

## YAYUN DU

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fluid-structure interaction  
Control  
Artificial Intelligence  
Circuit  
Design  
robotics  
buckling  
learning  
Flagella  
Optimization  
biomechanics

## PROFILE HIGHLIGHTS

- ❑ **Publications and Patent:** Published or submitted six first-authored articles and two co-authored articles within 2.5 years in top journals and conference proceedings in robotics. Several more are in preparation. Obtained a provisional patent about the under-canopy agricultural robot.
- ❑ **Mentorship and Inclusion:** Supervised twelve undergraduate students, including four female students and two community college transfer students. Co-authored peer reviewed papers with eight supervisees. Out of these supervisees, Zihang Zhao and Karunesh Schanandani later joined UCLA as PhD students, Andrew Miller joined graduate school at Stanford in Fall 2021, and Jingyi Chen joined Cornell and Jacqueline Lam joined UCLA as graduate students. Bhruhu Mallajosyula joined General Motors and Angeline Liu joined JPL.
- ❑ **Grant Writing:** Gathered preliminary data for a successful \$450k federal grant from US Department of Agriculture. Prepared ~ 33% of an NSF proposal with four PIs (\$1.2M) that received ratings of Very Good, Very Good, Very Good/Good, and Fair (eventually declined because of lacking robust localization algorithm). Resubmitted this proposal based on my research update.
- ❑ **Teaching and Leadership:** Averaged 8.0/9.0 on student evaluations in five courses across five departments, with departmental averages of ~ 7.2/9.0. Co-founder of Student Researchers United (SRU) at UCLA to waive nonresidential fees for international researchers and advocates for them. Conference planner and event coordinator of Southern California Robotics Symposium 2020, at UCLA (postponed due to COVID-19).

## EDUCATION

**University of California, Los Angeles, CA**

**Ph.D.** (Mechanical Engineering)

Major: System and Control

Minor: Structural and Solid Mechanics

**M.S.** (Mechanical Engineering)

GPA: 3.74/4.0

12/2018 - 03/2022 (expected)

09/2016 - 02/2018

**Harbin Institute of Technology, Heilongjiang, China**

**B.S.E.** (Automotive Engineering)

Ranking: 1/144

09/2012 - 07/2016

## RESEARCH EXPERIENCE

**Structure-Computer Interaction Lab, UCLA, Los Angeles, CA**

Graduate Research Assistant

Research area: robot design, modeling and control, biolocomotion, learning, agriculture robot, SLAM

04/2018 - present

Advisor: Prof. M. Khalid Jawed

**Biomechatronics Lab, UCLA, Los Angeles, CA**

Assistant in Research

Research area: FEA model enabling BioTac haptic sensor, sensation of touch through supervised learning-FEA

