

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 3 years in top journals and conference proceedings in robotics. Several more are in preparation. Submitted an invention disclosure to UCLA.
- ❑ **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 got admitted to Stanford graduate school for Fall 2021, and Jingyi Chen joined Cornell and Jacqueline Lam joined UCLA as graduate students. Bhruu 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).
- ❑ **Teaching and Leadership:** Received an average student evaluation score of 8.0/9.0 in five courses from five departments. 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

Biomechanics 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.

- P1. **Du, Y.**, Mallajosyula, B.#, Sun, D.#, Chen, J.#, Zhao, Z.#, Rahman, M., Quadir, M., Jawed, M. K., “Compact mobile robot for precision weed management in row crops”, *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, Prague, Czech Republic, 2021. (*Forthcoming*)
URL: <https://youtu.be/QjwI7DM3CIg>
- P2. **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 (*Forthcoming*)
URL: <https://arxiv.org/abs/2103.05712>
- P3. **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>
- P4. 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>
- P5. 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>
- P6. **Du, Y.**, Lam, J.,# , Sachanandani K.#, Jawed, M. K., “Modeling the locomotion of articulated soft robots in granular medium”, *the IEEE Transactions on Robotics*, 2021.(*Under review*)
URL: <https://arxiv.org/abs/2103.03993>
- P7. **Du, Y.**, Zhang, G.,# , Tsang D.#, Jawed, M. K., “Deep-CNN based real-time robotic multi-class weed identification”, *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2021. (*Submitted*)
URL: <https://youtu.be/ci66YtdtfQk>
- P8. **Du, Y.**, Miller, A.,# , Jawed, M. K., “Mechanics-based analysis on flagellated robots”, *Soft Robotics*, 2021 (*Submitted*)
- P9. **Du, Y.**, Mo, W.,# , Duan C.#, Jawed, M. K., “2D LiDAR based inter-row navigation algorithm” (*To be submitted to ICRA 2022*)
- P10. **Du, Y.**, Miller, A.,# , Jawed, M. K., “Generative model-assisted inverse design of soft flagellated robots” (*To be submitted to RAL in September 2021*)
- P11. **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*)
- P12. **Du, Y.**, Dong, Z.,# , Zhang, G.# , Wang, T., Jawed, M. K., “Continuous motion planning of multi-robot systems” (*To be submitted to IROS 2022*)
- P13. **Du, Y.**, Miller, A.,# , Lovekin, A. #, Jawed, M. K., “Direction changing of unflagellar soft robots in low Reynolds number fluid using buckling instability” (*Data collection and analysis in progress*)
- P14. **Du, Y.**, Zhao, Z.,# , Miller, A. #, Jawed, M. K., “Biologically inspired soft starfish locomotion” (*Data collection and analysis in progress*)

PRESENTATIONS

- C1. **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*)
- C2. **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*)
- C3. **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*)
- C4. **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*)
- C5. **Du, Y.***, Lam, J., Sachanandani K., Jawed, M. K., “Locomotion of Soft Robots with Flexible Flagella in Granular Medium”, 1st Southern California Mechanics Workshop, San Diego, CA, Jan 2020. (*Oral*)
- C6. **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*)
- C7. 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*)
- C8. **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

- ☐ Three papers for IEEE International Conference on Robotics and Automation (ICRA), 2021
- ☐ Four papers for IEEE International Conference on Intelligent Robots and Systems (IROS), 2021
- ☐ One paper for IEEE International Conference on Advanced Robotics and Mechatronics (ICARM), 2021

Professional membership

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

ADVISING EXPERIENCE

Undergraduate Student Research Program (SRP) 199 : Wenjie Mo, Chenda Duan, Yu Zhou, Guofeng Zhang, Darren Tsang, “Low-cost autonomous agricultural robot for weed control” , 2020-2021

Undergraduate Student Research Program (SRP) 199 : Andrew Miller, Arthur Lovekin, “Bacteria-inspired flagellated robot turn by buckling soft tails” , 2019-2021

Undergraduate Student Research Program (SRP) 199 : Keerthi Pradaa Balajee, “Bacteria-inspired soft robot capable of traveling through granular media” , 2019

Undergraduate Student Research Program (SRP) 199 : Taiki Nagata, “Collaborative robotic drawing simulation in Vrep with constant force” , 2019

Undergraduate Student Research Program (SRP) 99 : Karunesh Schanandani, Jacqueline Lam, “2D movement control of soft robots in low Reynolds number of fluid” , 2019

Undergraduate Summer Intern : Zihang Zhao, Visiting Undergraduate Student, “Build a compact agriculture robot for weed control” , 2019

TEACHING AND LEADERSHIP EXPERIENCE

Department of Electrical Engineering, UCLA, Los Angeles, CA Sep 17 - Sep 20
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 Sep 17 - Sep 20
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 Mar 18 - Jun 18
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 Sep 17 - Sep 19
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 Feb 21 -
 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 Jun 13 - Sep 13
 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	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 per 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 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; **8%** of students were awarded in 2013
- 2013 **First Prize** from College Foreign Language Teaching Committee and College Foreign Language Teaching Research Association in National English Competition for College Students; **6%** of students were awarded in 2013
- 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 EXPERIENCE

FAW Jiefang Automotive Co., Ltd., Changchun, China
Engineering Assistant Intern

01/2016 - 03/2016

TECHNICAL SKILLS AND INTERESTS

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

Modeling & Designing: Design (underwater robots, agricultural robots, and robotic arms), 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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