

RESEARCH INTERESTS

Developing robust and adaptive policies for controlling dynamical systems using data-driven methods such as model learning and state representation learning.

EDUCATION

Carnegie Mellon University (CMU) Pittsburgh, PA

Master of Science in Mechanical Engineering, Research Option; (Cumulative GPA: 4.00/4.00) Aug. 2017 – May. 2019

- **Coursework:** Advanced Control Systems Integration, Deep Reinforcement Learning and Control, Statistical Techniques in Robotics, Fundamentals of Computer Systems

National Taiwan University (NTU) Taipei, Taiwan

Bachelor of Science in Mechanical Engineering (Cumulative GPA: 3.95/4.30) Sep. 2012 – Jun. 2016

- **Coursework:** Linear Control Systems, Digital Control Systems, Intermediate Dynamics, Data Structure and Algorithms, Machine Learning and Having It Deep and Structured

RESEARCH EXPERIENCE

Intelligent Autonomous Manipulation Lab, CMU Robotics Institute Pittsburgh, PA

Graduate Research Assistant (Advisor: Professor Oliver Kroemer) Sep. 2017 - Present

- Created a general framework for learning robust strategies for contact-based manipulation tasks.
- Developed a method to model local dynamics of different contact modes, and integrated the obtained information into state representations.
- Learned a state transition model from experience using a mixture of statistical inference and symbolic planning.
- Utilized reinforcement learning to optimize a policy on the resulting model, improving the failure rate of various tasks from an average of 30% to an average of 5%.

Bio-Inspired Robotics Lab, NTU Department of Mechanical Engineering Taipei, Taiwan

Research Assistant (Advisor: Professor Pei-Chun Lin) Jan. 2015 - Aug. 2016

- Designed and fabricated a Spring Loaded Inverted Pendulum(SLIP) based quadruped robot.
- Utilized a deep neural network model to approximate the dynamics from simulated experience.
- Designed optimal control algorithms with respect to the learned dynamics to perform stable gaits in simulation.
- Developed a MATLAB toolbox that can derive and simulate Lagrangian mechanics using symbolic math.

PUBLICATIONS

(In review) **Austin S. Wang**, Oliver Kroemer, "Learning Robust Manipulation Strategies with Multimodal State Transition Models and Recovery Heuristics", *IEEE International Conference on Robotics and Automation (ICRA)*, 2019

Austin Shih-Ping Wang, Wei-Lun William Chen, and Pei-Chun Lin, Control of a 2-D Bounding Passive Quadruped Model with Poincare Map Approximation and Model Predictive Control", *International Conference on Advanced Robotics and Intelligent Systems (ARIS)*, 2016, pp.1-6.

AWARDS & HONORS

Best Presentation Paper Contest, 2nd Place Taipei, Taiwan

2016 International conference on Advanced Robotics and Intelligent Systems Aug. 2016

WORK EXPERIENCE

National Robotics Engineering Center

Pittsburgh, PA

Robotics Research Intern

Jul. 2018 - Present

- Trained a Grasp Quality Network(GQN) using data collected from an automated data collection process.
- Designed a homography-based visual servoing controller to optimize grasp poses using the trained network.

Techman Robot

Taoyuan, Taiwan

Research and Development Intern

May. 2017 - Jul. 2017

- Utilized reinforcement learning to improve efficiency in insertion tasks performed by robotic manipulators.
- Developed an algorithm to count repetitions in noisy sequences, which will be implemented onto analyzing data collected from production lines.

ACADEMIC PROJECTS

Learning to Run

Pittsburgh, PA

Course: Deep Reinforcement Learning and Control

Feb. 2018 - May. 2018

- Attempted to solve the NIPS challenge of the same name.
- Developed a controller that enables a physiologically-based human skeleton model to run as fast as possible.
- Used actor-critic methods and asynchronous updates to learn from numerous simulations ran in parallel.
- Extracted an action feature space using an autoencoder jointly trained online, increasing exploration efficiency.

Quadrotor Ping-Pong

Pittsburgh, PA

Course: Advanced Control Systems Integration

Sep. 2017 - Dec. 2017

- Developed a quadrotor system capable of hitting a ping-pong ball thrown into the air in a team of five students.
- Performed state estimation using a motion capture system along with an on-board IMU.
- Generated minimum jerk trajectories with respect to sensory inputs.
- Stabilized the quadrotor with respect to the trajectory with a nested LQR-PID controller.
- Integrated the motion capture system, the off-board planner, and the on-board controller through ROS.

Visual Question Answering with Deep Learning

Taipei, Taiwan

Course: Machine Learning and Having It Deep and Structured

Sep. 2015 - Dec. 2015

- Developed a model that solves the Visual Question Answering(VQA) dataset in a team of four students.
- Extracted features from the questions using convolutional neural networks and word embedding.
- Achieved a score of 81% correctness, which ranked 2nd among 30 teams in the class.

TEACHING EXPERIENCE

Advanced Control Systems Integration

Pittsburgh, PA

Teaching Assistant

Sep. 2018 - Present

- Guided students on lab sessions involving implementing controllers on dynamical systems.
- Advised teams on final projects involving accomplishing dynamically challenging tasks using quadrotors

SKILLS

- **Languages:** English (Fluent), Chinese (Native), Japanese (Intermediate)
- **Programming Languages:** Python, MATLAB, C++, C
- **Tools:** ROS, PyTorch, Tensorflow, Keras, Simulink, Solidworks