

# Nathan DeVrio

*Human-Computer Interaction Ph.D. Student,  
Carnegie Mellon University*

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## Research Interests

I research the next generation of interactive hardware technologies to address existing limitations in performance, capability, and usability. New devices should not just fix the shortcomings reported by users of current ones but also enable previously impossible and delightful forms of interaction.

**Technical Areas:** Human-Computer Interaction, Sensors, Activity Recognition, AR/VR, Ubiquitous Computing

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## Education

09/2020 - Present **Carnegie Mellon University,**  
Pittsburgh, PA *Human-Computer Interaction Institute,*  
Ph.D. in Human-Computer Interaction.

09/2016 - 05/2020 **University of Michigan,**  
Ann Arbor, MI Bachelors of Science in Engineering in Computer Engineering,  
GPA: 3.94/4.00.

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## Professional Experience

09/2020 - Present **Future Interfaces Group,** *Carnegie Mellon University,* Ph.D. Student,  
Pittsburgh, PA Advisor: Chris Harrison

As a part of my work as a researcher in the Future Interfaces Group (FIGLAB), I create novel sensing devices for aiding in interaction tasks. I am particularly interested in investigating wearable devices for environment- and context-aware computing. The technical areas that I specialize in include sensor hardware design, embedded programming, and machine learning for sensor data.

09/2018 - 03/2020 **Interactive Sensing and Computing Lab,** *University of Michigan,* Undergraduate Researcher,  
Ann Arbor, MI Advisor: Alanson Sample

Designed a wrist-worn device to detect different ways a user interacts with objects or surfaces and determine their activity by measuring properties of the body and the environment. Completed assembly of an embedded device integrating capacitive and electromagnetic sensors. Performed successful demos of the individual sensing components demonstrating the ability to classify user actions (capacitive) and environmental conditions (EM) using machine learning.

- 06/2019 - 08/2019 **Microsoft Corporation**, *Azure Storage Media and Edge*, SWE Intern,  
Redmond, WA Mentor: Aniket Malatpure  
Developed a root-cause analysis pipeline for Azure Stack in Python allowing for automatic filtering of potential root failures of failure during the build process starting from only a list of error events. Wrote a research paper describing the how the dependency graph algorithm I wrote could be applied to any private cloud system. Accepted for publication as first author at ISSRE 2020.
- 05/2018 - 08/2018 **Microsoft Corporation**, *Azure Storage Media and Edge*, SWE Intern,  
Bellevue, WA Mentors: Aniket Malatpure, Suman Nath  
Integrated an instrumentation tool prototyped by Microsoft Research for discovering hard-to-find fault injection and thread-safety bugs earlier in development into product code for Azure Stack. Augmented the tool to simulate cloud computing faults by performing context analysis on previous bug logs and simulating similar root causes elsewhere in the code to expose new bugs. Promoted the tool to other teams in Azure where it has already begun to enter use and find bugs.
- 09/2017 - 05/2018 **Robert Dick Group**, *University of Michigan*, Undergraduate Researcher,  
Ann Arbor, MI Advisor: Robert Dick  
Developed an embedded sensing and actuation device for aiding anesthesiologists in improving the accuracy and efficiency of epidural procedures. Aided in the process of using machine learning algorithms to correlate needle depth with sensor data to identify when the needle is approaching bone before the doctor makes contact.
- 05/2017 - 08/2017 **The MITRE Corporation**, *Electronic System Dev*, Embedded Software Intern,  
Bedford, MA Mentors: Rachel Bainbridge, Chris Niessen  
Researched electromagnetic fault attacks on cryptographic algorithms implemented on FPGAs. Programmed embedded cores in Verilog and scripts for attack testing in Python. Created an automated demo to highlight the results of the attack that educated visiting sponsors. Led a team in an embedded capture the flag competition to design, build, and defend a secure ATM banking system in C and Python and attack opposing systems with cryptanalytic techniques to capture flags. Placed in the top 5 teams.
- 12/2016 - 05/2017 **Lab11**, *University of Michigan*, Undergraduate Researcher,  
Ann Arbor, MI Advisors: Prabal Dutta, Branden Ghena  
Resolved errors in the preexisting implementation of a Bluetooth low-energy embedded audio sensor. Redesigned the device after performing power analytics to bring the project to an operational state.

06/2015 - 08/2015 **U.S. Naval Research Laboratory**, *Laboratory for Autonomous Systems Research*, Robotics Intern,  
Washington, D.C.  
Mentor: Donald Sofge  
Worked on a project to use bat-like echolocation via an FPGA sensor platform to identify different terrains an autonomous robot encountered. Utilized MATLAB, LabVIEW, and Python scripts to extract echoes from an ultrasonic sensor and developed a support vector machine algorithm that successfully classified four terrain types. Published as first author at the International Joint Conference on Neural Networks (2018).

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## Publications

### Conference Papers

- C.05 **N. DeVrio**, C. Harrison, DiscoBand: Multiview Depth-Sensing Smartwatch Strap for Hand, Body, and Environment Tracking. *In Proceedings of the ACM Symposium on User Interface Software and Technology (UIST 2022)*.
- C.04 K. Ahuja, V. Shen, C. Fang, **N. Riopelle**, A. Kong, C. Harrison, ControllerPose: Inside-Out Body Capture with VR Controller Cameras. *In Proceedings of the International Conference on Human Factors in Computing, (CHI 2022)*
- C.03 V. Varga, G. Vakulya, B. Buergisser, **N. Riopelle**, F. Zund, R. Sumner, T. Gross, A. Sample, Real-Time Interaction Capture through Physical Contact for Mixed Reality. *In Proceedings of the International Conference on Tangible, Embedded and Embodied Interaction, (TEI 2021)*
- C.02 **N. Riopelle**, A. Malatpure, S. Ashtekar, V. Raman, Dependency Graph-based Failure Analysis for Private Clouds. *In Proceedings of the International Symposium on Software Reliability Engineering, (ISSRE 2019)*
- C.01 **N. Riopelle**, P. Caspers, D. Sofge, Terrain Classification for Autonomous Vehicles Using Bat-Inspired Echolocation. *In Proceedings of the International Joint Conference on Neural Networks, (IJCCN 2018)*

### Posters

- P.01 **N. Riopelle**, A. Sample, ActiMate: A Wrist-Based, Heterogeneous Sensor Platform for Recognizing User Activities and Routines. *University of Michigan Engineering Research Symposium*, November 8, 2019

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## Awards

- 04/2021 **NSF GRFP Honorable Mention.**
- 03/2020 **UM EECS Department Outstanding Research Award.**
- 03/2019 **UM EECS Department Outstanding Achievement Award.**
- 03/2019 **UM EECS Scholar Award.**
- 02/2019 **UM Henry Ford II Prize Nominee (from Computer Engineering).**
- 03/2018, 03/2019 **UM James B. Angell Scholar.**
- 03/2017 **UM William J. Branstrom Freshman Prize.**
- 12/2016 - 04/2020 **UM Dean's List.**

12/2016 - 04/2020 **UM University Honors.**

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## Teaching Experience

Spring 2022 **05-435/865 Applied Fabrication for HCI**, *Teaching Assistant.*

Winter 2020 **EECS 598-015 Engineering Interactive Systems**, *Instructional Aide.*