ME 250 SEMINAR

Towards Autonomous Surgical Robots:
New Strategies in Design, Control, and AI

Surgical robots offer a potential future for combatting doctors shortages, decreased access to care, and the longer wait-times. My lab has looked towards developing autonomous surgical robots that can break the dependency on having a human surgeon perform each procedure, which is not scalable to meet the increasing population of patients, and suffers from a large and unpredictable variability amongst doctor experiences, training, and even day-to-day alertness. However, with very limited exceptions, we (as roboticists) are not there yet --- the hurdles facing surgical robotics AI and automation comprise a host of multidisciplinary problems, from challenging computer vision problems robot and scene estimation, to control challenges with flexible and complex surgical instrumentation, to sub-second reactive motion planning in constrained and dynamic environments. In this talk, I will show how my lab's research towards autonomous surgical robots have led us to develop computationally efficient methods for deformable SLAM, model-free robot learning, neural motion planning, and machine learning models for trajectory optimization. Furthermore, I will show how these techniques, many of which driven by data, are ubiquitous in that they expand not only to different surgical robots (both commercially available and those developed in the lab) but also to a broader set of applications across robot manipulation and bio-inspired robotics.

THURSDAY, NOVEMBER 5, 2020 | ZOOM | 11:00 AM - 11:50 AM

Michael Yip

Michael Yip is an Assistant Professor of Electrical and Computer Engineering at UC San Diego, IEEE RAS Distinguished Lecturer, Hellman Fellow, and Director of the Advanced Robotics and Controls Laboratory (ARCLab). His group currently focuses on solving problems in data-efficient and computationally efficient robot control and motion planning through the use of various forms of learning representations, including deep learning and reinforcement learning strategies. His lab applies these ideas to surgical robotics and the automation of surgical procedures. Previously, Dr. Yip's research has investigated different facets of haptics, soft robotics, artificial muscles, computer vision, and teleoperation. Dr. Yip's work has been recognized through several best paper awards at ICRA, including the inaugural best paper award for IEEE's Robotics and Automation Letters. Dr. Yip has previously been a Research Associate with Disney Research Los Angeles in 2014, a Visiting Professor with Amazon Robotics' Machine Learning and Computer Vision group in Seattle, WA in 2018, and a Visiting Professor at Stanford University in 2019. He received a B.Sc. in Mechatronics Engineering from the University of Waterloo, an M.S. in Electrical Engineering from the University of British Columbia, and a Ph.D. in Bioengineering from Stanford University.