

# Cynthia Sung

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## EDUCATION

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**Massachusetts Institute of Technology**, Cambridge, MA  
Ph.D. in Electrical Engineering and Computer Science Sep. 2016  
Thesis: Computational Design of Foldable Robots via Composition  
Advisor: Prof. Daniela Rus

S.M. thesis: Data Driven Task Allocation for Multi-Robot Deliveries Sep. 2013  
Advisor: Prof. Daniela Rus

**Rice University**, Houston, TX  
B.S. in Mechanical Engineering, minor in Computational and Applied Mathematics May 2011

**Certification:** Fundamentals of Engineering (FE) Exam, passed Apr. 2011

## ACADEMIC APPOINTMENTS

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**Gabel Family Term Assistant Professor** Jan. 2017 – present  
University of Pennsylvania  
Department of Mechanical Engineering and Applied Mechanics  
Secondary Appointment with Department of Computer and Information Science  
Secondary Appointment with Department of Electrical and Systems Engineering

## HONORS AND DISTINCTIONS

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2023 ONR Young Investigator Award  
2023 IEEE Philadelphia Section Delaware Valley Young Electrical Engineer of the Year  
2021 ICRA Best Paper Award in Mechatronics and Design  
2020 Johnson & Johnson WiSTEM<sup>2</sup>D Scholars Award  
2019 NSF CAREER Award  
2019 National Academy of Engineers Frontiers of Engineering participant  
2017 Popular Mechanics Breakthrough Award  
2017 Dimitris N. Chorafas Foundation Award  
2017 ASME New Faces of Engineering  
2015 ICRA Best Paper Finalist  
2012 National Defense Science and Engineering Graduate Fellowship  
2012 National Science Foundation Graduate Fellowship recipient

## PUBLICATIONS (1254 TOTAL CITATIONS, H-INDEX: 15)

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### Refereed Journals and Transactions (underline indicates group member)

1. C. Kim and *C. Sung*, “I-cord knitted SMA (ICKS) actuator capable of self-sensing,” (under review).
2. J. Weakly<sup>+</sup>, X. Li<sup>+</sup>, M. Li, T. Agarwal, C. Jiang, and *C. Sung*, “Bistable aerial transformer (BAT): A soft hybrid aerial vehicle with passive mode transitions,” (under review), <sup>+</sup> = equal contribution.

3. W.-H. Chen, W. Yang, L. Peach, D. E. Koditschek, and *C. R. Sung*, “Kinegami: Algorithmic design of compliant kinematic chains from tubular origami,” *IEEE Transactions on Robotics*, vol. 39, no. 2, pp. 1260–1280, April 2023, DOI:[10.1109/TRO.2022.3206711](https://doi.org/10.1109/TRO.2022.3206711).
4. A. Liu, M. Johnson, and *C. Sung*, “Increasing reliability of self-folding of the origami hyperpar,” *ASME Journal of Mechanisms and Robotics*, vol. 14, no. 6, p. 061003, 2022, DOI:[10.1115/1.4054310](https://doi.org/10.1115/1.4054310).
5. Y.-J. Lee, S. Misra, W.-H. Chen, D. E. Koditschek, *C. Sung*, and S. Yang, “Tendon-driven auxetic tubular springs for resilient hopping robots,” *Advanced Intelligent Systems*, vol. 4, p. 2100152, 2021, DOI:[10.1002/aisy.202100152](https://doi.org/10.1002/aisy.202100152).
6. Z. Yang, D. Chen, D. J. Levine, and *C. Sung*, “Origami-inspired robot that swims via jet propulsion,” *IEEE Robotics and Automation Letters*, vol. 6, no. 4, pp. 7145–7152, 2021, DOI:[10.1109/LRA.2021.3097757](https://doi.org/10.1109/LRA.2021.3097757).
7. D. Feshbach and *C. Sung*, “Reconfiguring non-convex holes in pivoting modular cube robots,” *IEEE Robotics and Automation Letters*, vol. 6, no. 4, pp. 6701–6708, 2021, DOI:[10.1109/LRA.2021.3095030](https://doi.org/10.1109/LRA.2021.3095030).
8. W. Cha, L. Kaspar, M. F. Campbell, T. J. Calenza, G. A. Popov, J. Wang, *C. R. Sung*, M. Yim, and I. Bargatin, “Carbon fiber–aluminum sandwich for micro-aerial vehicles and miniature robots,” *MRS Advances*, no. 6, p. 477–481, 2021, DOI:[10.1557/s43580-021-00084-3](https://doi.org/10.1557/s43580-021-00084-3).
9. W. Cha, M. F. Campbell, G. A. Popov, C. H. Stanczak, A. K. Estep, E. B. Steager, *C. R. Sung*, M. H. Yim, and I. Bargatin, “Microfabricated foldable wings for centimeter-scale microflyers,” *Journal of Microelectromechanical Systems*, vol. 29, no. 5, pp. 1127–1129, 2020, DOI:[10.1109/JMEMS.2020.3013813](https://doi.org/10.1109/JMEMS.2020.3013813).
10. W.-H. Chen, S. Misra, Y. Gao, Y.-J. Lee, D. E. Koditschek, S. Yang, and *C. Sung*, “A programmably compliant origami mechanism for dynamically dexterous robots,” *IEEE Robotics and Automation Letters*, vol. 5, no. 2, pp. 2131–2137, April 2020, DOI:[10.1109/LRA.2020.2970637](https://doi.org/10.1109/LRA.2020.2970637).
11. T. Tosun, *C. Sung*, C. McCloskey, and M. Yim, “Optimal structure synthesis for environment augmenting robots,” *IEEE Robotics and Automation Letters*, vol. 4, no. 2, pp. 1069–1076, April 2019, DOI:[10.1109/LRA.2019.2893879](https://doi.org/10.1109/LRA.2019.2893879).
12. S. Yim, *C. Sung*, S. Miyashita, D. Rus, and S. Kim, “Animatronic soft robots by additive folding,” *International Journal of Robotics Research*, vol. 37, no. 6, pp. 611–628, May 2018, DOI:[10.1177/0278364918772023](https://doi.org/10.1177/0278364918772023).
13. D. Rus and *C. Sung*, “Spotlight on origami robots,” *Science Robotics*, vol. 3, no. 15, p. eaat0938, 2018, DOI:[10.1126/scirobotics.aat0938](https://doi.org/10.1126/scirobotics.aat0938).
14. A. Schulz<sup>+</sup>, *C. Sung*<sup>+</sup>, A. Spielberg, W. Zhao, R. Cheng, E. Grinspun, D. Rus, and W. Matusik, “Interactive Robogami: An end-to-end system for design of robots with ground locomotion,” *International Journal of Robotics Research*, vol. 36, no. 10, pp. 1131–1147, Sep. 2017, DOI:[10.1177/0278364917723465](https://doi.org/10.1177/0278364917723465), <sup>+</sup> = equal contribution.
15. D. Feldman, *C. Sung*, A. Sugaya, and D. Rus, “iDiary: From GPS signals to a text-searchable diary,” *ACM Transactions on Sensor Networks*, vol. 11, no. 4, p. 60, Dec. 2015, DOI:[10.1145/2814569](https://doi.org/10.1145/2814569).
16. R. Niiyama, X. Sun, *C. Sung*, B. An, D. Rus, and S. Kim, “Pouch motors: Printable soft actuators integrated with computational design,” *Soft Robotics*, vol. 2, no. 2, pp. 59–70, June 2015, DOI:[10.1089/soro.2014.0023](https://doi.org/10.1089/soro.2014.0023).
17. *C. Sung* and D. Rus, “Foldable joints for foldable robots,” *ASME Journal of Mechanisms and Robotics*, vol. 7, no. 2, p. 021012, May 2015, DOI:[10.1115/1.4029490](https://doi.org/10.1115/1.4029490).
18. S. Miyashita, I. DiDio, I. Ananthabhotla, B. An, *C. Sung*, S. Arabagi, and D. Rus, “Folding angle regulation by curved crease design for self-assembling origami propellers,” *ASME Journal of Mechanisms and Robotics*, vol. 7, no. 2, p. 021013, May 2015, DOI:[10.1115/1.4029548](https://doi.org/10.1115/1.4029548).
19. *C. Sung*, E. D. Demaine, M. L. Demaine, and D. Rus, “Edge-compositions of 3D surfaces,” *ASME Journal of Mechanical Design*, vol. 135, no. 11, p. 111001, Sep. 2013, DOI:[10.1115/1.4025378](https://doi.org/10.1115/1.4025378).

