Carl Hildebrandt

Ph.D. Candidate, University of Virginia

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I specialize in autonomous systems and software testing, focusing on creating and executing test suites that bridge software, hardware, and physical world interactions. Outside academia, I'm an athlete and adventurer, with achievements like summiting Kilimanjaro and competing in the world's largest ultramarathon.

Education

2018 – 2024 **University of Virginia**, USA
Ph.D. Computer Science
Advisor: Dr. Sebastian Elbaum
Lab: LESS (less-lab-uva.github.io)

2013 – 2016 **University of Pretoria**, South Africa
B.Eng. in Computer Engineering

Experience

2018 – Research Assistant, LESS Lab, University of Virginia (less-lab-uva.github.io)

2022 – 2022 Graduate Research Intern, Raytheon BBN (www.rtx.com)

2019 – 2022 Head of Technology, Vuetech Health Innovations LLC(www.vuetechhealth.com)

2017 – 2018 Research Assistant, Nimbus Lab, University of Nebraska (www.nimbus.unl.edu)

2016 – 2017 Software Engineer, Cheesecake Trails

Honors & Awards

External

2020 **Distinguished Artifact Award**
Feasible and Stressful Trajectory Generation for Mobile Robots (ISSTA)

2018 **Best Paper Award on Safety, Security, and Rescue Robotics**
Fire-Aware Planning of Aerial Trajectories and Ignitions (IROS)

Internal

2023 **All-University Graduate Teaching Award**
The University of Virginia - Office of Graduate and Postdoctoral affairs

2022 **Graduate Teaching Award**
The University of Virginia - Annual Computer Science Department End-of-Year Awards

2021 **Best Poster Design**
The University of Virginia - Computer Science Research Symposium

2020 **Best Presentation**
The University of Virginia - Computer Science Virtual Research Symposium

Publications

NA   **Carl Hildebrandt**, Trey Woodlief, and Sebastian Elbaum, "ODD-diLLMma: Leveraging LLMs for Test Suite Analysis and Comparison with Debugging Support," NA **(Under Development)**

NA   **Carl Hildebrandt**, and Sebastian Elbaum, "Are Autonomous Systems Safe: A Continuous Differential Testing Framework using Large Language Models and Unlimited Real Data," NA **(Under Development)**

NA   Mira Khan, **Carl Hildebrandt**, and Sebastian Elbaum, "From Simulation to Reality: Streamlining Training AI-Based Drone Navigation Software using Mixed-Reality Environments," NA **(Under Development)**

NA   **Carl Hildebrandt**, Brendan Teich, Dylan Callahan, and Borislava I. Simidchieva, "A Framework for Benchmarking Collaborative-Autonomy Behaviors in Robots," NA **(Under Development)**

2023   **Carl Hildebrandt**, Meriel von Stein, and Sebastian Elbaum, "PhysCov: Physical Test Coverage for Autonomous Vehicles," in *Proceedings of the 32nd ACM SIGSOFT International Symposium on Software Testing and Analysis (ISSTA)*, ACM, 2023

2023   **Carl Hildebrandt**, Wen Ying, Seongkook Heo, and Sebastian Elbaum, "Mimicking Real Forces on a UAV Through a Haptic Suit," in *2023 IEEE International Conference on Robotics and Automation (ICRA)*, IEEE, 2023

2022   **Carl Hildebrandt**, Meriel von Stein, Trey Woodlief, and Sebastian Elbaum, "Preparing Software Engineers to Develop Robot Systems," in *2022 IEEE/ACM 44th International Conference on Software Engineering: Software Engineering Education and Training (ICSE-SEET)*, IEEE, 2022

2021   **Carl Hildebrandt**, and Sebastian Elbaum, "World-in-the-Loop Simulation for Autonomous Systems Validation," in *2021 IEEE International Conference on Robotics and Automation (ICRA)*, IEEE, 2021, pp. 10 912–10 919

