CARL HILDEBRANDT

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OBJECTIVE

Innovative Ph.D. candidate with expertise in autonomous system testing, authoring 7 first-author publications presented at top international conferences. Founder of a tech startup, securing over $100k in funding and 2 patents for AI monitoring solutions. Proficient in AI, autonomous vehicles, quadrotors, and robots. Seeking full-time roles.

EDUCATION

Ph.D. Computer Science, University of Virginia — Expected 2024
Title: Autonomous System Testing - Methods for Incorporating Real-World Environments and Physical Semantics.

Bachelor of Engineering in Computer Engineering, University of Pretoria — 2013 - 2016

SKILLS

Technical Skills	Autonomous System Testing, AI & Machine Learning, Software Development & Testing, Robotics, Robotic Dynamics, Mixed-Reality, Simulation, Computer Vision
Soft Skills	Research, Technical Writing, Public Speaking, Entrepreneurship & Startup Leadership, Problem-Solving, Teaching & Mentorship, Patent Development, Strategic Planning
Tools	Python, C++, Java, ROS, MATLAB, TensorFlow, Keras, PyTorch, Docker, Unity, Unreal Engine, Git, Gazebo, OpenCV, SolidWorks, Linux, Vicon Motion Tracking

EXPERIENCE

Graduate Research Assistant — Aug 2018 - Present
University of Virginia — *Charlottesville, Virginia, United States*

- Authored 7 papers in leading conferences for robotics and software systems, including ICRA (top-ranked in robotics), IROS (second highest-rated in robotics), ISSTA (top-ranked in software testing), and contributions to ICSE's alternative tracks (top-rated in software systems), demonstrating broad impact in these fields.
- Developed the lab component for "Robotics for Software Engineers" at UVA, creating a custom simulator compatible with multiple operating systems and addressing key robotic design principles. This course now attracts up to 45 students per semester and our work on it was published at a top-ranked education conference. My contributions to this innovative educational approach earned me the All-University Graduate Teaching Award, recognizing my impact on students' pathways into robotics.

Graduate Research Intern — May 2022 - Aug 2022
Raytheon Technologies - BBN — *Cambridge, Massachusetts, United States*

- Contributed to the MACE project, focusing on the Joint Services Academies Collaborative Autonomy Challenge—a simulated Combat Search and Rescue Scenario, where my contributions are still in use today.
- Developed 4 different swarm behaviors for aerial and ground vehicles in simulations, demonstrating the potential for small autonomous robot swarms in search and rescue operations.
- Developed a real-time analytics engine to enhance operational monitoring and decision-making efficiency.

Head of Technology — Nov 2019 - Jul 2022
Vuetech Health Innovations — *Charlottesville, Virginia, United States*

- Co-founded Vuetech Health and led its technology divison, securing over $100k in awards and investments to pioneer in healthcare technology.
- Led the creation and deployment of EVA, a patented AI monitoring system designed to assist caregivers and nurses in preventing patient falls. Oversaw a feasibility study at the University of Virginia School of Nursing with EVA's prototype, successfully detecting 82% of falls.

- Managed the full-stack architecture, from development and testing to maintenance, ensuring the system's robustness, high performance, and seamless operation.

Graduate Research Assistant Jul 2017 - Jul 2018
University of Nebraska-Lincoln *Lincoln, Nebraska, United States*

- Contributed to testing of a fire ignition system for drones, which later (after my departure) turned in IGNIS Unmanned Aerial System (UAS) for fire management at the startup Drones Amplified.
- Developed a lab demo featuring a drone that accurately caught thrown balls by matching their trajectories. This demonstration, highlighted advanced drone maneuverability and trajectory analysis.

Software Engineer Jan 2017 - Jul 2017
Cheesecake Trails *Johannesburg, Gauteng, South Africa*

- Core developer in a startup for custom POS systems, led web platform integration with backend.
- Unified user experience across web/mobile, focusing on functional design.

PUBLICATIONS

2024: **Carl Hildebrandt**, Trey Woodlief, and Sebastian Elbaum, "ODD-diLLMma: Driving Automation System ODD Compliance Checking using LLMs," 2024 **(Under Submission)**

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)**

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)**

PATENTS

2023: Victor Aquino, Melony Bennis, Tien Comlekoglu, Jefferson Griscavage, and **Carl Hildebrandt**, Vuetech Health Innovations LLC, "Systems and Methods for Safety, Security and Well-Being of Individuals", Patent No. US11688265B1

2022: Victor Aquino, Melony Bennis, Tien Comlekoglu, Jefferson Griscavage, and **Carl Hildebrandt**, Vuetech Health Innovations LLC, "Systems and Methods for Safety, Security and Well-Being of Individuals", Patent No. US11282367B1

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)

HONORS & AWARDS

2023: **All-University Graduate Teaching Award**, The University of Virginia - Graduate and Postdoctoral Affairs

2022: **Graduate Teaching Award**, The University of Virginia - 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

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)

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