**Refereed Conference Proceedings (underline indicates group member)**

20. D. Feshbach, W.-H. Chen, and *C. Sung*, “Kinegami: Open-source software for creating kinematic chains from tubular origami,” in *8th International Meeting on Origami in Science, Mathematics, and Education (OSME)*, (in prep.).

21. G. Unger and C. Sung, “Re-programmable matter by folding: Magnetically-controlled origami that self-folds, self-unfolds, and self-reconfigures on-demand,” in *8th International Meeting on Origami in Science, Mathematics, and Education (OSME)*, (in prep.).
22. S. Ho, E. Feehery, J. Weakly, and C. Sung, “A low-cost, adaptable system for lift and drag measurement in an educational wind tunnel,” in *ASEE Annual Conference & Exposition*, (in prep.).
23. D. Chen<sup>+</sup>, T. Park<sup>+</sup>, W. Hoganson<sup>+</sup>, Z. Yang, and C. Sung, “An experimental study on passive valves in an underwater robot for salp-like locomotion,” in *IEEE International Conference on Soft Robotics (RoboSoft)*, 2024, (under review), <sup>+</sup> = equal contribution.
24. S. Misra and C. Sung, “Online optimization of soft manipulator mechanics via hierarchical control,” in *IEEE International Conference on Soft Robotics (RoboSoft)*, 2024, (under review).
25. C. Kim, L. Yang, A. Anbuchelvan, R. Garg, N. Milbar, V. Flavia, and C. Sung, “Origami-inspired bistable gripper with self-sensing capabilities,” in *IEEE International Conference on Soft Robotics (RoboSoft)*, 2024, (under review).
26. R. Chen, J. Kwon, W.-H. Chen, and C. Sung, “Design and characterization of a pneumatic tunable-stiffness bellows actuator,” in *IEEE International Conference on Soft Robotics (RoboSoft)*, 2024, (under review).
27. D. Feshbach, X. Wu, S. Vasireddy, L. Beardell, B. To, Y. Baryshnikov, and C. Sung, “CurveQuad: A centimeter-scale origami quadruped that leverages curved creases to self-fold and crawl with one motor,” in *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2023.
28. C. Wilson, K. Brown, and C. Sung, “The impact of robotics expertise on iterative robot design decisions and vulnerability to anchoring bias,” in *ASME International Design Engineering Technical Conferences and Computers and Information in Engineering Conference (IDETC/CIE)*, 2023.
29. D. Chen, Z. Huang, and C. Sung, “Electronics design and verification for robots with actuation and sensing requirements,” in *ASME International Design Engineering Technical Conferences and Computers and Information in Engineering Conference (IDETC/CIE)*, 2023.
30. G. Chen, D. Chen, J. Weakly, and C. Sung, “Drag coefficient characterization of the origami magic ball,” in *ASME International Design Engineering Technical Conferences and Computers and Information in Engineering Conference (IDETC/CIE)*, 2023.
31. A. Carter, W.-H. Chen, S. Misra, and C. Sung, “A task-to-intelligence mapping: When is embodied intelligence worth designing?” in *Proceedings of the Embodied Intelligence Conference*, 2023, (to appear).
32. S. Misra, M. Mitchell, R. Chen, and C. Sung, “Design and control of a tunable-stiffness coiled-spring actuator,” in *IEEE International Conference on Robotics and Automation (ICRA)*, 2023, DOI:[10.1109/ICRA48891.2023.10161218](https://doi.org/10.1109/ICRA48891.2023.10161218).
33. Z. Huang, Q. Wu, D. Howard, and C. Sung, “EvoRobogami: Co-designing with humans in evolutionary robotics experiments,” in *Genetic and Evolutionary Computation Conference (GECCO)*, 2022, DOI:[10.1145/3512290.3528867](https://doi.org/10.1145/3512290.3528867).
34. S. Misra and C. Sung, “Forward kinematics and control of a segmented tunable-stiffness 3-D continuum manipulator,” in *IEEE International Conference on Robotics and Automation (ICRA)*, 2022, pp. 3244–3250, DOI:[10.1109/ICRA46639.2022.9812098](https://doi.org/10.1109/ICRA46639.2022.9812098).
35. Y. Sun<sup>+</sup>, J. Wang<sup>+</sup>, and C. Sung, “Repeated jumping with the REBOund: Self-righting jumping robot leveraging bistable origami-inspired design,” in *IEEE International Conference on Robotics and Automation (ICRA)*, 2022, pp. 7189–7195, DOI:[10.1109/ICRA46639.2022.9812232](https://doi.org/10.1109/ICRA46639.2022.9812232), <sup>+</sup> = equal contribution.
36. Y. Qin<sup>+</sup>, L. Ting<sup>+</sup>, C. Saven<sup>+</sup>, Y. Amemiya, M. Tanis, R. Kamien, and C. Sung, “TrussBot: Modeling, design and control of a compliant, helical truss of tetrahedral modules,” in *IEEE International Conference on Robotics and Automation (ICRA)*, 2022, pp. 4218–4224, DOI:[10.1109/ICRA46639.2022.9812295](https://doi.org/10.1109/ICRA46639.2022.9812295), <sup>+</sup> = equal contribution.
37. Y. Yuan and C. Sung, “Programmable stiffness and applications of 3D printed TPU diamond lattices,” in *ASME International Design Engineering Technical Conferences and Computers and Information in Engineering Conference (IDETC/CIE)*, 2021, pp. DETC2021–69 826, DOI:[10.1115/DETC2021-69826](https://doi.org/10.1115/DETC2021-69826).