04/2017 - 04/2018

Advisor: Prof. Veronica Santos

**New Energy Vehicle Research Institute, Harbin Institute of Tech, Harbin, China**

Assistant in Research

Research area: distributed vehicle system control, alternative fuel vehicle

07/2014 - 08/2016

Advisor: Prof. Dafang Wang

## PEER-REVIEWED PUBLICATIONS AND PROCEEDINGS

# indicates students supervised or mentored by Yayun Du; Red boxes indicate the most relevant work to soft robotics.

- W1. **Du, Y.**, Mallajosyula, B.#, Sun, D.#, Chen, J.#, Zhao, Z.#, Rahman, M., Quadir, M., Jawed, M. K., “A Low-cost Robot with Autonomous Recharge and Navigation for Weed Control in Fields with Narrow Row Spacing”, *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, Prague, Czech Republic, 2021. (Finalists for **Best Paper Award on Agri-Robotics, Best Paper Award on Robot Mechanisms and Design**)  
URLs: <https://youtu.be/QjwI7DM3CIg>,  
[https://youtu.be/-m\\_t2uBjU\\_I](https://youtu.be/-m_t2uBjU_I)
- W2. **Du, Y.**, A., Miller#, Jawed, M. K., “Simple Flagellated Soft Robot for Locomotion near Air-Liquid Interface”, *IEEE International Conference on Soft Robotics (RoboSoft)*, Yale, CT, 2021  
URL: <https://arxiv.org/abs/2103.05712>
- W3. **Du, Y.**, Deng, Z. #, Fang, Z.#, Wang, Y.#, Nagata, T.#, Bansal, K., Quadir, M., Jawed, M. K., “Vision and force based autonomous coating with rollers”, *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, Las Vegas, NV, USA, pp. 9954-9960, 2020  
URLs: <http://doi.org/10.1109/IROS45743.2020.9341619>,  
<https://www.youtube.com/watch?v=upDizLiNd2s>
- W4. Qin, L., Huang W., **Du, Y.**, Zheng, L., “Genetic algorithm-based inverse design of elastic gridshells”, *Structural and Multidisciplinary Optimization*, 62(5), pp.2691-2707, 2020.  
URL: <https://doi.org/10.1007/s00158-020-02639-8>
- W5. Wang, D., Zhou, C., Zou, M., Liao, J., **Du, Y.**, “Study on Inspection of the Initial Rotor Position of BLDC Based on High-frequency Signal Injection”, *IEEE Transportation Electrification Conference and Expo Asia-Pacific*, pp. 1-4, 2014.  
URL: <https://doi.org/10.1109/ITEC-AP.2014.6940758>
- W6. **Du, Y.**, Lam, J.,#, Sachanandani K.#, Jawed, M. K., “Modeling the locomotion of articulated soft robots in granular medium”, *IEEE Robotics and Automation Letter*, 2021.(*Under review*)  
URL: <https://arxiv.org/abs/2103.03993>
- W7. **Du, Y.**, Zhang, G.,#, Tsang D.#, Jawed, M. K., “Deep-CNN based real-time robotic multi-class weed identification”, *IEEE International Conference on Robotics and Automation (ICRA)*, 2021. (*Submitted*)  
URL: <https://youtu.be/ci66YtdtfQk>
- W8. **Du, Y.**, Miller, A.,#, Jawed, M. K., “Mechanics-based analysis on flagellated robots”, *Soft Robotics*, 2021 (*Under review*)
- W9. **Du, Y.**, Mo, W.,#, Duan C.#, Jawed, M. K., “2D LiDAR based inter-row navigation algorithm” (*To be submitted to IROS 2022*)
- W10. **Du, Y.**, Duan, C.,#, Jawed, M. K., “Inverse design of soft flagellated robots” (*To be submitted to RAL in November 2021*)
- W11. **Du, Y.**, Lovekin, A.,#, Duan, C.,#, Jawed, M. K., “Autonomous low cost customizable agricultural robot in fields ” (*To be submitted to Journal of Field Robotics in December 2021*)
- W12. **Du, Y.**, Dong, Z.,#, Zhang, G.#, Wang, T., Jawed, M. K., “Navigation in real fields via Imitation learning” (*To be submitted to IROS 2022*)

- W13. **Du, Y.**, Miller, A.,<sup>#</sup>, Lovekin, A. <sup>#</sup>, Jawed, M. K., “Direction changing of uniflagellar soft robots in low Reynolds number fluid using buckling instability” (*Data collection and analysis in progress*)
- W14. **Du, Y.**, Zhao, Z.,<sup>#</sup>, Miller, A. <sup>#</sup>, Jawed, M. K., “Biologically inspired soft starfish locomotion” (*Data collection and analysis in progress*)

## PRESENTATIONS

- P1. **Du, Y.**, “Simple untethered flagellated robot in fluids and granular media.”, MIT CEE Rising Star Workshop, Oct 27th-29th, 2021. (*Oral*)
- P2. **Du, Y.\***, Jawed, M. K., “A Low-cost Robot with Autonomous Recharge and Navigation for Weed Control in Fields with Narrow Row Spacing.”, International Conference on Intelligent Robots and Systems (IROS), Online, Sep 28th, 2021. (*Oral*)
- P3. **Du, Y.\***, Jawed, M. K., “Simple untethered flagellated robot in fluids and granular media.”, Seminar in Mechanical and Aerospace Engineering 298 at UCLA, May 28th, 2021. (*Oral*)
- P4. **Du, Y.\***, Miller, A., Jawed, M. K., “Simple flagellated soft robot near air-fluid interface”, IEEE International Conference on Soft Robotics, Online, April 12-16, 2021. (*Oral*)
- P5. **Du, Y.\***, Miller, A., Jawed, M. K., “Simple untethered flagellated robot in fluids and granular media”, American Physical Society March Meeting, Online, March 14-19, 2021. (*Oral*)
- P6. **Du, Y.\***, Deng, Z. , Fang, Z., Wang, Y., Nagata, T., Bansal, K., Quadir, M., Jawed, M. K., “Vision and force based autonomous coating with rollers”, International Conference on Intelligent Robots and Systems (IROS), Online, Oct 25, 2020. (*Oral*)
- P7. **Du, Y.\***, Lam, J., Sachanandani K., Jawed, M. K., “Locomotion of Soft Robots with Flexible Flagella in Granular Medium”, 1<sup>st</sup> Southern California Mechanics Workshop, San Diego, CA, Jan 2020. (*Oral*)
- P8. **Du, Y.\***, Lam, J., Sachanandani K., Jawed, M. K., “Locomotion of Soft Robots with Flexible Flagella in Granular Medium”, American Physical Society March Meeting, Boston, MA, March 4-8, 2019. (*Oral*)
- P9. Qin L.\*, **Du, Y.**, Huang, W., Jawed, M. K., “Numerical Simulations for Physics-based Training of Robots for Manipulation of Flexible Rods”, American Physical Society March Meeting, Boston, MA, March 4-8, 2019. (*Oral*)
- P10. **Du, Y.\***, Jawed, M. K., “Locomotion of Soft Robots with Flexible Flagella in Granular Medium”, Southern California Robotics Symposium, Caltech, CA, April 2019. (*Poster*)

