

# Niall L. Williams

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## EDUCATION

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**University of Maryland, College Park**, MD, USA

Aug 2019 - Present

*Ph.D. in Computer Science*

- Research interests: Virtual/Augmented reality, perception, motion planning, human-computer interaction
- Advisors: Dr. Dinesh Manocha & Dr. Aniket Bera

**Davidson College**, NC, USA

Aug 2015 - May 2019

*B.S. with High Honors in Computer Science*

- Thesis Title: Estimation and Comparison of Rotation Gain Thresholds for Redirected Walking
- Advisor: Dr. Tabitha Peck

## AWARDS & HONORS

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Dean's Fellowship, University of Maryland, College Park

2019, 2020

Senior Computer Science Award, Davidson College

May 2019

Nominated for CRA Outstanding Undergraduate Researcher Award

Oct 2018

## RESEARCH EXPERIENCE

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**Steering Algorithms for Virtual Reality Locomotion**

Jan 2020 - Present

- **Background:** In virtual reality, the size of the physical tracking space limits the size of the explorable virtual environment. Using a technique called redirected walking, we can steer users towards different directions in the physical space without interfering with their virtual experience by slowly rotating the virtual environment.
- Developing steering algorithms to minimize the chance of collision with physical obstacles. Focus is on shared, collaborative virtual experiences between multiple users who are in separate physical spaces.
- Developing a combined geometric and perceptual metric for quantifying the difference in navigability between the physical and virtual environments, to assess steering algorithm performance without empirical tests.

**Perceptual Thresholds for Virtual Reality Locomotion**

May 2018 - present

- **Background:** Psychophysical experiments typically require large amounts of trial data in order to measure perceptual thresholds, which can negatively affect results due to fatigue or boredom. Participants' confidence ratings may help us estimate perceptual thresholds using fewer experimental trials.
- Investigating the efficacy of a novel model for estimating perceptual thresholds with very little data, augmented with the user's self-perceived confidence level. Focus is on psychometric curve fitting with small data sets.
- Studying interactions between user confidence in their perception and predicting the onset of simulator sickness. Confidence ratings may offer a low-cost method for identifying users who are susceptible to simulator sickness.

**Gaits for Virtual Avatars** ([gamma.umd.edu](https://gamma.umd.edu))

Aug 2019 - Jan 2020

- **Virtual Avatars:** Worked on synthesizing and retargeting emotional gaits for realistic virtual avatars. Main contribution was in evaluating the results and investigating motion retargeting methods.

**Haptics for Teaching Physical Concepts** ([perceptproject.weebly.com](https://perceptproject.weebly.com))

July 2019 - Aug 2019

- **Background:** Haptics can be used to augment the ways we interact with and understand virtual environments. The main question in this work is whether haptic technology can help pre-service elementary school teachers better understand concepts of physics so they are better prepared to teach these concepts in the classroom.
- Implemented features into a physically-based buoyancy simulation to visualize forces and properties of buoyancy with haptic force-feedback.

- Explored the efficacy of different haptic input and feedback modes for future research involving concepts of thrust and drag.

## PUBLICATIONS & PRESENTATIONS

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### Journal Papers

- [1] **NL Williams**, A Bera, D Manocha. ARC: Alignment-based Redirection Controller for Redirected Walking in Complex Environments. *IEEE Transactions on Visualization and Computer Graphics*, 2021
- [2] **NL Williams** and TC Peck. Estimation of Rotation Gain Thresholds Considering FOV, Gender, and Distractors. *IEEE Transactions on Visualization and Computer Graphics*, 2019

### Conference Papers

- [1] U Bhattacharya, N Rewkowski, P Guhan, **NL Williams**, T Mittal, A Bera, D Manocha. Generating Emotive Gaits for Virtual Agents Using Affect-Based Autoregression. *IEEE International Symposium on Mixed and Augmented Reality*, 2020