38. X. Li<sup>+</sup>, J. McWilliams<sup>+</sup>, M. Li, C. Sung, and C. Jiang, “Soft hybrid aerial vehicle via bistable mechanism,” in *IEEE International Conference on Robotics and Automation (ICRA)*, 2021, pp. 7107–7113, DOI:[10.1109/ICRA48506.2021.9561434](https://doi.org/10.1109/ICRA48506.2021.9561434), <sup>+</sup> = equal contribution. (**Best paper in Mechatronics and Design**).
39. J. McWilliams, Y. Yuan, J. Friedman, and C. Sung, “Push on, push off: A compliant bistable gripper with mechanical sensing and actuation,” in *IEEE International Conference on Soft Robotics (RoboSoft)*, 2021, pp. 622–629, DOI:[10.1109/RoboSoft51838.2021.9479209](https://doi.org/10.1109/RoboSoft51838.2021.9479209).
40. C. Y. J. Kim, A. Chien, M. Tippur, and C. Sung, “Fabrication and characterization of I-cord knitted SMA actuators,” in *IEEE International Conference on Soft Robotics (RoboSoft)*, 2021, pp. 379–386, DOI:[10.1109/RoboSoft51838.2021.9479207](https://doi.org/10.1109/RoboSoft51838.2021.9479207).
41. W.-H. Chen, S. Misra, J. D. Caporale, D. E. Koditschek, S. Yang, and C. Sung, “A tendon-driven origami hopper triggered by proprioceptive contact detection,” in *IEEE International Conference on Soft Robotics (RoboSoft)*, 2020, pp. 373–380, DOI:[10.1109/RoboSoft48309.2020.9116040](https://doi.org/10.1109/RoboSoft48309.2020.9116040).
42. J. Carlson, J. Friedman, C. Kim, and C. Sung, “REBOund: Untethered origami jumping robot with controllable jump height,” in *IEEE International Conference on Robotics and Automation (ICRA)*, 2020, pp. 10 089–10 095, DOI:[10.1109/ICRA40945.2020.9196534](https://doi.org/10.1109/ICRA40945.2020.9196534).
43. H. Yuan, J. Pikul, and C. Sung, “Programmable 3-D surfaces using origami tessellations,” in *7th International Meeting on Origami in Science, Mathematics, and Education (OSME)*, vol. 3, 2018, pp. 893–906.
44. X. Deng and C. Sung, “Leveraging compliance in origami robot legs for robust and natural locomotion,” in *7th International Meeting on Origami in Science, Mathematics, and Education (OSME)*, 2018, pp. 965–980.
45. C. Sung, R. Lin, S. Miyashita, S. Yim, S. Kim, and D. Rus, “Self-folded soft robotic structures with controllable joints,” in *IEEE International Conference on Robotics and Automation (ICRA)*, May 2017, pp. 580–587, DOI:[10.1109/ICRA.2017.7989072](https://doi.org/10.1109/ICRA.2017.7989072).
46. A. Spielberg, B. Araki, C. Sung, R. Tedrake, and D. Rus, “Functional co-optimization of articulated robots,” in *IEEE International Conference on Robotics and Automation (ICRA)*, May 2017, pp. 5035–5042, DOI:[10.1109/ICRA.2017.7989587](https://doi.org/10.1109/ICRA.2017.7989587).
47. C. Sung and D. Rus, “Automated fabrication of foldable robots using thick materials,” in *International Symposium on Robotics Research (Springer Proceedings in Advanced Robotics)*, vol. 2, Sep. 2015, pp. 253–266, DOI:[10.1007/978-3-319-51532-8\\_16](https://doi.org/10.1007/978-3-319-51532-8_16).
48. C. Sung, J. Bern, J. Romanishin, and D. Rus, “Reconfiguration planning for pivoting cube modular robots,” in *IEEE International Conference on Robotics and Automation (ICRA)*, May 2015, pp. 1933–1940, DOI:[10.1109/ICRA.2015.7139451](https://doi.org/10.1109/ICRA.2015.7139451).
49. S. Miyashita, S. Guitron, M. Ludersdorfer, C. Sung, and D. Rus, “An untethered miniature origami robot that self-folds, walks, swims, and degrades,” in *IEEE International Conference on Robotics and Automation (ICRA)*, May 2015, pp. 1490–1496, DOI:[10.1109/ICRA.2015.7139386](https://doi.org/10.1109/ICRA.2015.7139386), (**Best paper finalist**).
50. C. Sung and D. Rus, “Foldable joints for foldable robots,” in *International Symposium on Experimental Robotics (Springer Tracts in Advanced Robotics)*, vol. 109, June 2014, pp. 421–433, DOI:[10.1007/978-3-319-23778-7\\_28](https://doi.org/10.1007/978-3-319-23778-7_28).
51. D. Feldman, A. Sugaya, C. Sung, and D. Rus, “iDiary: From GPS signals to a text-searchable diary,” in *ACM Conference on Embedded Networked Sensor Systems (SenSys)*, Nov. 2013, DOI:[10.1145/2517351.2517366](https://doi.org/10.1145/2517351.2517366).
52. C. Sung, E. D. Demaine, M. L. Demaine, and D. Rus, “Joining unfoldings of 3-D surfaces,” in *ASME International Design Engineering Technical Conferences and Computers and Information in Engineering Conference (IDETC/CIE)*, Aug. 2013, pp. DETC2013–12 692, DOI:[10.1115/DETC2013-12692](https://doi.org/10.1115/DETC2013-12692).
53. C. Sung, N. Ayanian, and D. Rus, “Improving the performance of multi-robot systems by task switching,” in *IEEE International Conference on Robotics and Automation (ICRA)*, May 2013, pp. 2999–3006, DOI:[10.1109/ICRA.2013.6630993](https://doi.org/10.1109/ICRA.2013.6630993).
54. D. Feldman, C. Sung, and D. Rus, “The single pixel GPS: learning big data signals from tiny coresets,” in *ACM International Conference on Advances in Geographic Information Systems (SIGSPATIAL)*, Nov. 2012, pp. 23–32, DOI:[10.1145/2424321.2424325](https://doi.org/10.1145/2424321.2424325).

