

# Ulrich Viereck

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## SUMMARY

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- Expected to graduate in August 2019 with a Ph.D. in Computer Science. Looking for a robotics researcher position in the greater Boston area starting in September 2019.
- Skilled computer scientist researcher with expertise in state-of-the-art approaches in robotics and machine learning, focusing on perception, planning, and control for manipulation in uncertain environments.
- Additional experience in electronic product design at a component and system level, testing, supporting in production, and resolving field problems.
- Strong leadership skills. Lead a product innovation project with an interdisciplinary team, which was awarded Siemens Gold. Experience in collaborative research projects, working with different teams of researchers.

## EDUCATION

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- **Northeastern University** Boston, MA  
*Ph.D. Candidate in Computer Science; GPA: 3.94* *September 2014 – Present*
  - **Thesis title:** Learning a visuomotor controller by planning trajectories in simulation
  - **Thesis committee:** Rob Platt, Christopher Amato, Hanumant Singh, and Kate Saenko
  - **Specialization:** Robotics, Machine Learning, and Artificial Intelligence
- **Karlsruhe Institute of Technology (KIT)** Karlsruhe, Germany  
*B.S. and M.S. in Electrical Engineering and Information Technology; GPA: 3.7* *2001 – April 2008*
  - **Specialization:** Embedded Systems Engineering

## WORK EXPERIENCE

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- **Northeastern University** Boston, MA  
*Research Assistant* *September 2014 – Present*
  - **Research overview:** I develop new methods for robot manipulation by combining new machine learning, vision, planning, and control algorithms using ROS, rviz, OpenRAVE, V-REP, Python, Caffe, PyTorch and TensorFlow. My current projects involve using a UR5 robot with wrist mounted Intel RealSense SR300 depth sensor for closed loop control of robotic manipulation. Below I provide more details.
  - **Robot grasping:** I propose an approach to learning a visuomotor controller for grasping. I use a wrist-mounted sensor to acquire depth images in front of the gripper and train a convolutional neural network to learn a distance function to true grasp configurations. The training sensor data is generated in simulation, a major advantage over previous work that uses real robot experience. I find that my approach significantly outperforms the baseline in the presence of kinematic noise and perceptual errors.
  - **Domain adaptation:** I propose an approach to domain transfer based on a pairwise loss function that helps transfer control policies learned in simulation onto a real robot. Using depth images as the sensor input, I explore the idea in the context of a manipulation task where a control policy is learned that enables a robot to perform a mating task involving novel objects. My method consistently outperforms baseline methods that train only in simulation or that combine real and simulated data in a naive way.
  - **Combining RL and planning:** Despite advances in learning policies using Reinforcement Learning (RL), fundamental challenges including sample inefficiency remain. I propose learning the value function or policy directly by planning and generating the trajectories in simulation as training experience. This involves having a planner with full state feedback to find collision free trajectories. I then use observations with actions along these trajectories to train a policy. As a final step, I use RL to finetune the policy.
  - **Robot gait rehabilitation:** I developed a force controller in C++ that actively compensates for robot-human interaction forces using a Barrett WAM robot. I designed a microcontroller-based sensor in C to localize of the end-effector at the patient's leg.
- **iRobot Corporation** Bedford, MA  
*Robotics Intern* *June 2018 – October 2018*

- **Object detection:** I trained an object detector and evaluated different approaches using deep learning framework TensorFlow. I generated synthetic images with ground truth bounding boxes using rendering software Blender. I trained a CycleGAN network that learns to transform synthetic images so that they appear more realistic. I improved the detector's precision from 43% to 67% by training on images transformed by the CycleGAN.

- **Siemens Building Technologies**

Florham Park, NJ

*Hardware Design Engineer*

*November 2010 – August 2014*

- **Voice evacuation:** I worked on development, testing, and bringing to production of the circuit boards controlling the intelligent voice evacuation system. I verified performance of the design running unit and system tests. I worked on the multiprocessor design comprising ARM9 CPU, CPLD and Coldfire V2 for network management.
- **Notification appliance:** I took over and brought to the production the PAD-4 NAC (Notification Appliance Circuit) extender comprising the TI MSP430 microcontroller, battery charger, boost converters for NAC circuits with fault supervision. I received the Siemens You Answered award in 2010.
- **System migration:** I worked on migration of the former Siemens MXL fire system to the new XLS system receiving the Top+ Silver award for innovation in 2012.

- **Mercedes-Benz Technology**

Sindelfingen, Germany & Troy, MI

*Test System Engineer*

*April 2008 – October 2010*

- **Automotive test systems:** I designed and implemented customized HIL (Hardware in the Loop) test systems for automotive control units. I introduced a new testing platform designed in Germany to the American market.
- **Ignition key robot:** I adapted a MathWorks Stateflow to control a robotic system that inserts and turns the ignition key for a test system.
- **Test automation:** I created simulations for the environment of ECUs in Simulink. I wrote test scripts in VB in test automation software PROVEtech:TA.

## AWARDS

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- PhD Fellowship, Northeastern University 2015
- Siemens Gold for Innovation in Serviceability 2013
- Siemens Top+ Silver for Innovation 2012
- Siemens You Answered award for quickly resolving issues in manufacturing tests 2010

## PUBLICATIONS

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- **Adapting control policies from simulation to reality**, U.Viereck, Xinchao Peng, K. Saenko, R.Platt, ISER 2018.
- **Learning a visuomotor controller for real world robotic grasping using easily simulated depth images**, U.Viereck, A.ten Pas, K. Saenko, R.Platt, CoRL 2017.
- **An arm for a leg: Adapting a robotic arm for gait rehabilitation**, G. Franchi, U.Viereck, R.Platt, S.Yen, C.J. Hasson, EMBC 2015.
- **Exploitation of the external JTAG interface for internally controlled configuration readback and self-reconfiguration of Spartan 3 FPGAs**, K Paulsson, U Viereck, M Hbner, J Becker, Symposium on VLSI 2008.

## CONFERENCES AND WORKSHOPS

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- **Conference on Robot Learning (CoRL), Mountain View, CA, 11/2017:** “Learning a visuomotor controller for real world robotic grasping using simulated depth images”, long presentation.
- **RSS workshop on New Frontiers for Deep Learning in Robotics, MIT, 07/2017:** “Learning a visuomotor controller for real world robotic grasping using simulated depth images”, spotlight and poster.
- **RoboCon, MIT, 02/2017:** “Learning control tasks for robotic manipulation using deep reinforcement learning”, presented as a long talk.
- **MassTLC Robotics Cluster, Northeastern, 05/2016:** “Robotic grasping and manipulation”, short presentation.

## SKILLS

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- **Languages:** Python, C, C++, MATLAB, VHDL
- **APIs/Tools:** ROS, Caffe, PyTorch, TensorFlow, OpenRAVE, V-REP, OMPL, Git
- **OSs:** Windows, Linux
- **Embedded:** Mentor Graphics DxDesigner, Simulink, Xilinx FPGA ISE/EDK

## MORE INFORMATION

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- **Languages:** English, German
- **Work authorization:** US permanent resident
- **Website:** For more information, please visit [www.ulrichviereck.com](http://www.ulrichviereck.com).