

# Allen Z. Ren

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## Research Interests

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My research interests lie in improving generalization performance and safety of agile robotic systems under rich sensing and allowing their fast adaptation in new, potentially out-of-distribution tasks and environments. I am particularly excited to leverage algorithmic and theoretical tools from machine learning, optimization, optimal control, and 3D modeling to tackle robotic tasks including contact-rich manipulation, legged robot navigation, and drone maneuvering in wind.

## Academic and Research Experiences

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**Ph.D. in Mechanical and Aerospace Engineering at Princeton University** 2019 - Present  
Intelligent Robot Motion (IRoM) Lab, advised by Anirudha Majumdar

**Summer Research Intern at Toyota Research Institute (TRI)** 2022 Summer  
Dexterous Manipulation Team, advised by Hongkai Dai and Ben Burchfiel

**Master of Science in Engineering in Robotics at Johns Hopkins University** 2018-2019

**Bachelor of Science in Mechanical Engineering at Johns Hopkins University** 2015-2019  
Minor in Mathematics, GPA: 3.92/4.00

## Publications

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### Preprint

**FlowDrone: Wind Estimation and Gust Rejection on UAVs Using Fast-Response Hot-Wire Flow Sensors**

Nathaniel Simon, [Allen Z. Ren](#), Alexander Pique, David Snyder, Daphne Barretto, Marcus Hultmark, and Anirudha Majumdar. Submitted to *IEEE International Conference on Robotics and Automation (ICRA)*, 2023.

### Peer-reviewed conference and journal publications

**Sim-to-Lab-to-Real: Safe Reinforcement Learning with Shielding and Generalization Guarantees**

Kai-Chieh Hsu<sup>1</sup>, [Allen Z. Ren](#)<sup>1</sup>, Duy Phuong Nguyen, Anirudha Majumdar<sup>2</sup>, Jaime F. Fisac<sup>2</sup>. *Artificial Intelligence Journal (AIJ)*, 2022.

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<sup>1</sup>Equal contributions in alphabetical order.

<sup>2</sup>Equal advising.

### **Leveraging Language for Accelerated Learning of Tool Manipulation**

Allen Z. Ren, Bharat Govil, Tsung-Yen Yang, Karthik Narasimhan, and Anirudha Majumdar. *Proceedings of the Conference of Robot Learning (CoRL)*, 2022.

### **Distributionally Robust Policy Learning via Adversarial Environment Generation**

Allen Z. Ren and Anirudha Majumdar. *IEEE Robotics and Automation Letters (RA-L)*, 2022.

### **Failure Prediction with Statistical Guarantees for Vision-Based Robot Control**

Alec Farid, David Snyder, Allen Z. Ren, and Anirudha Majumdar. *Proceedings of Robotics: Science and Systems (RSS)*, 2022.

### **Stronger Generalization Guarantees for Robot Learning by Combining Generative Models and Real-World Data**

Abhinav Agarwal, Sushant Veer, Allen Z. Ren, and Anirudha Majumdar. *Proceedings of the IEEE International Conference on Robotics and Automation (ICRA)*, 2022.

### **Generalization Guarantees for Imitation Learning**

Allen Z. Ren, Sushant Veer, and Anirudha Majumdar. *Proceedings of the Conference of Robot Learning (CoRL)*, 2020.

### **Multi-Contact Force-Sensing Guitar for Training and Therapy**

Zhiyi Ren, Chun-Cheng Hsu, Can Kocabalkanli, Khanh Nguyen, Iulian I. Iordachita, Serap Bastepe-Gray, and Nathan Scott. *Proceedings of the IEEE Sensors Conference*, 2019.

### **Dynamic Traversal of Large Gaps by Insects and Legged Robots Reveals a Template**

Sean W Gart, Changxin Yan, Ratan Othayoth, Zhiyi Ren, and Chen Li. *Bioinspiration & Biomimetics*, 2018.

## **Technical reports**

### **Toward Robust Stair Climbing of the Quadruped using Proprioceptive Sensing**

Zhiyi Ren and Aaron Johnson. *CMU Robotics Institute Summer Scholars Working Papers Journal*, 2018.

## **Teaching Experience**

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### **Teaching Assistant**

- Fall 2022, Fall 2021, MAE 345/549 Introduction to Robotics, Princeton MAE department.
- Spring 2021, MAE 206 Introduction to Engineering Dynamics, Princeton MAE department.
- Spring 2019, 530.343 Design and Analysis of Dynamical Systems, JHU ME department.
- Fall 2018, 530.424/624 Dynamics of Robots and Spacecraft, JHU ME department.
- Spring 2017, 600.120 Intermediate Programming, JHU CS department.

## Awards and Honors

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- **Harari Fellowship, Princeton University** 2022  
Awarded for excellence in both academics and research in graduate studies.
- **Crocco Prize, Princeton University** 2022  
Awarded for outstanding assistantship in instruction in MAE 345/549, Introduction in Robotics.
- **Robert George Gerstmyer Award, Johns Hopkins University** 2019  
Awarded for outstanding undergraduate achievement in mechanical engineering.
- **ASME Best Senior Design Project, Johns Hopkins University** 2019  
Awarded for best senior design project (Smart Guitar) among 13 teams.
- **James F. Bell Award, Johns Hopkins University** 2018  
Awarded for outstanding research and scholarly achievement in mechanical engineering.
- **Robotics Institute Summer Scholars, Carnegie Mellon University** 2018  
Selected as one of the 30 summer research scholars at the Robotics Institute, CMU.

## Academic Service

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### Undergraduate research mentoring

- Bharat Govil (COS), Princeton 2022 Spring
- Alan Ji (MAE), Princeton 2021 Summer
- Shri Deshmukh (ME), Caltech (SURI program) 2020 Summer

### Reviewing

- Artificial Intelligence Journal (AIJ) 2022 - Present
- IEEE Transactions on Robotics (T-RO) 2022 - Present
- Conference on Neural Information Processing Systems (NeurIPS) 2022 - Present
- IEEE Robotics and Automation Letters (RA-L) 2021 - Present
- Learning for Dynamics and Control Conference (L4DC) 2021 - Present
- Conference on Robot Learning (CoRL) 2020 - Present
- International Conference on Robotics and Automation (ICRA) 2020 - Present

### Miscellaneous

- Co-organizer, Princeton Robotics Seminar 2020 - Present
- Webmaster, Robotics at Princeton ([robo.princeton.edu](http://robo.princeton.edu)) 2020 - Present