Matthew Wilson

Researcher

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Education

University of British Columbia — *Vancouver, BC, CA*

M.S. in Computer Science — *Sep. 2019 -*

University of Utah — *Salt Lake City, UT, USA*

B.S. in Computer Engineering — *Aug. 2015 - May 2019 (4 years)*

- GPA: 3.82

Research Experience

University of British Columbia, Vancouver, BC — *MOCCA Lab*

Graduate Researcher — *September 2019 -*

- Advisor: Michiel van de Panne

University of Utah, Salt Lake City, UT — *LL4MA Lab*

Undergraduate Researcher — *January 2018 - August 2019 (1.5 years)*

- Advisor: Tucker Hermans

Carnegie Mellon University, Pittsburgh, PA — *MSL Lab*

Roboitcs Institute Summer Scholar (REU) — *June 2017 - August 2017 (3 months)*

- Advisors: Ralph Hollis, Jean Oh

Research Projects

Learning to Manipulate Object Collections Using Grounded State Representations — *Conference on Robot Learning (CoRL 2019) (Oral)*

Undergraduate Researcher, LL4MA Lab — *November 2018 - June 2019 (7 months)*

- See website: `https://matwilso.github.io/projects/object_collections`

Sim-to-Real Adaptation via Meta-Learning — *GitHub repo*

Undergraduate Researcher, LL4MA Lab — *July 2018 - November 2018 (4 months)*

- Worked on applying meta-learning to improve performance for simulation to real adaptation in robotics vision tasks
- Successfully reproduced results of domain randomization for object localization as in [Tobin et al. 2017]
- Implemented Model Agnostic Meta-Learning (MAML) and domain randomization to train object localization model to handle greater scene variation (e.g., camera view point and varied table configurations)
- Learned a lot, but unfortunately saw negative results of my approach over a baseline

Guided Policy Search Reproducing

Undergraduate Researcher, LL4MA Lab — *Jan 2018 - Jul 2018 (5 months, as side-project)*

- Adapted Guided Policy Search algorithm code to work on LL4MA Lab KUKA robot in simulation
- Learned about trajectory optimization and model-based reinforcement learning

Go, Look, and Tell: Natural Language Communication with a Ballbot — *Paper | Poster*

Robotics Institute Summer Scholar, MSL Lab — *June 2017 - August 2017 (3 months)*

- Developed system for a user to give natural language commands and ask questions of dynamically balancing mobile robot (Ballbot)
- Integrated vision system, natural language processing via Amazon Echo, world model (database), and mobile robot navigation system
- Communicated work as a paper and poster

Open Source and Engineering Projects

Implementation of Model-Agnostic Meta-Learning (MAML) algorithm — *https://github.com/matwilso/maml_numpy*

algorithm implementation — *June 2018*

- Derived forward and backward passes of MAML (meta-learning algorithm) and implemented them in numpy

Reinforcement Learning (RL) Implementations

https://github.com/matwilso/rl-implementations

ALGORITHM IMPLEMENTATION

Spring 2018

- Implemented deep reinforcement learning algorithms (mainly just REINFORCE) in both numpy and TensorFlow

Utah Student Robotics Team

Website | GitHub

ELECTRICAL & PROGRAMMING TEAM MEMBER

Nov 2015 - Aug 2018 (2 years 8 months)

- Helped design, build, and program robots to compete in NASA Robotic Mining Competitiong for 3 years of competition
- Started on the mechanical subteam, but contributed most to electrical and software
- Developed simulation of robot for testing, using Gazebo and ROS
- Was software team lead in 2017-18 year and developed low-level motor controller code and autonomy components such as vision system, position controllers for actuators, and finite state machine
- Wrote technical paper on Systems Engineering for NASA competition, getting 3rd and 4th places in 2017, 2018
- Attended outreach events for K-12 students. Talked to kids about robotics and space exploration
- It was all pretty fun

Writing

Explanation of Proximal Policy Optimization (PPO) on Stack Overflow

https://stackoverflow.com/questions/46422845

STACK OVERFLOW

June 2018

- Wrote explanation of a popular reinforcement learning algorithm, Proximal Policy Optimization (PPO)
- Top answer on Stack Overflow, with 80+ upvotes
- Cited by popular blog post and used in popular YouTube video with 30k+ views

Honors & Awards

Presidential Scholarship	*University of Utah*	2015-2019
Dean's List	*College of Engineering*	2015-2018
UROP Undergraduate Research Award	*University of Utah*	Summer 2018
3rd Place / 50, NASA Robotic Mining Competition (RMC)	*NASA Kennedy Space Center*	May 2018
3rd Place / 50, NASA Robotic Mining Competition (RMC)	*NASA Kennedy Space Center*	May 2017
3rd Place / 50, Systems Engineering Paper, NASA RMC	*NASA Kennedy Space Center*	May 2017
Judges' Innovation Award, NASA RMC	*NASA Kennedy Space Center*	May 2016
3rd Place, Hackathon	*HackTheU Hackathon*	Nov 2016