuating and sensing functions.

Soft Intelligence Lab, Huazhong University of Science and Technology 09/2019-06/2022

Supervised by Prof. Zhigang Wu

Project Initiator and Leader, **Bioinspired Multimodal Multipose Hybrid Grippers**

- Proposed a pneumatic-based soft-rigid collaborative strategy. The two-finger gripper derived from it can not only safely pinch potato chips, but also stably lift 27 kg dumbbells (Its maximum holding force has far exceeded the current finger-based soft/hybrid grippers).
- For the first time, introduced the multiple poses of human fingers into robotic finger design. The two-finger gripper derived from it can achieve excellent compliance while ensuring its wide output force range.
- Proposed a design method to achieve high stability by parallel soft-rigid structures. The two-finger gripper derived from it proved to be highly stable under gravity and external stimuli, e.g. sudden speed changes and impacts.
- Published a paper on Soft Robotics, applied two invention patents, won a series of awards including the 1st price in 2020 National Post-Graduate Competition of Robot Innovation Design.
- The graduation project ranked first in the 20-person group with a score of 96.

Project Co-initiator and Leader, **Magnetic Liquid Metal Droplet Enabled Soft Reconfigurable Circulator**

- Designed a soft reconfigurable circulator to realize the logic, programming and adaptive control of soft robots through the cyclic motion of the magnetic liquid metal droplet (MLMD) in it.

- Introduced a one-step, cost-effective strategy applying ultraviolet laser micro machining method to overcome the stickiness problem and achieve controllable motion of MLMD outside liquid environment.
- Conducted the characterization of controlled motion and extreme deformation (shape variation, splitting and merging) of MLMD, and explained the mechanism based on experimental results.
- Presented the SRCs' multifunctional control with three different demonstrations: a soft logic control based grasping function diagnosis, integrated re-programmable control of a soft car and self-adaptive control of a soft sorting gripper.
- Presented the preliminary work at MicroTAS2021, and preparing to submit to Advanced Materials.

School of Mechanical Engineering, Yanshan University 01/2019-07/2019

Supervised by Prof. Zhigang Wu and Prof. Fugang Zhai

Graduation Project, **Design, Manufacture and Application of Soft Material 3D Printer**

- Independently designed, selected and built a soft material FDM 3D printer, completed its control system construction and program debugging, and proposed a printing table with automatic cleaning and leveling functions (applied two invention patents).
- Optimized the structure and working parameters of two optional mixed-flow nozzles (active and passive) respectively with Comsol.
- Theoretically and experimentally studied the relationship between the printing parameters and filament properties of the printer, and summarized the control equations for different filament output characteristics.
- Experimentally explored the relationship between the composition ratio of silicone material and its stiffness, and further developed a plug-in based on Cure slicing software to achieve continuous and seamless variable stiffness 3D printing.
- The graduation project ranked first in the group of 30+ people with a score of 95.6.

REVIEWER FOR JOURNALS AND CONFERENCES

- Soft Robotics
- 2021 27th International Conference on Mechatronics and Machine Vision in Practice (M2VIP2021)

ACTIVITIES

Association of Sci. & Tech. Innovation, School of Mechanical Engineering, Yanshan University

Technical Lead to Vice President 09/2016-06/2018

- Worked across departments to maintain the daily operations, managed four teams within the association, and planned all kinds of activities and competitions at the school level.
- Proposed and organized open classes of SolidWorks, and participated in editing the SolidWorks textbook for the Class of 2020.

School of Mechanical Engineering, Yanshan University

Class Commissary in Charge of Studies 09/2015-06/2019

- Participated in the class management and the organization of various class activities, and coordinate the relationship between students.
- Assisted in the collection, distribution, and correction of classmates' coursework, and helped to improve the academic performance of class members.

SKILLS

- Programming & Languages: C/C++(4 yrs), Python (4 yrs), VB (2 yrs), JAVA (1 yr); Keil (6 yrs), VS (3 yrs), VC (3 yrs)
- Modeling & Drawing: SolidWorks (7 yrs), Inventor (4 yrs), CAD (4 yrs), CAXA (4 yrs), CorelDRAW (3 yrs)
- Data Analysis: Origin (3 yrs), Excel (7 yrs)
- Analysis & Simulation: Matlab (6 yrs), ANSYS (5 yrs), COMSOL (3 yrs), ABAQUS (3 yrs)
- Image & Video Processing: PR (6 yrs), PS (4 yrs)

HOBBIES

Music (NetEase musician & VOCALOID tuner); Zheng (tenth level); Drawing (sketch, watercolour, and stick figures); Public Speaking