Ulrich Viereck

74 Fenway Apt 41
Boston, MA, 02115

Web: www.ulrichviereck.com
Email : uliv@ccs.neu.edu
Mobile : 201-970-9024

Summary

- Expected to graduate in December 2019 with a Ph.D. in Computer Science. Looking for a robotics researcher position in the greater Boston area starting in January 2020.
- 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

- **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

- **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, OMPL, 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

- 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

- **Adapting control policies from simulation to reality**, U. Viereck, X. 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. Hübner, J. Becker, Symposium on VLSI 2008.

Conferences and Workshops

- **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

- **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

- **Languages**: English, German
- **Work authorization**: US permanent resident
- **Website**: For more information, please visit **www.ulrichviereck.com**.