Richard Cheng

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EDUCATION

California Institute of Technology (Caltech), Pasadena, CA *(GPA: 3.9)* Expected Graduation: Dec. 2020
PhD candidate in Mechanical Engineering | Recipient of the Guggenheim Fellowship
Advisor: Joel W. Burdick, Co-Advisor: Richard M. Murray

Main Research Projects:
1. *Safe/Reliable Reinforcement Learning for Robot Planning and Control*
2. *Assured Safety during Human-Robot Interaction using Learned Predictive Models*
3. *Spinal Cord Rehabilitation for Motor Recovery through Spinal Stimulation*

Princeton University, Princeton, NJ *(GPA: 3.9)* Graduated: June 2015
B.S.E – Mechanical and Aerospace Engineering | Magna Cum Laude, Phi Beta Kappa, Tau Beta Pi
Minor: Computer Science | Recipient of the Shapiro Prize for Academic Excellence (Awarded to Top 3% of Students)

WORK EXPERIENCE

Toyota Research Institute (Robotics Team) – Research Intern, Los Altos, CA | June 2019 - Oct 2019
- Developed motion planning capabilities for a high degree-of-freedom mobile manipulation robot.
- Researched ways to speed up and improve whole-body motion planning, using machine learning to inform the exploration strategy for an RRT-based planner. Key results published in IROS 2020 paper.

SELECT PUBLICATIONS (IROS, ICML, AAAI, CDC, CoRL, TNSRE)

- **R Cheng**, R.M. Murray, J.W. Burdick. *Limits of Probabilistic Safety Guarantees when Considering Human Uncertainty.* Conference on Robot Learning (CoRL), 2020. (Submitted)
- **R Cheng**, K Shankar, J.W. Burdick. *Learning an Optimal Sampling Distribution for Efficient Motion Planning.* IEEE Conference on Intelligent Robots and Systems (IROS), 2020.
- **R Cheng,** M.J. Khojasteh, A.D. Ames, J.W. Burdick. *Safe Multi-Agent Interaction through Robust Control Barrier Functions with Learned Uncertainties.* Conf. on Decision and Control (CDC), 2020.
- **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.
- M Tucker, M Cheng, E Novoseller, **R Cheng**, Y Yue, J.W. Burdick, A.D. Ames. *Human Preference-Based Learning for High-dimensional Optimization of Exoskeleton Walking Gaits.* IROS, 2020.
- **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.
- P Chirarattananon, Y Chen, EF 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.

SOFTWARE / HARDWARE SKILLS

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

PROFESSIONAL SERVICE

- Program Chair for AISafety workshop at IJCAI 2019 and SafeAI workshop at AAAI 2020
- Session Co-Chair for Neural Signal Processing at EMBC (Engineering in Medicine and Biology Conference)
- Reviewer for NeurIPS, IROS, ACC, CDC, IEEE-TAC (Transactions on Automatic Control), IEEE-TNNLS (Transactions on Neural Networks and Learning Systems), Transportation Research Part C

TEACHING / MENTORSHIP EXPERIENCE

- Co-advising an undergraduate project on preference-based learning. Led to a first-author workshop paper by the undergraduate at ICML (*Preference-Based Bayesian Optimization in High Dimensions with Human Feedback)*
- 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, and lectured on ROS basics
- Served as TA for CDS 110 (Intro to Feedback Systems) – held precept and clarified concepts for students
- Volunteered as a tutor at the Garden State Youth Correctional Facility, helping inmates to obtain their GED