Richard Cheng

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EDUCATION

California Institute of Technology (Caltech), Pasadena, CA, Expected June 2020   (GPA: 3.9)
PhD candidate in Mechanical Engineering
Advisor: Joel W. Burdick,   Co-Advisor: Richard M. Murray
Received M.S. degree in Mechanical Engineering (2017)

Princeton University, Princeton, NJ, June 2015   (GPA: 3.9)
B.S.E – Mechanical and Aerospace Engineering | Magna Cum Laude, Phi Beta Kappa, Tau Beta Pi
Minors: Computer Science, Robotics and Intelligent Systems

RESEARCH

Safe/Reliable Reinforcement Learning, Caltech, Pasadena, CA | November 2017 - Current
- Examining how reinforcement learning, a powerful method for learning complex tasks, can be made safe during the learning process. Goal is to utilize reinforcement learning in the real world to accomplish difficult tasks (e.g. control complex robots)
- Studying ways to inject model information into reinforcement learning to optimally guide the learning process and improve efficiency/reliability

Spinal Cord Rehabilitation, Caltech-UCLA Collaboration, Los Angeles, CA | September 2016 - Current
- Work with researchers at UCLA to develop spinal stimulation therapy for spinal cord injury
- Discovered a neural mechanism by which spinal cord stimulation can enable motor recovery
- Built prototype robotic training device to deliver perturbations to patients during balancing tasks

WORK EXPERIENCE

Toyota Research Institute – Robotics, Los Altos, CA | June 2019 - Oct 2019
- Worked as a research intern in the Robotics division of TRI, developing capabilities for its high degree-of-freedom mobile robot for the home. Researched ways to speed up and improve whole-body motion planning by learning an exploration strategy for an RRT-based planner.

TEACHING/MENTORSHIP EXPERIENCE

- Advised a senior thesis *(State Estimation and Control for a Perturbing Platform for Robotic Rehabilitation)*, and a summer research project *(Design and Implementation of a SCI Rehabilitation Home Therapy Robot)*
- Served as TA for ME/CS/EE 134 (Autonomy) – designed/debugged labs on path planning using Turtlebots, ran students through the labs, graded assignments, and lectured on ROS basics
- Served as TA for CDS 110 (Introduction to Feedback Systems) – held office hours, clarified concepts for students, and graded assignments
- Served as tutor for the Caltech RISE program, helping high school students struggling in math/science
- Volunteered as tutor at the Garden State Youth Correctional Facility, helping inmates to obtain their GED

SKILLS

- Software Proficiency: Python, MATLAB, ROS, TensorFlow, Arduino, Solidworks
- Hardware Proficiency: 3D Printing, Machine shop (mill, lathe, waterjet, etc…), Laser cutting

SELECT PUBLICATIONS

- **R Cheng**, A Verma, G Orosz, S Chaudhuri, Y Yue, J.W. Burdick. *Control Regularization for Reduced Variance Reinforcement Learning*. International Conference on Machine Learning (ICML), 2019.
- **R Cheng**, G Orosz, R.M. Murray, J.W. Burdick. *End-to-End Safe Reinforcement Learning through Barrier Functions for Safety-Critical Continuous Control Tasks*. AAAI Conference on Artificial Intelligence, 2019.
- **R Cheng**, Y Sui, D Sayenko, J.W. Burdick. *Motor Control after Human SCI through Activation of Muscle Synergies under Spinal Cord Stimulation*. IEEE Trans. on Neural Systems and Rehabilitation Engineering, 2019.
- **R Cheng**, Y Sui, D Sayenko, J.W. Burdick. *On Muscle Activation for Improving Robotic Rehabilitation after Spinal Cord Injury*. IEEE/RSJ Conference on Intelligent Robots and Systems (IROS), 2018.
- P Chirarattananon, KY Ma, **R Cheng**, RJ Wood. *Wind Disturbance Rejection for an Insect-Scale Flapping-Wing Robot*. IEEE/RSJ Conference on Intelligent Robots and Systems (IROS), 2015.