

CURRENT POSITION

Postdoctoral Associate, Cornell University

2021 - present

Supervisor: Kirstin Petersen, [Collective Embodied Intelligence Lab](#)
Electrical and Computer Engineering

EDUCATION

University of Illinois at Urbana-Champaign (UIUC)

2015 - 2020

Degree: Ph.D. in Computer Science
Thesis Title: *Designing Boundary Interactions for Simple Mobile Robots*
Committee: [Steven M. LaValle](#) (advisor), Nancy Amato, Sayan Mitra, Todd Murphey (Northwestern University)

Colorado School of Mines (CSM)

2011 - 2015

Degree: B.S. in Engineering Physics. GPA 3.93/4.0
Minor in Computational and Applied Mathematics
Minor in Public Affairs, McBride Honors Program

PUBLICATIONS

Journal Articles

1. **A. Nilles**, Y. Ren, I. Becerra, S. M. LaValle. "A Visibility-Based Approach to Computing Nondeterministic Bouncing Strategies," in *The International Journal of Robotics Research*, 2021.
2. A. LaViers, C. Cuan, C. Maguire, K. Bradley, K. B. Mata, **A. Nilles**, I. Vidrin, N. Chakraborty, M. Heimerdinger, U. Huzaifa, R. McNish, I. Pakrasi, and A. Zurawski. "Choreographic and Somatic Approaches for the Development of Expressive Robotic Systems," in *MDPI – Arts*, 2018.

Conference Articles

3. **A. Nilles**, S. Ceron, N. Napp, and K. Petersen. "Strain-Based Consensus in Soft, Inflatable Robots," in the *IEEE 5th International Conference on Soft Robotics (RoboSoft)*, 2022.
4. S. Ceron, M. A. Kimmel, **A. Nilles**, and K. Petersen. "Soft Robotic Oscillators With Strain-Based Coordination," in *IEEE Robotics and Automation Letters (RAL)*, 2021.
5. **A. Nilles**, A. Pervan, T. Berrueta, T. Murphey, S. M. LaValle. "Information Requirements of Collision-Based Micromanipulation," in the *14th Workshop on the Algorithmic Foundations of Robotics (WAFR)*, 2021.
6. M. Suomalainen, **A. Nilles**, S. M. LaValle. "Virtual Reality for Robots," in *IEEE Conference on Intelligent Robots and Systems (IROS)*, 2020.
7. **A. Nilles**, J. Wasserman, A. Born, C. Horn, J. Born, S. M. LaValle. "A Hardware and Software Testbed for Underactuated Self-Assembling Robots," in the *IEEE International Symposium on Multi-Robot and Multi-Agent Systems (MRS)*, 2019.
8. **A. Nilles**, Y. Ren, I. Becerra, S. M. LaValle. "A Visibility-Based Approach to Computing Nondeterministic Bouncing Strategies," in the *13th Annual Workshop on the Algorithmic Foundations of Robotics (WAFR)*, 2018.
9. **A. Nilles**, C. Gladish, M. Beckman, and A. LaViers. "Improv: Live Coding for Robot Motion Design," in *Proceedings of the 5th International Conference on Movement Computing (MOCO)*, ACM, 2018.
10. **A. Nilles**, I. Becerra, and S. M. LaValle. "Periodic Trajectories of Mobile Robots," in *IEEE Conference on Intelligent Robots and Systems (IROS)*, 2017.

Workshop and Poster Presentations

- A. Q. Nilles, S. M. LaValle. “Robust Combinatorial Planning over Simple Boundary Interactions,” in *Workshop on Robust Task & Motion Planning* at RSS 2019.
- A. Q. Nilles, D. A. Shell, J. M. O’Kane. “Robot Design: Formalisms, Representations, and the Role of the Designer,” in *Workshop on the Autonomous Design of Robots* at ICRA 2018.
- A. Q. Nilles, I. Becerra, and S. M. LaValle. “Controllable Billiards: Characterizing the Paths of Simple Mobile Robots,” poster in *Dynamics Days*, 2018.
- A. Q. Nilles, “Partially Coherent Transport: Computational Analysis and Overcoming Anderson Localization,” 2014 CSM Physics poster session.
- A. Q. Nilles, “Teaching the Smart Grid: Why Data Management is Essential to the Future of Electricity,” *WISE Journal of Engineering and Public Policy*.

INVITED TALKS

- “Is Less More? Characterizing resource trade-offs for simple mobile robots with embodied intelligence.” Autonomy Talks, Institute for Dynamic Systems and Control, ETH Zürich. 8 February 2021, recording available on ETH Zürich Frazzoli YouTube Channel.
- “Is Less More? Characterizing Resource Trade-offs When Designing Robot-Boundary Interactions.” Cornell Robotics Seminar, 12 May 2020, talk given via Zoom.
- “Towards Self-Assembly and Collective Manipulation with Extremely Underactuated Robots,” NxR Group Meeting, Northwestern University. 1 March 2019.
- “Interesting Trajectories of Mobile Robots in Polygons,” 2017 Midwest Robotics Workshop (MWRW). May 18 2017.
- “New Developments in Combinatorial Data Structures and Algorithms for Robotic Planning, Filtering and Design,” UIUC Theory Seminar, October 3 2016.
- “Case Studies in Robotics Toolchains,” UIUC Robotics Seminar, September 9 2016.