55. C. Sung, D. Feldman, and D. Rus, “Trajectory clustering for motion prediction,” in *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, Oct. 2012, pp. 1547–1552, DOI:[10.1109/IROS.2012.6386017](https://doi.org/10.1109/IROS.2012.6386017).
56. C. Sung, R. R. Kamath, Y. Cui, C. Ouyang, E. Carstens, R. F. Ramos, and Z. M. Oden, “Design of a novel mechanical syringe pump for neonatal care in low-resource settings,” in *IEEE Global Humanitarian Technology Conference*, Oct. 2011, pp. 78–83, DOI:[10.1109/GHTC.2011.21](https://doi.org/10.1109/GHTC.2011.21).
57. C. Sung and M. K. O’Malley, “Effect of progressive visual error amplification on human motor adaptation,” in *IEEE International Conference on Rehabilitation Robotics (ICORR)*, June 2011, pp. 1–6, DOI:[10.1109/ICORR.2011.5975399](https://doi.org/10.1109/ICORR.2011.5975399).
58. Z. Kadivar, C. Sung, Z. Thompson, M. K. O’Malley, M. Liebschner, and Z. Deng, “Comparison of reaching kinematics during mirror and parallel robot assisted movements,” in *Medicine Meets Virtual Reality Conference (MMVR)*, Feb. 2011, pp. 247–253, DOI:[10.3233/978-1-60750-706-2-247](https://doi.org/10.3233/978-1-60750-706-2-247).

### Book Chapters

59. C. Sung and J. Paik, “Origami robots,” in *Springer Handbook of Soft Robotics*, T. Nanayakkara, Ed., 2023, (in review).

