

Matthew Wilson

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Education

🏛️ University of British Columbia

M.S. IN COMPUTER SCIENCE

[Vancouver, BC, CA](#)

Sep. 2019 - May 2021 (2 years)

🏛️ University of Utah

B.S. IN COMPUTER ENGINEERING

[Salt Lake City, UT, USA](#)

Aug. 2015 - May 2019 (4 years)

Experience

Graduate Student Researcher

UNIVERSITY OF BRITISH COLUMBIA, VANCOUVER, BC

- Advisor: Michiel van de Panne

[MOCCA Lab](#)

Sep 2019 - May 2021 (2 years)

Undergraduate Researcher

UNIVERSITY OF UTAH, SALT LAKE CITY, UT

- Advisor: Tucker Hermans

[LL4MA Lab](#)

Jan 2018 - Aug 2019 (1.5 years)

Robotics Institute Summer Scholar (REU)

CARNEGIE MELLON UNIVERSITY, PITTSBURGH, PA

- Advisors: Ralph Hollis, Jean Oh

[MSL Lab](#)

Jun 2017 - Aug 2017 (3 months)

University Robotics Club Member

UNIVERSITY OF UTAH, SALT LAKE CITY, UT

- Advisor: Jon Davies

[Utah Student Robotics](#)

Jan 2016 - Aug 2018 (2.5 years)

Projects and Publications

📄/🔗 **boxLCD: A Simple Testbed for Learned Simulator and World Model Research**

[ICLR 2021 SimDL Workshop](#) | [GitHub](#)

MATTHEW WILSON

Feb 2021 - Current

- Developing a small-scale testbed for research in unsupervised learning / generative models for robot learning and training models to solve it.

📄 **Learning to Manipulate Object Collections Using Grounded State Representations**

[CoRL 2019 \(Oral, Best System Paper\)](#)

MATTHEW WILSON, TUCKER HERMANS

Nov 2018 - Jun 2019 (7 months)

- Led sim2real deep reinforcement learning project, training manipulation policy in simulation and deploying on real Baxter Robot
- See project page for summary video and slides: https://matwilso.github.io/projects/object_collections

📄 **Go, Look, and Tell: Natural Language Communication with a Ballbot**

[Preprint](#) | [Poster](#)

MATTHEW WILSON, JEAN OH, RALPH HOLLIS

Jun 2017 - Aug 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

🔧 **NASA Robotic Mining Competition**

[Competition Website](#)

UTAH STUDENT ROBOTICS (MECHANICAL MEMBER, ELECTRICAL MEMBER, AND SOFTWARE LEAD)

Nov 2015 - Aug 2018 (2 years 8 months)

- Helped design, build, and program robots to compete in NASA Robotic Mining Competition for 3 years of competition
- Started on the mechanical subteam, but contributed most to electrical and software
- Helped design, spec, and assemble (solder, wire up) electrical system components
- 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 place in 2017
- Attended outreach events for K-12 students. Talked to kids about robotics and space exploration

Open Source Implementations

Generative Models

https://github.com/matwilso/generative_models

ALGORITHM IMPLEMENTATION

Feb 2018

- Implemented fundamental generative model algorithms in PyTorch, including Autoregressive models, GANs, VAEs, and Diffusion Models

Domain Randomization for Transferring from Simulation to the Real World

<https://github.com/matwilso/domrand>

REPRODUCING

Jun 2018

- Developed a simulation environment, collected a dataset of images and labels, and trained a VGG model to localize objects
- Reproduced domain randomization results from Tobin et. al 2017 and verified predictions on a physical system

Model-Agnostic Meta-Learning (MAML)

https://github.com/matwilso/maml_numpy

ALGORITHM IMPLEMENTATION

Jun 2018

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

REINFORCE

<https://github.com/matwilso/reinforce>

ALGORITHM IMPLEMENTATION

Spring 2018

- Implemented REINFORCE deep reinforcement learning algorithms in both TensorFlow and raw numpy

Writing

Blog posts on Robot Learning

<https://matwilso.github.io/blog/>

PERSONAL BLOG

Jul 2020 - Current

- [Feb 22, 2021] The Future of Robot Learning. Discussion of the role unsupervised learning is going to play in the future of robot learning. From two perspectives of model-based RL (world models) and sim2real (learned simulators).
- [Feb 22, 2021] Learned Simulators. Specific thoughts on the idea of a learned simulator and the framing they provide on robot learning progress.
- [Jul 20, 2020] GPT Physics Sim. Some of my earlier thoughts on extrapolating technologies like GPT to video and physics simulation.

Explanation of Proximal Policy Optimization (PPO) on Stack Overflow

<https://stackoverflow.com/questions/46422845>

STACK OVERFLOW

Jun 2018

- Wrote explanation of a popular reinforcement learning algorithm, Proximal Policy Optimization (PPO)
- Top answer on Stack Overflow, with 125+ upvotes. Cited by popular blog post and used in popular YouTube video with 75k+ views

Honors & Awards

Best System Paper Award, CoRL 2019

Osaka, Japan

Oct 2019

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 RMC

NASA Kennedy Space Center

May 2017, 2018

Judges' Innovation Award, NASA RMC

NASA Kennedy Space Center

May 2016

Skills

Languages Python (PyTorch, TensorFlow, Jax), C/C++, Java, basic HTML+JS (some d3)

Other Git, Linux/Unix, Mujoco, ROS, Gazebo, Solidworks, \LaTeX , some machine shop experience (basic, mill)