

Alexandra (Alli) Nilles

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Objective: Seeking postdoc or software engineering position in robotics. My specialties are motion planning, control, and design of mobile robots, as well as API and interface design.

EDUCATION

University of Illinois at Urbana-Champaign (UIUC)

Aug. 2015 - Aug 2020 (estimated)

Degree: PhD Candidate in Department of Computer Science. GPA 3.73/4.0

Thesis: *Planning and Control of "Bouncing Robots": Algorithmic Approaches to Structured Robot-Boundary Interactions*. Advised by Dr. Steven M. LaValle.

Colorado School of Mines (CSM)

Aug. 2011 - May 2015

Degree: B.S. in Engineering Physics. GPA 3.93/4.0

Minor in Computational and Applied Mathematics

Minor in Public Affairs, from McBride Honors Program

SKILLS

- **Programming:** Python, C++, Haskell, MatLab, Mathematica, parallel computing, shell scripting, embedded programming (mBed, Arduino).
- **Experimental:** Calibration, collection and analysis of video, motion-capture, and IMU data. Electronics prototype design and construction, electronics lab equipment (oscilloscopes, multimeters, soldering, etc), safety and troubleshooting techniques.
- **Computing:** Linux, Windows, \LaTeX , Git/Github, Pandoc, high performance computing clusters.
- **Teaching:** Laboratory and instructional teaching experience in robotics, math, and computer science. Have lectured to large audiences (100+ people).

EMPLOYMENT HISTORY

Research Assistant in UIUC CS Department

Aug. 2015 - May 2020

- Researched hierarchical controllers for underactuated mobile robots that explicitly use robot-boundary interactions as a motion strategy.
- Designed, implemented, and analyzed a novel, exact, nondeterministic planning algorithm for our model of robot-boundary interactions.
- Characterized robot trajectories as discrete dynamical systems (mathematically and programmatically identified attractors, regions of attraction, convergence rates).
- Developed interactive simulation and visualization programs in Python and Haskell.
- Shared results in peer-reviewed publications and conference presentations.
- Managed and mentored over ten undergraduate researchers over five years.

Teaching Assistant for ECE 470 (Introduction to Robotics)

Aug. 2019 - Dec. 2019

- Solo instructor for weekly laboratory section (15 students). Lectured on necessary background in laboratory and programming skills. Facilitated as students completed the lab. Graded lab reports.
- Expanded course content on probability, filtering, estimation, motion planning, robot kinematics and dynamics. Wrote homework and exam problems using online coursework platform PrairieLearn.
- Guest lectured for two 75-minute lectures on forward kinematics (class of ~90 students).
- Held office hours (3 hr/week) for labwork and coursework.

Research Intern at Petronics (Sprite Robotics)

May 2016 - Aug. 2016

- Contributed to development of a small, agile, robotic cat toy.
- Configured a ROS server and added a wifi module to the robot to stream data through ROS.
- Wrote Python program to compare robot pose estimates with ground truth from motion capture.
- Analyzed how the robot slipped on different surfaces to improve low-level controllers.

Tutor at Colorado School of Mines Math Learning Center

Jan. 2015 - May 2015

- Tutored drop-in students five hours a week for all undergraduate classes in Math department. Primarily calculus, differential equations, and linear algebra.

Research Intern at Complexity Sciences Center, UC Davis

June 2014 - Aug. 2014

- Implemented an information-theoretic learning algorithm for robots with limited sensing capabilities.
- Researched how to efficiently represent sensor histories in the learning algorithm.

Laboratory Technician at NANSLO

Feb. 2012 - May 2014

- 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.

SELECTED PEER-REVIEWED PAPERS

- A. Q. Nilles, Y. Ren, I. Becerra, S. M. LaValle. "A Visibility-Based Approach to Computing Nondeterministic Bouncing Strategies," in *The International Journal of Robotics Research*, expected 2020.
- A. Q. 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*, 2020.
- A. Q. 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*, 2019.
- A. Q. 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*, ACM. 2018.
- A. Q. Nilles, I. Becerra, and S. M. LaValle. "Periodic Trajectories of Mobile Robots," in *IEEE Conference on Intelligent Robots and Systems (IROS)*, 2017.

PROFESSIONAL ACTIVITIES

- 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; 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, developed *The Robot Design Game*, (<http://robot-design.org/>), facilitated workshop and discussions.
- Head of student committee organizing an internal Robotics@UIUC seminar (Fall 2016).
 - Recruited student speakers, advertised talks, maintained wiki with schedule and speaker slides.

AWARDS AND HONORS

- 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