Intelligent Control, Communication and Robotics Overview

Optimal control approaches for uncertain systems use an approximation-based solution by leveraging the approximate dynamic programming and reinforcement learning. These approximate optimal control approaches assume continuous or periodic feedback transmission and execution of the controller, leading to redundant usages of resources.

Further, recent results from the machine learning community show the neural networks are vulnerable to crafted attacks and can significantly change their decision-making capabilities. In a learning control system, where the neural networks are the backbone of the controllers, an attack on the controller learning signals may lead to higher control cost, and eventually, instability. The *research goals are to 1)* simultaneously optimize the communication and computational resource usages to minimize the control, computation, and communication costs of large-scale interconnected and multiplayer systems and 2) *develop secure-by-design resilient optimal adaptive controllers, which can perform* near *optimally, even under adversarial attacks on the learning mechanisms*.