2020   **Carl Hildebrandt**, Sebastian Elbaum, Nicola Bezzo, and Matthew B Dwyer, "Feasible and stressful trajectory generation for mobile robots," in *Proceedings of the 29th ACM SIGSOFT International Symposium on Software Testing and Analysis (ISSTA)*, 2020, pp. 349–362 **(Distinguished Artifact Award)**

2020   **Carl Hildebrandt**, Sebastian Elbaum, and Nicola Bezzo, "Blending kinematic and software models for tighter reachability analysis," in *2020 IEEE/ACM 42nd International Conference on Software Engineering: New Ideas and Emerging Results (ICSE-NIER)*, IEEE, 2020, pp. 33–36

2018   Evan Beachly, Carrick Detweiler, Sebastian Elbaum, Brittany Duncan, **Carl Hildebrandt**, Dirac Twidwell, and Craig Allen, "Fire-aware planning of aerial trajectories and ignitions," in *2018 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, IEEE, 2018, pp. 685–692 **(Best Paper Award)**

Patents

2020   **Carl Hildebrandt**, Jefferson Griscavage, Victor Aquino, Melony Bennis, and Tien Comlekoglu, Vuetech Health Innovations LLC, "Systems and Methods for Safety, Security and Well-Being of Individuals", Patent No. 11282367

Talks

2023   **Carl Hildebrandt** "PhysCov: Physical Test Coverage for Autonomous Vehicles", International Symposium on Software Testing and Analysis, July 19th

2022   **Carl Hildebrandt** "Preparing Software En- gineers to Develop Robot Systems", International Conference on Software Engineering: Software Engineering Education and Training, May 25th

2021   **Carl Hildebrandt** "World-in-the-Loop Simulation for Autonomous Systems Validation", International Conference on Robotics and Automation, May 30th

2020   **Carl Hildebrandt** "Feasible and Stressful Trajectory Generation for Mobile Robots", International Conference on Software Engineering, July 7th

2020   **Carl Hildebrandt** "Blending Kinematic and Software Models for Tighter Reachability Analysis", International Symposium on Software Testing and Analysis, July 21st

Community Service

2022   **Artifact Reviewer**, IEEE/ACM International Conference on Automated Software Engineering (ASE).

2022   **Graduate Student Council**, The University of Virginia, Computer Science Department (CSGSG).

2022   **Paper Reviewer**, IEEE International Conference on Robotics and Automation Society (ICRA)

2021   **Student Volunteer**, IEEE/ACM International Conference on Software Engineering (ICSE)

Teaching

2022   Supporting instructor, **Robotics for Software Engineers**, The University of Virginia

2021   Lab Designer and Guest Lecturer, **Robotics for Software Engineers**, The University of Virginia

2020   Lab Designer and Teaching Assistant, **Robotics for Software Engineers**, The University of Virginia

2016   Head Teaching Assistant, **Data Structures and Algorithms in Java**, The University of Pretoria

2015   Head Teaching Assistant, **Program Design in C++**, The University of Pretoria

2015   Teaching Assistant, **Data Structures and Algorithms in Java**, The University of Pretoria

2014   Teaching Assistant, **Introduction to Programming in C**, The University of Pretoria

Skills

Licences: Commercial drone license for small unmanned aircraft systems

Advanced: Python, C++, ROS, Shell Scripting, LaTeX, Quadrotors, Ubuntu, Windows, MacOS, Unity

Experienced: C, Java, Solidworks, Keras, Tensorflow, Control Theory, Arduino, Raspberry Pi, Odroid

Proficient: Lua, C#, Assembly, HTML, CSS, Javascript, ONNX, FPGA, Soldering, Digital Logic

Achievements

2019   National Club Field Hockey Champions - The University of Virginia

2017   Half Iron Man - South Africa

2017   Comrades Ultra Marathon - South Africa

2016   Summited Kilimanjaro - Tanzania

2012   National u18B Field Hockey Team - South Africa