NIALAH J. WILSON-SMALL

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RESEARCH

My research centers coordination algorithms for multi-robot systems as well as human-drone interactions. Specifically, I study how drones can use tactile feedback to influence human motion considering both individual and group interactions. My work is at the cross section of design, human-robot interaction, and autonomy.

EDUCATION

Ph.D., Aerospace Engineering
Cornell University, Ithaca, NY, 2022
Dissertation: "Embodied Physical Interactions for Robot-to-Robot and Robot-to-Human Coordination"
Advisor: Prof. Kirstin Petersen

M.S., Aerospace Engineering
Cornell University, Ithaca, NY, 2020

B.S., Mechanical Engineering
Howard University, Washington, D.C., 2017

TEACHING EXPERIENCE

New York University Tandon School of Engineering, Brooklyn, NY
Industry Assistant Professor: Mechanical and Aerospace Engineering 8/2022 - Present
Support the Robotics and Mechatronics Master's program and the Undergraduate Robotics Minor. Courses: Intro to Mechanical Engineering ME-UY 1012, Mechatronics ROB-GY 5103, Swarm Robotics ROB-GY 6333

Cornell University, Ithaca, NY
Teaching Assistant, Mixed Reality, CS 5678 1/2022 - 5/2022
Provided detailed feedback on research project progress reports. Graded paper reviews and assessed final projects reports.

Teaching Assistant, Mechatronics, MAE 3780 8/2019 - 12/2019
Tutored students in office hours and provided technical support during lab sessions with 36 students. Graded laboratory reports and gave detailed feedback on assignments.

INDUSTRY EXPERIENCE

Smashworks Dance
New York, NY 9/2023 – Present
Artist In Residence
Collaborate with the dancers to develop new tactile drones to further physical human-drone interaction research. Choreographing an evening length performance with the new technology.

Sandia National Laboratories
Albuquerque, NM 5/2021-8/2021 (Remote)
Autonomy NM Grad R&D Intern: Autonomy for Hypersonics
Contributed to controls and system integration projects.

Albuquerque, NM 5/2015-4/2016 (DOE L Security Clearance)
Summer Technical Intern/R&D Year Round Telecommuter: Thermal/Fluids Experimentation Sciences
Operated various lab equipment to characterize bellows (springs) and test their effect on dynamic systems with damping and multiphase flow under high vibration conditions. Wrote multiple scripts in MATLAB to analyze the data sets.

The Boeing Company (Engineering Accelerated Hiring Initiative)
Everett, WA 6/2017-8/2017
Weight Engineer Intern: Optimization Center & Product Development in Flight Sciences
Utilized HyperWorks to produce weight efficient design alternatives for 777 and freighter parts. Collaborated across departments to provide accurate weight estimates to inform trade studies for a freighter configuration.

Seattle, WA 5/2016-7/2016
Metrology Intern: Metrology and Test Equipment Services in Boeing Test and Evaluation
Designed, implemented, and tested a system including the programming, bracket design, and electronics to replace the laser interferometer measurement system with an optical encoder to be used in the Photometry Lab.

Precision Technology, USA Roanoke, VA 5/2014-7/2014
Mechanical Engineering Intern
Designed components and configurations for multi-axis linear electromechanical actuator systems in SolidWorks.

PUBLICATIONS

1. Nialah Jenae Wilson-Small, David Goedicke, Kirstin Petersen, and Shiri Azenkot. 2023. A Drone Teacher: Designing Physical Human-Drone Interactions for Movement Instruction. In Proceedings of the 2023 ACM/IEEE International Conference on Human-Robot Interaction (HRI '23). Association for Computing Machinery, New York, NY, USA, 311–320. https://doi.org/10.1145/3568162.3576985
2. Nialah Jenae Wilson-Small, Louisa Pancoast, Kirstin Petersen, and Shiri Azenkot. 2023. Exploring Human-Drone Collaboration Through Contact Improvisation. In Companion of the 2023 ACM/IEEE International Conference on Human-Robot Interaction (HRI '23). Association for Computing Machinery, New York, NY, USA, 97–101. https://doi.org/10.1145/3568294.3580050
3. Nialah J. Wilson*, Steven Ceron*, Logan Horowitz, and Kirstin H. Petersen. "Scalable and Robust Fabrication, Operation, and Control of Compliant Modular Robots", *Scientific Frontiers* special issue on Designing Self-Organization in the Physical Realm, doi: 10.3389/frobt.2020.00044, 2020.
4. Steven Ceron, Nialah Wilson, Logan Horowitz, and Kirstin Petersen. "Comparative Analysis of Sensors in Rigid and Deformable Modular Robots for Shape Estimation", Intl. Symp. for Multi-Robot and Multi-Agent Systems (MRS), 2019.
5. Steven Ceron*, Logan Horowitz*, Nialah Wilson, Claire Chen, Daniel Kim, and Kirstin Petersen. "Towards a Scalable, Self-Reconfigurable Robot with Compliant Modules", ext. abs., Intl. Symp. for Multi-Robot and Multi-Agent Systems (MRS), 2019.