### Workshop Papers and Posters

- [1] K Qi, D Borland, E Jackson, **NL Williams**, J Minogue, and T Peck. The impact of haptic and visual feedback on teaching. *IEEE Conference on Virtual Reality and 3D User Interfaces (VR)*, 2020
- [2] K Qi, D Borland, **NL Williams**, E Jackson, J Minogue, and T Peck. Augmenting Physics Education with Haptic and Visual Feedback. *IEEE VR 2020 Fifth Workshop on K-12+ Embodied Learning through Virtual Augmented Reality (KELVAR)*, 2020
- [3] J Minogue, D Borland, T Peck, E Jackson, K Qi, and **NL Williams**. Tracing the development of a haptically-enabled science simulation (hesss) for buoyancy. *NARST Annual International Conference*, 2020
- [4] **Niall Williams** and Tabitha C Peck. Estimation of rotation gain thresholds for redirected walking considering fov and gender. *IEEE Conference on Virtual Reality and 3D User Interfaces (VR)*, pages 1229-1230 IEEE, 2019

### Presentations

- [1] Measuring Perceptual Limits of Redirected Walking in Virtual Reality, *Davidson College Coffee Talk*, Davidson College, NC, 2018.

## TEACHING EXPERIENCE

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### Advanced Data Structures (CMSC 420) TA

Aug 2020 - Present

*University of Maryland, College Park*

*College Park, MD*

- Hold office hours, assist with questions during lectures, and grade assignments and exams.

### Stanford Code In Place Online Section Leader (Volunteer)

April 2020 - May 2020

*Stanford University Computer Science Department*

*Online*

- Code In Place was a 5-week online introductory course on programming offered by Stanford University during the COVID-19 pandemic, aimed at teaching people a new skill during lockdown. All participation was voluntary.
- Led weekly review sessions and held office hours for 10 people in the course.

### Game Programming (CMSC 425) TA

Jan 2020 - May 2020

*University of Maryland, College Park*

*College Park, MD*

- Redesigned assignments and labs to provide students with more practice in implementing theoretical concepts.
- Hold office hours, assist with questions during lectures, and grade assignments.

### Advanced Data Structures (CMSC 420) TA

Aug 2019 - Dec 2019

*University of Maryland, College Park*

*College Park, MD*

- Hold office hours, assist with questions during lectures, and grade assignments and exams.

## Head TA

*Davidson College Mathematics & Computer Science Department*

Jan 2019 - May 2019

*Davidson, NC*

- Coordinated shift scheduling for all computer science TAs.
- Liaised with TAs, graders, and professors to resolve any problems throughout the semester.
- Worked with the department to create a more structured environment for future graders and TAs.

## Computer Science Tutor

*Davidson College Center for Teaching & Learning*

Aug 2018 - May 2019

*Davidson, NC*

- Assist peers in learning new programming languages, troubleshooting coding issues and understanding introductory course-related concepts.
- Guide peers toward developing an independent thinking style through open-ended questions.
- Courses tutored: Programming and Problem Solving, Discrete Structures, Data Structures, Computer Organization, Bioinformatics Programming.

## Computer Science Grader

*Davidson College Mathematics & Computer Science Department*

Aug 2017 - Dec 2018

*Davidson, NC*

- Grade and provide feedback on assignments for 20–40 students per semester.
- Feedback includes optimization, debugging, implementations of different data structures, and cleanliness.
- Wrote a script to automate grading for a new homework assignment.

## PROFESSIONAL SERVICE & COMMUNITY INVOLVEMENT

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### Reviewer

- IEEE Conference on Virtual Reality and 3D User Interfaces (VR) 2020, 2021
- ACM SIGGRAPH Asia 2020

### Student Volunteer

- IEEE Conference on Virtual Reality and 3D User Interfaces (VR) 2020
- ISMAR Conference 2019

### Departmental Service

- University of Maryland, College Park
  - Graduate school application mentor 2020
  - Application reviewer for graduate school admissions 2019, 2020
- Davidson College
  - Student representative for Math & Computer Science department 2018 - 2019
  - Co-founder of the Davidson College ACM chapter 2018

### Other Community Involvement

- CRA URMD Grad Cohort 2020 Attendee

## PROGRAMMING SKILLS

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**Languages:** C/C++, C#, Python, R, Java

**Software Packages and Tools:** Unity3D, SteamVR, OpenGL, D3.js, git,  $\text{\LaTeX}$

**Operating Systems:** Linux (Ubuntu), Windows