AWARDS AND HONORS

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| • Cornell Postdoc Leadership Program | 2021-2022 |
| • Mentor Stipend, Illinois Scholars Undergraduate Research Program | 2019 |
| • Leung Student Venture Fund Award, UIUC ECE Department | 2019 |
| • IEEE MRS (Multi-Robot Systems) Travel Grant | 2019 |
| • Workshop on Algorithmic Foundations of Robotics (WAFR) Robot Guru Travel Grant | 2018 |
| • Saburo Muroga Endowed Fellowship, UIUC CS Department | 2015-2016 |
| • Physics Faculty Distinguished Graduate Award, CSM | May 2015 |
| • Leo Borasio Outstanding Junior Award, McBride Honors Program, CSM | May 2014 |
| • President’s Undergraduate Scholarship, CSM | 2011-2015 |

TEACHING EXPERIENCE**Teaching Assistant, ECE 470: Introduction to Robotics****Fall 2019**

- One of five TAs for an upper level 90-student class with lecture and lab components, covering topics such as state estimation and filtering, forward and inverse kinematics, motion planning, control, and introductory computer vision.
- Individually supervised a twice-weekly 15-student lab section, using Universal Robots UR3 robot arms and computer vision.
- Gave two 75-minute guest lectures on inverse kinematics for the full ninety-student class.
- Developed homework and test problems using the online learning platform PrairieLearn.

Mentees

- Emily Hall and Max Altman (2019-2020)
 - 4th year undergraduates: supervised on a funded undergraduate research project (a robotic pen), assisted with project transition during onset of pandemic
- Jordan Parker (2018)
 - 1st year undergraduate: worked on Improv, connected her with a paid research position in the RAD Lab
- Chase Gladish (2018)
 - 4th year undergraduate: I supervised her senior thesis on Improv, a live-coding platform for robot motion
 - co-author on 2018 MOCO paper
- Samara (Yingying) Ren (2017-2020)
 - undergraduate: co-author on one WAFR paper and IJRR paper, until she started a graduate degree at EPFL
- Austin Born, John Born, Chris Horn, Justin Wasserman (2017-2019)
 - supervised this team of undergraduates, including receiving a \$1000 undergraduate research award, and publishing a 2018 MRS paper
 - J. Wasserman wrote senior thesis on “Controlling, Modeling, and Scaling Underactuated, Non-deterministic Robot Structures”
- Michael Zeng (2016)
 - 3rd year undergraduate: collaborated on dynamical properties of bouncing robots
- Oluwami Dosunmu-Ogunbi (2015-2016)
 - 4th year undergraduate: worked on CAD, microcontrollers, IMU data collection and analysis

Colorado School of Mines Math Learning Center

Description: Tutored five hours a week for all classes in Math department. Primarily calculus, differential equations, and linear algebra.

Dates: Jan 2015 - May 2015

North American Network of Science Labs Online (NANSLO)

Description: Developed, monitored, and troubleshoot remote-controlled robotic physics, chemistry, and biology experiments for college students in online classes. Served as a TA and equipment technician while classes were running. This was innovative distance learning research through the Department of Labor.

Dates: Feb 2012 - May 2014

PROFESSIONAL SERVICE

- Head of student committee organizing an internal Robotics@UIUC seminar (Fall 2016).
 - Recruited student speakers, advertised talks, maintained wiki.
- President of Computer Science Graduate Students Organization (2017 - 2018).
 - Organized social events, communicated with department administration about graduate student needs, assisted in organizing annual prospective PhD student visit weekend.
- Reviewer for IROS '17, '18, '19, '20; ICRA '18, '19, '20; EAAI '17; CGTA '19
- Program Committee Member for MRS '19
- Co-organizer for 2017 Robotic Science and Systems (RSS) full day workshop, “Minimality and Trade-offs in Automated Robot Design.” July 16 2017.
 - Recruited and communicated with speakers, helped develop materials (The Robot Design Game, <http://robot-design.org/>), facilitated workshop and discussions.

- Co-organizer for 2021 ICRA full day workshop, “Compositional Robotics: Mathematics and Tools.” 31 May 2021.

OUTREACH AND DIVERSITY SERVICE

- 2019-2020: Mentor for Illinois Scholars Undergraduate Research (ISUR) Program. Supervised two URM undergraduate students building a robotic pen.
- 2019: WAFR Robot Guru Mentor - six month remote mentorship of undergraduates interested in robotics research
- 2014: Founding member of Equality Through Awareness (ETA) at CSM, a group promoting diversity in STEM through discussion, mentoring, and invited speakers.
 - facilitated weekly group discussions on articles and topics relevant to underrepresented minorities
 - In 2018, ETA was awarded the Martin Luther King Jr. Recognition Award from CSM
- 2012-2015: Society of Physics Students - participated in outreach events such as interactive physics demonstrations at local elementary and middle schools.

OTHER EMPLOYMENT

Petronics internship: Development of small, agile mobile robot

Description: Worked closely with engineers to develop hardware and software for their mobile platform. Configured a ROS server and added a wifi module to the robot to stream data through ROS. Analyzed the resulting data using Python, to compare streaming pose estimates from the robot with a ground truth from a motion capture system (also ROS-integrated). Analyzed how the robot slipped on different surfaces to help improve low-level controllers.

Dates: May 2016 - August 2016

Complexity Sciences Center, UC Davis

Description: NSF REU with Dr. Jim Crutchfield. I successfully implemented an information-theoretic learning algorithm for exploratory robots with limited sensing capabilities. I also researched ways to include more memory in the learning algorithm.

Dates: June - Aug 2014

Institute of Electrical and Electronics Engineers (IEEE)

Description: Washington Internships for Students of Engineering (WISE) program: researched smart grid data management and policy alternatives; published an overview and policy recommendation in the *WISE Journal of Engineering and Public Policy*.

Dates: June - Aug 2013

REFERENCES

- Professor Steven M. Lavalle
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