### Workshop Papers and Unrefereed Conference Presentations/Posters

60. G. Unger and C. Sung, “Magnetic morphing for origami self assembly,” in *Society of Engineering Science Annual Technical Meeting*, Minneapolis, MN, Oct. 2023.
61. D. Chen and C. Sung, “How the origami magic ball produces jet propulsion in a soft squid-inspired swimmer,” in *Society of Engineering Science Annual Technical Meeting*, Minneapolis, MN, Oct. 2023.
62. W.-H. Chen, S. Rozen-Levy, G. Addison, L. Peach, D. E. Koditschek, and C. R. Sung, “DOQ: A dynamic origami quadrupedal robot,” in *ICRA Origami-based Structures for Designing Soft Robots with New Capabilities*, London, UK, May 2023.
63. G. Unger and C. Sung, “Magnetically reprogrammable matter through origami fabrication,” in *Gordan Research Conference on Active and Adaptive Materials*, Ventura, CA, Jan. 2023.
64. W.-H. Chen, W. Yang, L. Peach, D. E. Koditschek, and C. Sung, “Kinegami: Algorithmic design of compliant kinematic chains from tubular origami,” in *IROS Computational Design of Soft Robots (CD-SoRo)*, Kyoto, Japan, Oct. 2022.
65. S. Misra and C. Sung, “Control of a segmented tunable-stiffness 3-D continuum manipulator,” in *ICRA Compliant Robot Manipulation: Challenges and New Opportunities*, Philadelphia, PA, May 2022.
66. J. Carlson, J. Friedman, C. Kim, and C. Sung, “REBOund: Untethered origami jumping robot with controllable jump height,” in *Northeast Robotics Colloquium*, Philadelphia, PA, Oct. 2020.
67. C. Sung, “Mechanics and mechanism design for foldable robots,” in *IROS Folding in Robotics*, Vancouver, Canada, Sep. 2017.
68. C. Sung and D. Rus, “Data-driven task assignment for multi-vehicle package delivery,” in *IROS ECHORD++ Workshop on Urban Robotic Applications*, Hamburg, Germany, Oct. 2015.
69. A. Schulz, C. Sung, A. Spielberg, W. Zhao, Y. Cheng, A. Mehta, E. Grinspun, D. Rus, and W. Matusik, “Interactive Robogami: Data-driven design for 3D print and fold robots with ground locomotion,” in *ACM SIGGRAPH Talks*, Los Angeles, CA, Aug. 2015.
70. C. Wu, D. Feldman, C. Sung, and D. Rus, “Using coresets for map making for long-term operation of robots,” in *ICRA Workshop on Long-Term Autonomy*, Karlsruhe, Germany, May 2013.

### Journal Issues and Proceedings Edited

71. Guest Editor, “Special section on computational fabrication,” *Computers and Graphics*, vol. 102, no. C, 2022.
72. Editor, *Proceedings of the Symposium on Computational Fabrication*, 2021.

73. Guest Editor, “Special issue on computational robot design and customization,” *Robotica*, 2021.
74. Editor, *Proceedings of the Symposium on Computational Fabrication*, 2020.

## Patents

75. *C. Sung* and G. Unger, “Reprogrammable Morphing Sheets Via Magnetically Controlled Folding,” U.S. Provisional Application, No. 63/379,011, filed October 11, 2022, refiled October 3, 2023.
76. N. Milbar, *C. Sung*, F. Vitale, G. Unger, and R. Garg, “Peripheral Interfacing Muscle Replacement,” U.S. Provisional Application, No. 63/364,282, filed May 6, 2022, refiled May 9, 2023.
77. L. S. Smoot and *C. R. Sung*, “System for Providing Multi-Directional and Multi-Person Walking in Virtual Reality Environments,” U.S. Patent, No. 10,228,758, issued March 12, 2019.
78. D. Rus, D. Feldman, *C. R. Sung*, and A. K. Sugaya, “Text Characterization of Trajectories,” U.S. Patent, No. 10,176,244, issued January 8, 2019.

## RESEARCH GRANTS

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1. National Aeronautics and Space Administration, *TRUSSES: Temporarily, Robots Unite to Surmount Sandy Entrapments, then Separate*, PI [w/ Douglas Jerolmack (Penn), Daniel Koditschek (Penn), Feifei Qian (USC), Mark Yim (Penn)], 11/01/2023–10/31/2025, \$2,000,000 (Penn: \$1,600,000).
2. National Science Foundation, EDSE-2322898, *Algorithmic Design of Origami Mechanisms and Robots*, PI, 9/01/2023–8/31/2026, \$479,255.
3. Pennsylvania Space Grant Consortium Mini-Grant, *Characterizing a low-cost load cell setup for wind tunnel measurements*, PI, 09/01/2023–12/31/2023, \$12,000.
4. Office of Naval Research Young Investigator Award, N00014-23-1-2068, *Salp-Inspired Reconfigurable Robot Platform for Long-term Distributed Sensing*, PI, 12/01/2022–11/30/2025, \$750,000.
5. Penn Center for Precision Engineering for Health (CPE4H) Seed, *Towards an Artificial Muscle Replacement for Facial Reanimation*, PI [w/ Flavia Vitale (Penn), Niv Milbar (CHOP)], 07/01/2022–06/30/2024, \$160,000
6. Penn Medicine Center for Human Appearance, *Designing a Synthetic Solution for Facial Reanimation*, co-I [w/ Scott Levin (PI, Penn), Niv Milbar (Penn), Flavia Vitale (Penn)], 07/01/2022–6/30/2024, \$40,000.
7. Pennsylvania Space Grant Consortium Mini-Grant, *Wing characteristics for a minimally actuated hybrid aerial vehicle*, PI, 06/01/2022–12/31/2022, \$12,000.
8. Children’s Hospital of Philadelphia, Cardiac Center Innovation Grant, *Development of a pulsatile cavopulmonary conduit using architected materials and soft robotics*, co-PI [w/ Benjamin Kozyak (PI, CHOP), Jordan Raney (Penn)], 02/01/2022–01/31/2024, \$200,000.
9. National Science Foundation, DCSD-2121887, *Collaborative Research: Leveraging Fluid-Structure Interactions for Efficient Control in Geophysical Flows*, PI [w/ Ani Hsieh (Penn), Eric Forgoston (Montclair), Philip Yecko (Cooper Union)], 11/01/2021–10/31/2024, \$678,884 (Penn: \$426,556).
10. Johnson & Johnson WiSTEM<sup>2</sup>D Scholars Award Program, *Origami-Inspired Engineering for Device Personalization On-Demand*, PI, 05/01/2020–04/23/2023, \$150,000.
11. Penn Health-Tech, *Remotely Adjustable Pulmonary Artery Band*, PI [w/ Mark Fogel (CHOP), Jonathan Chen (CHOP)], 01/01/2020–12/31/2020, \$50,000.
12. National Science Foundation, IIS-1845339, *CAREER: Computational Design for Robust Legged Robots*, PI, 03/15/2019–03/14/2024, \$513,080.
13. DARPA Microsystems Technology Office, *UNO: Underactuated Naturally-Stabilized One-Motor Robot*, co-PI [w/ Mark Yim (PI, Penn), Mark Allen (Penn), Igor Bargatin (Penn), George Park (Penn), Michael Rubenstein (Northwestern)], 03/01/2019–08/31/2020, \$3,276,307.

