Nathan DeVrio

PhD Student in Human-Computer Interaction,
Carnegie Mellon University

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Research Interests

I research the next generation of interactive hardware technologies to address 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, Wearable AI, AR/VR, Ubiquitous Computing

Education

2020 - Present
Pittsburgh, PA
Carnegie Mellon University,
Human-Computer Interaction Institute,
PhD in Human-Computer Interaction.

2016 - 2020
Ann Arbor, MI
University of Michigan,
Bachelors of Science in Engineering in Computer Engineering,
Summa Cum Laude.
GPA: 3.94/4.00

Professional Experience

2020 - Present
Pittsburgh, PA
Future Interfaces Group, *Carnegie Mellon University*, PhD Student,
Advisor: Chris Harrison
Additional Committee Members: Scott Hudson, Hrovje Benko, Nikolas Martelaro
Creating novel sensing devices for aiding in interaction tasks. The technical areas that I specialize in include sensor hardware design, embedded programming, and machine learning for sensor data.

2023
Redmond, WA
Meta Reality Labs, *AR/VR Input Technologies*, Research Scientist Intern (PhD),
Advisors: Roger Boldu, Eric Whitmire, Wolf Kienzle
Researched ways to use sensors to enable interactions with the next generation of AR and VR devices..

2018 - 2020
Ann Arbor, MI
Interactive Sensing and Computing Lab, *University of Michigan*, Undergraduate Researcher,
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.

2019
Redmond, WA
Microsoft Corporation, *Azure Storage Media and Edge*, SWE Intern,
Mentor: Aniket Malatpure
Developed a root-cause analysis pipeline for Azure Stack. Published a research paper describing the how the dependency graph algorithm I wrote could be applied to any private cloud system.

2018
Bellevue, WA
Microsoft Corporation, *Azure Storage Media and Edge*, SWE Intern,
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.

2017 - 2018
Ann Arbor, MI
Robert Dick Group, *University of Michigan*, Undergraduate Researcher,
Advisor: Robert Dick
Developed an embedded sensing and actuation device for aiding anesthesiologists in improving the accuracy and efficiency of epidural procedures by identifying when the needle is approaching bone.

2017 **The MITRE Corporation**, *Electronic System Dev*, Embedded Software Intern,
Bedford, MA Mentors: Rachel Bainbridge, Chris Niessen
Researched electromagnetic fault injection attacks on cryptographic algorithms implemented on FPGAs. Led a team in an intern embedded security capture the flag competition and placed in the top 5 teams.

2016 - 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.

2015 **U.S. Naval Research Laboratory**, *Laboratory for Autonomous Systems Research*, Robotics Intern,
Washington, D.C. Mentor: Donald Sofge
Used bat-like echolocation delivered via an FPGA sensor platform to identify different terrains an autonomous robot encountered. Published a research paper on my approach and experimental results.

Publications

Conference Papers (Peer-Reviewed and Journal Quality)

C.10 **N. DeVrio**, C. Harrison, EverRing: Powering Highly-Capable Ring Devices with Headset RF Energy , *In Proceedings of the ACM International Symposium on Wearable Computers*, **(UbiComp/ISWC 2025)**.

C.09 V. Mollyn*, **N. DeVrio***, C. Harrison, EclipseTouch: Touch Segmentation on Ad Hoc Surfaces using Worn Infrared Shadow Casting, *In Proceedings of the ACM Symposium on User Interface Software and Technology*, **(UIST 2025)**.

C.08 **N. DeVrio**, R. Boldu, E. Whitmire, W. Kienzle, Contextra: Detecting Object Grasps With Low-Power Cameras and Sensor Fusion On the Wrist, *In Proceedings of the ACM Conference on Mobile Human-Computer Interaction*, **(MobileHCI 2025)**.

C.07 **N. DeVrio**, C. Harrison, Reel Feel: Rich Haptic XR Experiences Using an Active, Worn, Multi-String Device, *In Proceedings of the ACM Conference on Human Factors in Computing*, **(CHI 2025)**.

C.06 ***N. DeVrio**, *V. Mollyn, C. Harrison, SmartPoser: Arm Pose Estimation With a Smartphone and Smartwatch Using UWB and IMU Data. *In Proceedings of the ACM Symposium on User Interface Software and Technology*, (**UIST 2023**).

