

Alexander L. Burka

4337 Pine St, Apt. 1F
Philadelphia, PA 19104

(484) 278-3789
aburka@ieee.org

Core Competencies

Robot hardware design

- Designed and built electrical systems for a portable visuo-haptic sensing platform (power distribution, sensor interfaces and data acquisition)
- Instrumented airplane engine repair tool and collected data during operation

Software development

- Wrote data acquisition, processing and analysis pipeline using Rust, C and MATLAB
- Analyzed force/torque, accelerometer, and visual data in various projects
- Built several web applications (desktop and mobile): a hardware controller, a document management system and an online silent auction
- Contributed to open-source projects including the Rust compiler

Experience

Ph.D. Research, University of Pennsylvania, Philadelphia, PA

2012 - present

- Visuo-haptic surface classification
 - Designed, built and tested a multimodal sensor device to build a texture dataset with applications to textural surface understanding for autonomous robots
 - Applied various machine learning techniques from the literature to our dataset, using Caffe and PyTorch
- Robotic technology for airplane engine repair
 - Designed and implemented a sensor package to characterize human-operated equipment
 - Collaborated with a major engine manufacturer looking to mechanize their process
- Developed a collision warning system for public transit buses
 - Designed and built a parametric speaker
 - Implemented a prototype pedestrian detector for automatic warnings
- Member of Team THOR for the 2013 DARPA Robotics Challenge
 - Managed software and networking during dress rehearsal
 - Constructed test equipment to approximate competition tasks
- Computer vision and structure learning
 - Developed mathematical representation for complex articulated objects
 - Implemented a visual kinematic learning system for autonomous robots

Robotics Research Intern, Swarthmore College, Swarthmore, PA

2011

- Developed visual navigation algorithm for a general purpose mobile robot (Turtlebot)
- Worked with ROS (the Robot Operating System) and OpenCV

Peer Tutoring “Wizard,” Swarthmore College, Swarthmore, PA

2009 - 2012

- Led study sessions and assisted with laboratory instruction in engineering courses
- Courses: Mobile Robotics, Linear Physical System Design, and Electrical Circuit Analysis

Laser Laboratory Intern, Swarthmore College, Swarthmore, PA

2009

- Developed automated waveguide testing apparatus using LabVIEW
- Simulated coupled waveguide arrays using C
- Sponsored through an HHMI Research Fellowship

Sysadmin, Swarthmore College Computing Society, Swarthmore, PA

2008 - 2012

- Spearheaded web application for equipment reservation
- Developed RFID card entry system
- Administered Linux servers and Mac OS X clients

Summer Intern, MIT Lincoln Laboratory, Lexington, MA

2008

- Developed web application for publication tracking
- Planned and implemented a robotics workshop for high school students

Education	<p>University of Pennsylvania, Philadelphia, PA Ph.D. in Electrical & Systems Engineering <i>August 2018</i> M.S. in Robotics <i>May 2015</i> IMPRS-IS Associated Scholar Research: Robotics/Haptics Advisor: Katherine J. Kuchenbecker</p> <p>Swarthmore College, Swarthmore, PA B.S. in Engineering <i>May 2012</i> Concentration in Electrical and Computer Engineering Minors in Cognitive Science and Mathematics</p>
Leadership Activities	<p>Village Education Project <i>2009 - 2012</i></p> <ul style="list-style-type: none"> • Student-run nonprofit working against educational inequality in rural Ecuador • Developed and taught computer curriculum in Ecuador (summer 2009) • Assisted with supervising volunteers in Ecuador (summer 2011) <p>IEEE Swarthmore Student Chapter (elected chapter president) <i>2010 - 2011</i></p>
Awards and Honors	<p>NSF Graduate Research Fellowship <i>awarded 2013</i></p> <p>Tau Beta Pi, The Engineering Honor Society <i>initiated 2011</i></p> <p>Sigma Xi, The Scientific Research Society <i>inducted 2009</i></p>
Skills	<p><i>Engineering Skills:</i> Robotics, Circuit design, Embedded processor development</p> <p><i>Programming:</i> Rust, C/C++, Python, Java, HTML/JS, L^AT_EX</p> <p><i>Computer Software:</i> Linux/OS X/Windows, Android, MATLAB, PCB Artist</p> <p><i>Languages:</i> English (native), Spanish (conversational)</p>
Publications	<p>Alex Burka and Katherine J. Kuchenbecker (2018). <i>Can humans infer haptic surface properties from images?</i> Haptics Symposium; San Francisco, CA.</p> <p>Alex Burka and Katherine J. Kuchenbecker (2017). <i>Handling scan-time parameters in haptic surface classification.</i> IEEE World Haptics Conference (WHC); Fürstenfeldbruck, Germany. (Candidate for Best Poster Paper.)</p> <p>Alex Burka, Abhinav Rajvanshi, Sarah Allen and Katherine J. Kuchenbecker (2017). <i>Proton 2: Increasing the sensitivity and portability of a visuo-haptic surface interaction recorder.</i> International Conference on Robotics and Automation (ICRA); Singapore.</p> <p>Alex Burka and Katherine J. Kuchenbecker (2017). <i>How much haptic surface data is enough?</i> Association for the Advancement of Artificial Intelligence (AAAI) Spring Symposium; San Francisco, CA.</p> <p>Alex Burka, Siyao Hu, Stuart Helgeson, Shweta Krishnan, Yang Gao, Lisa Anne Hendricks, Trevor Darrell and Katherine J. Kuchenbecker (2016). <i>Proton: A visuo-haptic data acquisition system for robotic learning of surface properties.</i> Multisensor Fusion and Integration (MFI); Baden-Baden, Germany.</p> <p>Alex Burka, Siyao Hu, Stuart Helgeson, Shweta Krishnan, Yang Gao, Lisa Anne Hendricks, Trevor Darrell and Katherine J. Kuchenbecker (2016). <i>Design and implementation of a visuo-haptic data acquisition system for robotic learning of surface properties.</i> Haptics Symposium; Philadelphia, PA.</p> <p>Alex Burka, Siyao Hu, Shweta Krishnan, Lisa Anne Hendricks, Yang Gao, Trevor Darrell and Katherine J. Kuchenbecker (2015). <i>Toward a large-scale visuo-haptic dataset for robotic learning.</i> Computer Vision and Pattern Recognition (CVPR); Boston, MA.</p> <p>Alex Burka, Alaric Qin and Daniel D. Lee (2014). <i>An application of parametric speaker technology to bus-pedestrian collision warning.</i> Intelligent Transportation Systems Conference (ITSC); Qingdao, China.</p> <p>Alex Burka, Keliang He, Jacqueline Kay and Matt Zucker (2011). <i>Vision-based localization for mobile robots.</i> Poster presentation at Sigma Xi; Swarthmore, PA.</p> <p>Alex Burka, Lucas Janes, Bo Sun, and Lynne Molter (2009). <i>Non-linear transmittance properties of dielectric slab waveguides.</i> Poster presentation at Sigma Xi; Swarthmore, PA.</p> <p>Alex Burka, Lucas Janes, Bo Sun, and Lynne Molter (2009). <i>Numerical simulation of loosely coupled circular waveguide arrays.</i> Poster presentation at Sigma Xi; Swarthmore, PA.</p>