14. ARO Multidisciplinary University Research Initiative, *SLICE: Science of Embodied Innovation, Learning and Control*, Senior Personnel [Daniel Koditschek (PI, Penn), Yuliy Baryshnikov (UIUC), Noah Cowan (JHU), Robert Full (UC Berkeley), Lucia Jacobs (UC Berkeley), James Knierim (JHU), Shu Yang (Penn)], 08/15/2018–08/31/2024, \$6,250,000 (Sung: \$89,122).
15. Pennsylvania Pediatric Medical Device Consortium, *Remotely Adjustable Pulmonary Artery Band*, PI [w/ Mark Fogel (CHOP), Jonathan Chen (CHOP)], (40 hrs. consulting with Archimedic).
16. Penn University Research Foundation, *Reconfiguring Origami Robots for Low-Energy Deployment in Fluid Flows*, PI, 08/01/2017 – 01/31/2019, \$25,000.
17. National Science Foundation, CNS-1138847, *Collaborative Research: An Expedition in Computing for Compiling Printable Programmable Machines*, co-PI [w/ Daniela Rus (PI, MIT), Vijay Kumar (PI, Penn), Andre DeHon (Penn), Martin Demaine (MIT), Sanjeev Khanna (Penn), Sangbae Kim (MIT), Insup Lee (Penn), Wojciech Matusik (MIT), Martin Rinard (MIT), Rob Wood (Harvard), Mark Yim (Penn)], 04/01/2012 – 03/31/2017, \$10,000,000 (Penn: \$3,400,000).

## INVITED SEMINARS AND PRESENTATIONS

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1. (upcoming) Princeton University, Feb. 2, 2024
2. “Computational Design of Origami and Compliant Robots.” Massachusetts Institute of Technology, Robotics Seminar, Sep. 29, 2023
3. “Origami-Inspired Design for Compliant and Reconfigurable Robots”
  - Temple University, Electrical & Computer Engineering Department Seminar, Sep. 13, 2023
  - University of Maryland, College Park, Maryland Robotics Center, May 5, 2023
  - Northeastern University, the Institute for Experiential Robotics, April 27, 2023
  - Columbia University, Mechanical Engineering Seminar, April 14, 2023
  - Harvard University, Computer Science Colloquium, April 6, 2023
  - École Polytechnique Fédérale de Lausanne, Mar. 6, 2023
  - Cornell University, School of Mechanical and Aerospace Engineering, November 15, 2022
  - University of California, Berkeley, Design of Robotics and Embedded systems, Analysis, and Modeling seminar, November 7, 2022
  - University of California, San Diego, Contextual Robotics Institute, November 3, 2022
  - Johns Hopkins University, Department of Mechanical Engineering, October 6, 2022
4. “Computational Design of Compliant, Dynamical Robots”
  - ETH Zürich, Autonomy Talks, June 7, 2022.
  - Stanford University, Robotics Seminar, May 13, 2022.
  - University of California, Los Angeles, Department of Electrical and Computer Engineering, May 2, 2022.
5. “Planning and Design for Pivoting Modular Robots.” ICRA 2022 Workshop on Modular, Self-Reconfigurable Robots, May 23, 2022.
6. “Designing Compliance for Dynamical Tasks.” International Conference on Embodied Intelligence, Short Talk, Mar. 24, 2022.
7. “Dynamical Robots via Origami-Inspired Design”
  - Carnegie Mellon University, Department of Mechanical Engineering, Mar. 25, 2022.
  - University of Sheffield, Department of Automatic Control and Systems Engineering & Sheffield Robotics, Dec. 1, 2021.

- Carnegie Mellon University, Robotics Institute, April 30, 2021.
  - The College of New Jersey, Women Engineers in Computer and Electrical Engineering Technical Seminar, April 28, 2021.
  - Ames Research Center Robotics Seminar, April 7, 2021.
  - Caltech Engineering and Applied Science Department of Aerospace, Nov. 11, 2020.
8. “Dynamical Robots via Origami-Inspired Design.” ASME 2021 Virtual International Design Engineering Technical Conferences & Computers and Information in Engineering Conference (IDETC/CIE), Special Early Career session, Aug. 17, 2021.
  9. “The Role of Computation in Design.” IROS 2020 Workshop on Mechanisms and Design from Inception to Realization, Oct. 29, 2020.
  10. “Leveraging Origami Robots for Deployable Robots On-Demand.” 6th International Conference on Clinical and Engineering Frontiers in Pediatric and Congenital Heart Disease, Philadelphia, PA, May 10-11, 2019.
  11. “Computational Methods for Origami Robot Design.” Northeast Robotics Colloquium, Rutgers University, New Brunswick, NJ, Oct. 20, 2018.
  12. “Compliant Origami for Robust and Natural Motion.” RSS Workshop on Design and Control of Small Legged Robots, Pittsburgh, PA, June 30, 2018.
  13. “Create Your Own Robot.” TEDxPenn, Philadelphia, PA, April 7, 2018.
  14. “Computational Design for Personalized Origami Robots.” Department of Cardiology/MRI, The Children’s Hospital of Philadelphia, December 18, 2017.
  15. “Origami Robotics.” Personalized Intelligent Living: Human, Robot and Nature, Penn Wharton China Center, June 27, 2017.
  16. “Modeling and Design of Small-Scale Folded Robots.” RSS Workshop on the Challenges in Modeling and Control of Centimeter-Scale Robots, Ann Arbor, MI, June 18, 2016.
  17. “Computational Tools for Robot Design: A Composition Approach”
    - Department of Electrical and Computer Engineering, University of California at San Diego, La Jolla, CA, Apr. 6, 2016.
    - Department of Computer Science, University of Southern California, Los Angeles, CA, Mar. 31, 2016.
    - Department of Mechanical Engineering, Carnegie Mellon University, Pittsburgh, PA, Mar. 29, 2016.
    - Department of Aerospace Engineering and Engineering Mechanics, University of Texas at Austin, Austin, TX, Mar. 21, 2016.
    - School of Electrical and Computer Engineering, Cornell University, Ithaca, NY, Mar. 9, 2016.
    - Robotics@MIT Seminar, Massachusetts Institute of Technology, Cambridge, MA, Mar. 8, 2016.
    - Department of Mechanical Engineering, University of California at Berkeley, Berkeley, CA, Mar. 2, 2016.
    - Department of Computer Science, Rice University, Houston, TX, Feb. 23, 2016.
    - Department of Mechanical Engineering, Rice University, Houston, TX, Feb. 22, 2016.
    - Department of Mechanical and Aerospace Engineering, Princeton University, Princeton, NJ, Feb. 18, 2016.
    - Robotics Seminar, Stanford University, Stanford, CA, Feb. 10, 2016.
    - Department of Mechanical Engineering and Applied Mechanics, University of Pennsylvania, Philadelphia, PA, Jan. 26, 2016.
    - Department of Mechanical Engineering and Materials Science, Yale University, New Haven, CT, Nov. 11, 2015.
  18. “Print-and-Fold Robots.” Greater Boston Chinese Cultural Association Speaking Series, West Newton, MA, Nov. 14, 2015.



