Richard Cheng

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EDUCATION

California Institute of Technology (Caltech), Pasadena, CA, Expected June 2020
PhD candidate in Mechanical and Civil Engineering | Minor in Control and Dynamical Systems
Advisor: Joel W. Burdick, Co-Advisor: Richard M. Murray
Received M.S. degree in Mechanical and Civil Engineering (2017)

Princeton University, Princeton, NJ, June 2015
B.S.E – Mechanical and Aerospace Engineering | Magna Cum Laude, Phi Beta Kappa, Tau Beta Pi
Minors: Applications of Computing, Robotics and Intelligent Systems

CURRENT RESEARCH

Safe Reinforcement Learning, Caltech, Pasadena, CA | February 2018 - 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 optimize spinal stimulation therapy) while staying safe
- 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 patients
- Discovered an underlying mechanism by which spinal cord stimulation can enable motor recovery
- Examining how machine learning techniques can learn time-varying spinal stimulation to improve rehab

TEACHING/MENTORSHIP EXPERIENCE

- Advised a senior thesis project *(Design and Implementation of a SCI Rehabilitation Home Therapy Robot)*, and a summer research project *(State Estimation and Control for a Perturbing Platform for Robotic Rehabilitation)*
- Served as TA for ME/CS/EE 134 (Autonomy) – designed and debugged a lab on path planning using Turtlebots, ran students through the labs, graded assignments, and lectured twice on ROS for the course
- 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 middle/high school students struggling in math and 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 general physics to students at Princeton

HONORS AND AWARDS

- Guggenheim Graduate Fellowship
- Guenther Fellowship
- National Science Foundation Graduate Research Fellowship: Honorable Mention
- Shapiro Prize for Academic Excellence (awarded to top 3% of freshman/sophomore class at Princeton)

SKILLS

- Chinese (Conversational)
- Software Proficiency: Python, Arduino, MATLAB, ROS, Java, 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 Continuous Control Tasks.* AAAI Conference on Artificial Intelligence, 2019. *(In Review)*
- R Cheng, Y Sui, D Sayenko, J.W. Burdick. *On Muscle Activation for Improving Robotic Rehabilitation after Spinal Cord Injury.* Intelligent Robots and Systems (IROS), 2018 IEEE/RSJ.
- 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, KY Ma, R Cheng, RJ Wood. *Wind Disturbance Rejection for an Insect-Scale Flapping-Wing Robot.* Intelligent Robots and Systems (IROS), 2015 IEEE/RSJ.
- 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.