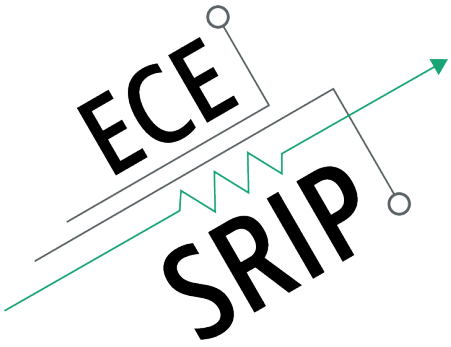


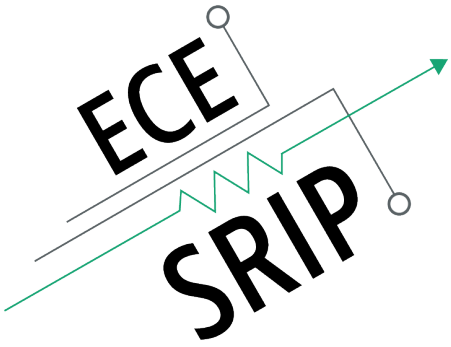
FACULTY MENTOR
Yip, Michael

PROJECT TITLE
Data-Efficient Reinforcement and Imitation Learning

PROJECT DESCRIPTION
Building efficient reinforcement learning techniques that can solve sparse-reward problems with minimum interaction with the environment.

INTERNS NEEDED
2 MS Students, 1 BS Student

PREREQUISITES
Ms students with prior knowledge of deep learning and reinforcement learning. Bs students with good coding skills in python and c++.



FACULTY MENTOR
Yip, Michael

PROJECT TITLE
Real-time GPU Database and Interactive Visualization

PROJECT DESCRIPTION
Development of computationally efficient motion planning algorithms by utilizing machine learning techniques.

INTERNS NEEDED
1 MS student and 1 BS student

PREREQUISITES
Ms students with prior knowledge of deep learning. Bs students with good coding skills in python and c++.

FACULTY MENTOR
Yip, Michael

PROJECT TITLE
Sparse Regression for Distance Estimation in Robot Configuration Space

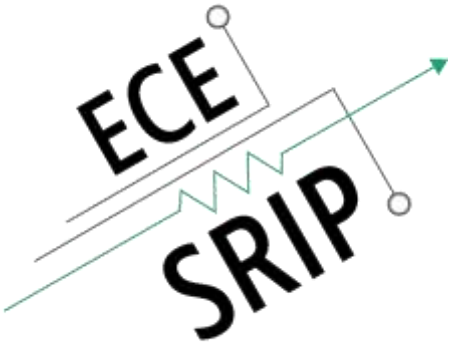
PROJECT DESCRIPTION
The output of this project will be a lightweight model to calculate the distance from collision (or any infeasible state) for a given robot configuration, providing a cost of feasibility of a given configuration.

There are three stages for this project:
1. Generating training data and model fitting (1 month)
-Standard SVR techniques will be used
-Student must try techniques in various dimensional spaces, and assess the effects of parameter choices, regularization, etc. on accuracy
-Student must experiment with target values, e.g., distance in joint space to opposite label or distance/penetration depths measure in C-space
Completion of stage 1 will occur when student adequately models C-space distance
2. Adding L0-minimizer to sparsify model (1 month)
-Student should integrate techniques used in sparse SVC to the SVR problem
-Comparisons will be made measuring accuracy, speed, and model sizes between standard and sparse SVR
-Completion of stage 2 will occur when student summarizes the tradeoffs of sparseness/speed and accuracy
3. Algorithm profiling and applications (1 month)
-Student will profile and optimize the algorithm/code to improve speed
-Student will demonstrate abilities of model in one (or more) applications
--Motion planning: Potential fields method using C-space costs
--Motion planning: Path planning by minimization of path length, maximization of C-space distance
--Self-collision avoidance: Straight-line interpolation between random configurations, but self-collisions are circumvented using C-space costs
-Completion of stage 3 will occur when student documents abilities and limitations of the proposed method

INTERNS NEEDED
1 MS Student

PREREQUISITES

Basic programming (e.g., MATLAB or Python), basic linear algebra, familiarity with machine learning concepts.



FACULTY MENTOR
Yip, Michael

PROJECT TITLE
Model-free control and modeling methods for muscle-powered robotics research

PROJECT DESCRIPTION
This project aims to develop model-free control and modeling methods using supervised learning for a foundational approach towards muscle-powered machines that move using biomimetic muscle actuators. A data-driven selection and design of muscle-actuated biomimetic motions will be used to overcome the major hurdles regarding selection and configurations of robot muscles. With both a defined "performance space" and "configuration space", we intend to offer a unifying framework, with statistically relevant modeling, that enables straightforward muscle selection and design for applications with parameterized motion requirements.

INTERNS NEEDED
1 BS or MS student

PREREQUISITES
Machine learning, controls