19. “Geometric design of print-and-fold robots via composition.” 2nd USC Symposium on the Futures of Robotics, Los Angeles, CA, Apr. 15, 2014.
20. “Formula Racer: An algebra video game.” Houston Serious Games Research Consortium, Quarterly Meeting, Houston, TX, Dec. 2009.

## TEACHING EXPERIENCE

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ENGR 1050: Introduction to Scientific Computation (Spring 2019–2021, 2023; Fall 2023)  
MEAM 5200: Introduction to Robotics (Fall 2017–2020, 2022)  
MEAM 6240: Distributed Robotics (Spring 2022)  
MEAM 2110: Engineering Mechanics: Dynamics (Spring 2017–2018)  
Soft Robotics, Teacher’s Institute of Philadelphia (Spring 2022)  
Origami Engineering, Teacher’s Institute of Philadelphia (Spring 2018)  
Intro to Computer Science, MIT Women’s Technology Program (Summer 2013)

## STUDENTS

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### Ph.D. Students

Wei-Hsi Chen (ESE Ph.D. 07/2022, co-advisor: Daniel Koditschek), “Creating dynamical robots of different morphologies and sizes through automatic origami design”, now postdoctoral researcher  
Jessica Weakly, née McWilliams (MEAM Ph.D., exp. 05/2024)  
Christopher Kim (MEAM Ph.D., exp. 2025)  
Dongsheng Chen (MEAM Ph.D., exp. 2025)  
Daniel Feshbach (CIS Ph.D., exp. 2026)  
Shivangi Misra (ESE Ph.D., exp. 2026)  
Gabriel Unger (MEAM Ph.D., exp. 2027)  
Mason Mitchell (CIS Ph.D., exp. 2028)  
Zhiyuan (Annie) Yang (MEAM Ph.D., exp. 2028)

### Masters Students

Rongqian Chen (ESE M.S., Spring 2023), Thesis: “Effect of Stiffness on Jumping Efficient for a Legged Hopping Robot”  
Alec Lanter (MEAM M.S., Spring 2023), Thesis: “Preliminary Design of an Origami-Inspired Pulmonary Artery Band”, now at Naval Surface Warfare Center  
Yuchen Sun (Robotics M.S., Fall 2021), Thesis: “Repeated Jumping with the REBOund: Self-Rigthing Jumping Robot Leveraging Bistable Origami-Inspired Design”, now at National University of Singapore  
Zhiyuan (Annie) Yang (MEAM M.S., Spring 2021), Thesis: “Design and Characterization of an Origami-Inspired Robot that Swims via Jet Propulsion”, MSE Merit Scholarship, Master’s Outstanding Research Award, now at General Motors R&D  
Quinn Wu (Robotics M.S., Spring 2021), Thesis: “An Evolutionary Robotics Framework for Automated Morphology Exploration using MAP-Elites”  
Max Doppelt (Robotics M.S., Spring 2020), Thesis: “Tracking Nonrigid Origami Using Unlabeled Markers”, now at EverC  
Shivangi Misra (Robotics M.S., Spring 2020), Thesis: “Decentralized Control in a Reconfigurable Expanding Bistable Origami Structure,” now ESE Ph.D.  
Jaimie Carlson (Robotics M.S., Spring 2019), Thesis: “REBound: Modeling and Actuation of a Reconfigurable Jumping Origami Robot,” now at Amazon Robotics

## SERVICE

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### Conferences and Workshops

**Associate Editor**, Transactions on Robotics, 2021–  
**Associate Editor**, International Journal of Robotics Research, 2023–