## GRANT WRITING

- G1. Collected preliminary data for Grant # 2021-67022-34200, “Autonomous Robotic Systems for Precision Weed Control in Flax”, National Institute of Food and Agriculture, **United States Department of Agriculture**, \$453,190, 2021 - 2025. PIs: Mukhlesur Rahman and Mohi Quadir (North Dakota State University), M. Khalid Jawed (UCLA)
- G2. Wrote  $\sim 33\%$  of the project narrative for a proposal titled “Smart and Connected Robotic Infrastructure for Data-driven Sustainable Agriculture”, **National Science Foundation**, \$1.2M, 2021. PIs: Rajit Gadh (UCLA), M. Khalid Jawed (UCLA), Wei Wang (UCLA), and Mukhlesur Rahman (North Dakota State University). Received ratings of (1) Very Good, (2) Very Good, (3) Very Good/Good, and (4) Fair, but eventually declined because of lacking effective and efficient localization algorithm.

## ACADEMIC SERVICE

### Reviewer

- ☐ IEEE Robotics and Automation Letters (RA-L)
- ☐ IEEE International Conference on Robotics and Automation (ICRA)
- ☐ IEEE International Conference on Intelligent Robots and Systems (IROS)
- ☐ IEEE International Conference on Advanced Robotics and Mechatronics (ICARM)

### Professional membership

- ☐ American Physical Society
- ☐ Institute of Electrical and Electronics Engineers

## ADVISING EXPERIENCE

### Undergraduate Student Research Program (SRP) 199

- ☐ 2020-2021 Wenjie Mo, Chenda Duan, Yu Zhou, Guofeng Zhang, Darren Tsang  
“Low-cost autonomous agricultural robot for weed control”
- ☐ 2019-2021 Andrew Miller, Arthur Lovekin  
“Bacteria-inspired flagellated robot turn by buckling soft tails”
- ☐ 2019 Keerthi Pradaa Balajee  
“Bacteria-inspired soft robot capable of traveling through granular media”
- ☐ 2019 Taiki Nagata  
“Collaborative robotic drawing simulation in Vrep with constant force”

### Undergraduate Student Research Program (SRP) 99

- ☐ 2019 Karunesh Schanandani, Jacqueline Lam  
“2D movement control of soft robots in low Reynolds number of fluid”

### Undergraduate Summer Intern

- ☐ 2019 Zihang Zhao, Visiting Undergraduate Student  
“Build a compact agriculture robot for weed control”

## TEACHING AND LEADERSHIP EXPERIENCE

**Department of Electrical Engineering, UCLA**, Los Angeles, CA 09/2017 - 09/2020  
**Teaching Associate** for online *ECE 205A Matrix Analysis for Scientists and Engineers* (Graduate)  
 Student evaluation: **8.0/9.0** (Department average: 7.2/9.0)

**Department of Mechanical Engineering, UCLA**, Los Angeles, CA 09/2017 - 09/2020  
**Teaching Assistant** for *M20 Introduction to Computer Programming with MATLAB* (Undergraduate)  
 Student evaluation: **8.0/9.0** (Department average: 7.0/9.0)