6. Wilson, Nialah Jenae. Bellows Characterization for Dynamic Systems with Damping and Multiphase Flow_njw. No. SAND2016-1457C. Sandia National Lab.(SNL-NM), Albuquerque, NM (United States), 2016., Poster
7. Wilson, N. Bellows Characterization for Dynamic Systems with Damping and Multiphase Flow. Presen., Emerging Researchers National Conference in STEM, 2016, Poster

PRESENTATIONS

1. Nialah J. Wilson, "Designing Tactile Human-Drone Interactions for Movement Instruction", ext. abs., STEMNoire 2021
2. Wilson, N. Design and Coordination of Flexible Modular Robots. Presen., RSS: Women in Robotics Workshop, 2018 (Received Inclusion@RSS Travel Grant)

MENTORSHIP AND PROFESSIONAL DEVELOPMENT

Howard University Robotics Organization Mentor *1/2021-5/*2021
Created a ROS2 and Gazebo curriculum. Taught the students via recorded modules and created an end of semester assignment.

Master of Engineering Project Team Supervisor 8/2019-5/2020
Led a team of 4 students for their capstone project to design a swarm of micro-blimps. Provided technical guidance.

Graduate Resident Fellow Carl Becker House 8/2019- 5/2020
Oversaw 36 residents on my floor and organized events for the entire house of over 350 students. Coordinated with Cornell and external faculty, staff, and students to create events that fostered a community environment. Addressed the entire community in weekly presentations.

Undergraduate Project Supervisor 1/2019-5/2019
Mentored and provided technical support to a student altering a commercial micro-blimp and implementing a feedback control loop.

Senior Capstone Design Project: Team Lead 8/2016-4/2017
Led team of 4 students then expanded to co-lead a team of 8. Designed and built an apparatus to test thermal radiation transfer between metallic concentric cylinders in a vacuum environment. Identified tasks and delegated to teammates. Coordinated with manufacturers, team members, and our sponsors Sandia National Laboratories to meet specifications and our deadline. Presented our results to our sponsors at their facilities in Albuquerque, NM.

Howard University Robotics Organization*: Co-Founder*, *President 8/2015-5/2017*
Drafted legislation and coordinated with university department heads to establish the organization. Created modules to teach students about basic robotics principles. Organized two autonomous car competitions for the students.

Congressional Black Caucus Foundation *Emerging Leaders First China Cohort 8/2014*
Selected in the first cohort of African American students to travel China to learn about their history, legislation, and emerging technologies towards the goal of fostering new US-China relationships and mentoring future delegators.

OUTREACH

1. *ENVISION Women in STEM Proposal Writing Competition*, 1/2021 & 1/2022: Judged high school students' entries and provided constructive feedback.
2. *Expand Your Horizons*, Cornell University, Ithaca, NY 4/2019: Served as an assistant for a workshop for middle school girls to expose them to engineering careers (~30 girls)

3. *New Visions Engineering*, Cornell University, Ithaca, NY 11/2018: Co-designed and led a four-hour robotics workshop for ~15 high school students interested in engineering.
4. *Connecting Opportunities*, Cornell University, Ithaca NY 7/2018: Co-designed and led a 2-hour robotics workshop for ~12 high school students interested in engineering.
5. *Middle School Outreach, Howard University Middle School of Math and Science,* Washington DC 11/2017: 2-day trip to Washington DC to teach 7th grade teachers a physics science project for their students.