**Co-Chair**, IEEE Robotics and Automation Society, Technical Committee on Mechanisms and Design, 2022–  
**Program Committee**, IEEE/IFToMM International Conference on Reconfigurable Mechanisms and Robotics  
 Conference (ReMAR), 2024  
**Awards Committee**, IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2023  
**Organizer**, ICRA Workshop on Origami-based Structures for Designing Soft Robots with New Capabilities,  
 2023 [w/ Stéphane Viollet (CNRS/Aix-Marseille), Jamie Paik (EPFL), Kanty Rabenorosoa (CNRS/UBFC),  
 Pierre Renaud (INSA Strasbourg), Mirko Kovac (ICL)]  
**Organizer, Tours**, IEEE International Conference on Robotics and Automation (ICRA), 2022  
**Program Committee**, Workshop on the Algorithmic Foundations of Robotics, 2020–2022  
**Associate Editor**, IEEE International Conference on Robotics and Automation (ICRA), 2019–2022  
**General Chair**, ACM Symposium on Computational Fabrication, 2021 [w/ Emily Whiting (Boston U), John  
 Hart (MIT)]  
**Associate Editor**, IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2017–2020  
**General Chair**, ACM Symposium on Computational Fabrication, 2020 [w/ Emily Whiting (Boston U), John  
 Hart (MIT)]  
**Organizer**, Northeast Robotics Colloquium, 2019 [w/ Michael Posa (Penn), Pratik Chaudhari (Penn)]  
**Organizer**, ICRA Workshop on Robot Design and Customization: Opportunities at the Intersection of Com-  
 putation and Digital Fabrication, 2019 [w/ Mark Yim (Penn), Stelian Coros (ETHZ), Robert MacCurdy  
 (CU Boulder)]  
**Program Committee**, International Conference on Cyber-Physical Systems, 2019  
**Program Committee**, Robotics Systems and Sciences (RSS) Pioneers, 2018  
**Program Committee**, ACM SIGGRAPH Symposium on Computational Fabrication, 2017

## Outreach

High school students hosted in lab: Deborah Ang (Summer 2023), Angad Singh (Summer 2023), Sridhar Shenoy  
 (Summer 2023), Louis Beardell (Summer 2022), Bao To (Summer 2022), Satviki Vasireddy (Summer 2022),  
 Avani Ahuja (Summer 2021–Spring 2022), Jessica Yang (Summer 2021), Addison Liu (Spring 2018–present),  
 Nathen Ho (Summer 2020), Neal Tinaikar (Summer 2019), Neera Raychaudhuri (Summer 2018), Emily Wang  
 (Summer 2018)  
**Advisory Board Member**, Teachers Institute of Philadelphia, 2018–present  
**Panelist**, Negotiating the Offer, MIT Path of Professorship Workshop, Cambridge, MA, 2017–2022  
**Moderator**, What is Rigor and What is the Right Level of Rigor?, Penn Center for Teaching and Learning,  
 Mar. 19, 2019  
**Speaker**, Curiosity Camp, Penn School of Engineering and Applied Science, Philadelphia, PA, 2018–2019  
**Panelist**, The Joy of Being Faculty & How to Apply for a Faculty Position, Philadelphia, PA, Apr. 27, 2018  
**Speaker**, Teaching Your First Class, Penn’s Center for Teaching and Learning, Jan. 29, 2018  
**Guest Lecture**, “Computational Design for Origami Robots.” Electronic Science and Technology Leadership  
 Development Program, Penn’s English Language Program, Nov. 15, 2017  
**Panelist**, How to Apply for a Faculty Position, Philadelphia, PA, Apr. 27, 2017  
**Organizing Committee**, MIT Path of Professorship Workshop, Cambridge, MA, 2015–2016  
**Organizing Committee**, Robotics@MIT Student Conference, Cambridge, MA, Feb. 12–13, 2016  
**Planning Committee**, GW@MIT Spring Leadership Conference, Cambridge, MA, Apr. 9–11, 2013

## MEDIA COVERAGE

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“The Small Origami Robot with Potential for Big Things.” Mashable. Sep. 6, 2023. <https://youtu.be/tP3GGZl6vCs>.  
 “Family File Tree [Maker Update] | Maker.io.” Digikey. Aug. 31, 2023. <https://youtu.be/AUISYIEYlguA>.  
 “Video Friday: TruckBot >Your weekly selection of awesome robot videos.” IEEE Spectrum. Aug. 25, 2023.  
<https://spectrum.ieee.org/video-friday-truckbot>.  
 “How do you make robots more accessible to non-experts? This Penn researcher has some ideas.” Technical.ly  
 Philly. Mar. 30, 2023. <https://technical.ly/software-development/cynthia-sung-robotics-grasp-lab/>.  
 “Philly hosts a robot lollapalooza, attracting 4,500 roboticists and showing off devices that fly, swim and enter  
 the body.” The Philadelphia Inquirer. May 26, 2022. <https://www.inquirer.com/business/robots-philly-ieee-amazon-toyota-penn-engineering-20220526.html>.

- “Origami Robots.” *Mission Unstoppable*, CBS. Oct. 16, 2021. <https://youtu.be/8jprzZYWOXc>.
- “Soft Robotics with Cynthia Sung.” IEEE Soft Robotics podcast. Feb. 10, 2021. <https://soundcloud.com/ieeer-softrobotics/soft-robotics-with-cynthia-sung>.
- “Virtual Robots: Taking Risks in an Online Classroom.” Penn Engineering Today. Feb. 24, 2021. <https://blog.seas.upenn.edu/virtual-robots-taking-risks-in-an-online-classroom/>.
- “Video Friday: Agility Robotics, Pancake Robots, and Metallica’s Drone Show.” IEEE Spectrum. Sep. 8, 2017. <https://spectrum.ieee.org/automaton/robotics/robotics-hardware/video-friday-agility-robotics-pancake-robots-metallica-drone-show>.
- “MIT’s Robogami lets you build custom 3D-printable robots from standard, folding parts.” TechCrunch. Aug. 22, 2017. <https://techcrunch.com/2017/08/22/mits-robogami-lets-you-build-custom-3d-printable-robots-from-standard-folding-parts/>.
- “Soft Robotic Structures Fold Themselves Up in Hot Water.” IEEE Spectrum. May 30, 2017. <https://spectrum.ieee.org/automaton/robotics/robotics-software/soft-robotic-structures-fold-themselves-up-in-hot-water>.