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

CURRENT RESEARCH

Safe Reinforcement Learning, Caltech, Pasadena, CA | November 2017 - Current
- Examining how reinforcement learning, a powerful method for learning tasks from scratch, 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 or self-driving cars)
- Studying ways to inject model information into reinforcement learning to optimally guide the learning process and improve efficiency/safety

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 robotic training device to deliver perturbations to patients during balancing tasks
- Researching machine learning techniques to learn time-varying spinal stimulation for rehab

TEACHING/MENTORSHIP EXPERIENCE

- Advised a senior thesis *(State Estimation 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 a lab on path planning using Turtlebots, ran students through the labs, graded assignments, and lectured on ROS
- 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 Correctional Facility, helping inmates to obtain their GED
- Worked at McGraw Study Hall, teaching multivariable calculus and physics to students at Princeton

SKILLS

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

PEER-REVIEWED PUBLICATIONS

- **R Cheng**, G Orosz, R.M. Murray, J.W. Burdick. *Safe Reinforcement Learning through Barrier Functions for Safety-Critical Control Tasks.* AAAI Conference on Artificial Intelligence, 2019.
- **R Cheng**, et al. *Motor Control after Human SCI through Activation of Muscle Synergies under Spinal Cord Stimulation.* IEEE Transactions on Neural Systems and Rehabilitation Engineering. (Submitted).
- **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.
- **R Cheng** and J.W. Burdick. *Extraction of Muscle Synergies in Spinal Cord Injured Patients.* Engineering in Medicine and Biology Conference (EMBC), 2018.
- P Chirarattananon, Y Chen, E Helbling, KY Ma, **R Cheng**, RJ Wood. *Dynamics and Flight Control of a Flapping-Wing Robotic Insect in the Presence of Wind Gusts.* Interface Focus, 2017.
- 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.