

# Tom Z. Jiahao

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## RESEARCH INTERESTS

Robotics, Deep Learning, Dynamical Systems, Scientific Machine Learning, Swarm Robotics.

## EDUCATION

**University of Pennsylvania** (expected 2024), Philadelphia, PA, USA  
Ph.D. in Computer Science, Department of Computer and Information Science  
Advisors: Prof. M. Ani Hsieh, Prof. Vijay Kumar

**Cornell University** (Dec 2018), GPA: 3.75, Ithaca, NY, USA  
B.Sc. in Computer Science, Department of Computer Science  
B.Sc. in Mechanical Engineering, Sibley School of Mechanical and Aerospace Engineering  
Advisors: Prof. Hadas Kress-Gazit, Prof. Amit Lal

## EMPLOYMENT

**Research Assistant** Aug. 2019 - Present  
*GRASP Lab*, University of Pennsylvania, Philadelphia, PA  
Develop algorithms to combine deep learning with first-principle models for modeling dynamical systems. Apply these algorithms in control, swarm robotics, and other applications.

**Research Assistant** Feb. 2019 - Jul. 2019  
*Autonomous Systems Lab*, Cornell University, Ithaca, NY  
Develop Gazebo simulation for decentralized holonomic robot swarm in non-reactive scenarios. Optimize collision avoidance and deadlock mitigation for continuous controller implementation. Develop AirSim simulation for a swarm of 250 ground/air robot.

**Hardware Electrical Engineer** Feb. 2019 - Jul. 2019  
*Geegab LLC*, Ithaca, NY  
Work includes concepts generation, analog circuit design, mechanical/electronic components prototyping, and process automation around a proprietary GHz ultrasonic transducer.

**Research Assistant** May 2016 - Sep. 2018  
*SonicMEMS Lab*, Cornell University, Ithaca, NY  
Design layout of GHz ultrasonic transducer phased array MEMS device with Cadence, design test PCBs with EAGLE. Implement MATLAB code for phasing ultrasonic transducer array, to achieve wave steering and focusing. Research on quarter wave length matching layer.

**Hardware Engineering Intern** June 2018 - Aug. 2018  
*Uber ATG*, Pittsburgh, PA  
Prototyped a device for applying adhesive films onto glasses. The prototype is fabricated using sheet metal and uses compressed air and vacuum systems for operation.

## Product Engineering Intern

Sep. 2017 - May 2018

*Rapyuta Robotics*, Tokyo, Japan

Designed electronics and mechanical prototypes for product development. Scripted SolidWorks plug-ins in VBA to facilitate BOM generation and management. Designed and conducted experiments to drive key design decisions on drone design. Instructed and supervised Mechatronics assemblers on prototype and product assembly tasks.

## Mechanical Engineering Intern

May 2017 - Aug. 2017

*iRobot*, Bedford, MA

Performed testing and data analysis on robot prototype to drive key design decisions in the mopping robot product line. Implemented design for manufacturability (DFM) requests from contract manufacturers. Designed, and fabricated testing fixtures for various sub-assembly prototype testing. Developed rubber component prototypes, including designing and manufacturing molds.

## PUBLICATIONS

### Journal Articles

- [2] K. Y. Chee<sup>\*1</sup>, **T. Z. Jiahao**<sup>\*</sup>, and M. A. Hsieh, "Knode-mpc: A knowledge-based data-driven predictive control framework for aerial robots," *IEEE Robotics and Automation Letters (RA-L)*, vol. 7, no. 2, pp. 2819–2826, 2022.
- [1] **T. Z. Jiahao**, M. A. Hsieh, and E. Forgoston, "Knowledge-based learning of nonlinear dynamics and chaos," *Chaos: An Interdisciplinary Journal of Nonlinear Science*, vol. 31, no. 11, p. 11101, 2021.

### Conference Articles

- [3] Y. Wu<sup>\*</sup>, **T. Z. Jiahao**<sup>\*</sup>, J. Wang, P. A. Yushkevich, M. A. Hsieh, and J. C. Gee, "NODEO: A Neural Ordinary Differential Equation Based Optimization Framework for Deformable Image Registration," *IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, 2022.
- [2] **T. Z. Jiahao**<sup>\*</sup>, L. Pan<sup>\*</sup>, and M. A. Hsieh, "Learning to swarm with knowledge-based neural ordinary differential equations," *IEEE International Conference on Robotics and Automation (ICRA)*, 2022.
- [1] T. Nathans-Kelly, R. Evans, L. Klein, and **J. Zhang**, "We WOVE, we designed, we conquered: Assessing engineering self-efficacy in a Mechanical Engineering Communication Initiative—Instructor and student perspectives," *2017 IEEE International Professional Communication Conference (ProComm)*, 2017, pp. 1-8, doi: 10.1109/IPCC.2017.8013963.

## INVITED TALKS

- [1] Invited speaker, SIAM Conference on Applications of Dynamical Systems (DS21) Minisymposium, Virtual, May 2021.

## GRANTS AND AWARDS

### Awards and Honors

2017 Print Provider Prize, Master Builder Prize, IARPA Nail to Nail (N2N) Fingerprint Challenge

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<sup>1</sup> \* indicates co-first authors.

- 2016 Engineering Learning Initiatives Undergraduate Research Award, Cornell University  
2014–18 Dean’s List for all semesters, Cornell University

### **Fellowships**

- 2019–20 Graduate Fellowship, University of Pennsylvania

### **TEACHING**

#### **Cornell University**

MAE 3780: Mechatronics. Fall 2016.

#### **University of Pennsylvania**

CIS 502: Analysis of Algorithms. Fall 2020.

CIS 810: Writing and Speaking in Styles. Spring 2022

### **OTHER EXPERIENCE**

#### **Mechanical Project Lead**

Sep. 2014 - Dec. 2018

*Cornell Unmanned Air Systems*, Cornell University, Ithaca, NY

Spent four years designing, prototyping, and manufacturing mechanical components of fixed-wing aircrafts. During this time, I led the development of a 2-axis camera gimbal with protective dome. I designed and fabricated modularized UAV payload mounts, bulkheads, and accessories SolidWorks, 3D printers, machine shop tools and laser cutter. I designed and fabricated antenna tracker pitch mechanism, which keeps antennas in-line with plane. I fabricated and post-processed composite-based airfoil and fuselage components. I assisted as the mechanical representative for emergency fix, crashed plane salvation, and failure analysis during routine test flights at Neno International Airport.

#### **Technician**

Sep. 2015 - May 2017

*Cornell Rapid Prototyping Lab*, Cornell University, Ithaca, NY

Operated various models of 3D printers, laser cutter, post-processing printed/cut parts for students, faculties, and research labs. Advised students on mechanical designs for rapid prototyping and performed design analysis. Conducted regular 3D printer, laser cutter, and fume extractor maintenance.

#### **EurekaFest 2017 Duck ‘N’ Hover Student Mentor**

Summer 2017

*Museum of Science*, Boston, MA

Mentored a group of 5 high school students in the finale competition on the design and build of a wind-powered device capable of hovering three stories in the air, carrying as many rubber ducks as possible. My team won the grand champion, with our device lifting over 200 ducks.

#### **Home Fire Safety Volunteer**

Summer 2018

*American Red Cross*, Pittsburgh, PA

Put up door hangers for houses in the neighborhood as a notice for upcoming fire alarm installation.

Updated March 2022