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*, Nov 8, 2019

Patents

Granted

1 **N. Riopelle**, C. Harrison, Multiview depth-sensing wearable device. US Patent No. US 2024/0144727 A1.

Filed/Pending

1 R. Bodlu, E. Whitemire, R. Sodhi, **N. DeVrio**, W. Kienzle, Detecting Object Grasps with Low-Power Cameras and Sensor Fusion on the Wrist, and Systems and Methods of Use Thereof. US Patent App. 63/573,118. Filed Apr 2024.

Honors & Awards

2025 **Best Paper Award**, *Contextra*, MobileHCI.
2025 **Popular Choice Best Demo Award Honorable Mention**, *Reel Feel*, CHI.
2022 **Fast Company's Innovation by Design Award**, *ControllerPose*.
2021 **NSF GRFP Honorable Mention**.
2020 **UM EECS Department Outstanding Research Award**.
2019 **UM EECS Department Outstanding Achievement Award**.
2019 **UM EECS Scholar Award**.
2019 **UM Henry Ford II Prize Nominee (from Computer Engineering)**.
2018, '19 **UM James B. Angell Scholar**.
2017 **UM William J. Branstrom Freshman Prize**.
2016 - 2020 **UM Dean's List**.
2016 - 2020 **UM University Honors**.

Invited Talks & Panels

2023 **Invited Talk**, *Brown HCI*.
2022, '23 **Alumni Panel Member**, *Connect with Michigan ECE*.

Academic Service

Peer Reviewing

2024 - Present **ACM UIST**, *3 Special Recognitions for Outstanding Reviews*.
2023 - Present **ACM CHI**, *1 Special Recognition for Outstanding Reviews*.
2024 - Present **ACM IMWUT**.
2023 **ACM VRST**.

Service to Department

2025 **HCII PhD Admissions Committee Member**, *Carnegie Mellon University*.
2021 - 2024 **Graduate Application Support Program Volunteer**, *Carnegie Mellon University*.
2022 - 2024 **HCII PhD Orientation Volunteer Organizer**, *Carnegie Mellon University*.

Service to Academic Community

2022 **Student Volunteer**, *ACM CHI*.

Teaching Experience

Courses

2024 **05-430/630 Programming User Interfaces**, *Teaching Assistant*.
2022 **05-435/865 Applied Fabrication for HCI**, *Teaching Assistant*.
2020 **EECS 598-015 Engineering Interactive Systems**, *Instructional Aide*.

Guest Lectures

2024 **18-453 Introduction to XR Systems**, *Carnegie Mellon University*.

Students Advised

2024 **Will Page**, *Masters*, Human-Computer Interaction, (Currently on Apple Sensor Incubation team).

2023 **Hongyu Mao**, *Masters*, Computational Design, (Currently PhD Student at UW).

2023 **Alexander Kyu**, *Masters*, Human-Computer Interaction, (Currently at Collaborations Pharmaceuticals).

2022 - 2023 **Vimal Mollyn**, *Masters*, Engineering Design and Data Science, (Currently PhD Student at CMU).

Selected Press Coverage

2025 **Hackster.io**, *String Theory Applied to VR*.

2022 **Today Show**, *Step into the Metaverse: How the virtual world may change reality*.

2022 **NBC Nightly News**, *Inside the metaverse: what does the future of virtual reality feel like?*.

2022 **CNN**, *These researchers came up with a solution for one of VRâĂŹs biggest issues: tracking your legs*.

2022 **ACM TechNews**, *A Solution for One of VR's Biggest Issues: Tracking Your Legs*.

2022 **RoadToVR**, *Researchers Show Full-body VR Tracking with Controller-mounted Cameras*.

2022 **VR Times**, *Researchers Demonstrate Body Tracking via Modded VR Controllers in Meta Quest 2*.

2022 **RealVirtual**, *ControllerPose: full body capture with cameras on the controllers*.

2022 **UploadVR**, *Researchers Demonstrate Body Tracking From Cameras On VR Controllers*.

2022 **Raspberry Pi**, *Track body movements better with Raspberry Pi and fisheye cameras*.

2022 **Laptop Mag**, *VR controller cameras can help you play Feet Saber*.

2022 **Data Visualization Society: Nightingale**, *At the Vanguard of Interface Design*.