**Department of Physics & Astronomy, UCLA**, Los Angeles, CA 03/2018 - 06/2018  
**Teaching Assistant** for *Physics 5C Physics for Life Sciences Majors: Electricity, Magnetism, and Modern Physics* *Physics 1C Physics for Scientists and Engineers: Electrodynamics, Optics, and Special Relativity* (Undergraduate)  
 Student evaluation: **8.0/9.0** (Department average: 7.4/9.0)

- Department of Psychology, UCLA**, Los Angeles, CA 09/2017 - 09/2019  
**Teaching Assistant** for *Psychology 120B Sensation & Perception* (Undergraduate)  
 Student evaluation: **8.0/9.0** (Department average: 7.2/9.0)
- Co-founder of Student Researchers United (SRU), UCLA**, Los Angeles, CA 02/2021 - present  
 Fight for waiving nonresidential fee in UC system for incoming Ph.D. students  
 Advocate for and provide legal resources and peer support to international researchers
- Organizer of Southern California Robotics Symposium 2020, UCLA**(postponed), Los Angeles, CA  
 Settle on the agenda, venues and budget, onsite arrange and book the right venues for various sessions;includes the presentation, posters, lunch and dinner bars  
 Cooperate with another Ph.D. peer to design and UCLA IT support team to launch the conference website  
 Finalize and invite speakers and sponsors
- Co-founder of Yuan Meng Tibet**, Tibet, China 06/2013 - 09/2013  
 Create and lead the first volunteer team at HIT to teach in rural areas in Tibet  
 Establish long-term collaboration with local Tibetan government since 2013 Summer

## SELECTED AWARDS AND HONORS

### GRADUATE

- 2021 Finalists for **Best Paper Award on Agri-Robotics, Best Paper Award on Robot Mechanisms and Design** in IROS, 2021 (4/1261 for each category)
- 2021 **Mentor of Honorable Mention Best Researcher** in Summer Undergraduate Researcher Program (SURP) 2021 at UCLA
- 2021 **MIT Civil and Environmental Engineering (CEE) Rising Stars travel grant**
- 2021 **Chinese-American Engineers and Scientists Association of Southern California (CESASC) Scholarship** (\$1,000)
- 2018-2021 **Graduate Division Fellowship** from UCLA Graduate Division (\$ 49,097.72/year)
- 2016 **Best Article Award** from UCLA Graduate Division for sharing the story “How I get to UCLA”

### UNDERGRADUATE

- 2012-2016 **National Scholarship** from Ministry of Education of the People's Republic of China with **first** GPA ranking (**1/144**) for four years in Department of Automotive Engineering
- 2015 **Top Ten Students** of Harbin Institute of Technology, Weihai for combined top **1%** GPA, excellent publications and outstanding leadership. I was the only junior gaining this honor while others were seniors
- 2015 **Honorable Mention** from COMAP for Mathematical Contest in Modeling (MCM)
- 2015 **Outstanding Leader Award** from Harbin Institute of Technology for academic excellence and fantastic student club activity organization
- 2014 **Best-organized Volunteer Team Leader** from Harbin Institute of Technology for establishing the first volunteer team of college students to teach in Tibet and building long-term cooperation with the local government
- 2013 **First Prize** from Heilongjiang Provincial Education Department in Mathematics Competition for College Students (Top **8%**)
- 2013 **First Prize** from College Foreign Language Teaching Committee and College Foreign Language Teaching Research Association in National English Competition for College Students; (Top **0.5%**)
- 2013 **Most Creative Award** from Department of Automotive Engineering for the lowest cost and most efficient pressure oil pump design; **1 out of 10** teams was awarded

## TECHNICAL SKILLS AND INTERESTS

**Programming:** MATLAB, ROS, Python, C/C++, HTML, JavaScript, Lua

**Modeling & Designing:** Design (underwater robots, agricultural robots, and robotic arms), VREP, CATIA, Solidworks, AutoCAD, Mathematica, COMSOL, Simulink/Carsim, Davinci Resolve, Adobe Illustrator, Eagle, Altium Designer, Microsoft Office

**Manufacturing:** Circuit board printing (with conductive ink) and soldering (with reflow oven and iron), multi-layer flexible PCB with chemical erosion, CNC, lathing, drilling, milling, grinding, planing machine operation

**Interests:** Public Speaking, Testing Robot in Real Scenes

**Languages:** Chinese (native), advanced English (conversation and reading), and Korean (conversation)

## REFERENCES

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Last updated: October 30, 2021