NEXT LEVEL INNOVATION IN ROBOTICS AND AUTONOMY

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Title: **Intermittent Hybrid Reinforcement Learning and its Application to Optimal Adaptive Control**

Abstract:

Learning through interactions is one of the basic ideas of reinforcement learning (RL). In RL methods, an agent learns to take actions in order to maximize the cumulative reward over time. One of the classical approaches to solve a decision making problem using RL is dynamic programming (DP). The traditional DP approach however requires extensive computation and the knowledge of the environment. On the other hand, the temporal difference learning (TDL) framework based on RL and DP using online approximators is more efficient for implementation. In TDL, the value function is updated using a consistency condition in the form of Bellman and/or Hamiltonian-Jacobi-Bellman equation and suitable decisions/actions are generated. An important application of TDL is in the optimal adaptive control of dynamic systems using feedback information from the environment.

This talk will present a TDL framework for dynamical systems via periodically sampled information first and next using event sampled state and action information. Online function approximators will be utilized to estimate the optimal value functions by minimizing the TD error. A novel hybrid learning approach based on a combination of time and iterative approach and its application to optimal adaptive control will be introduced using event sampled or intermittent feedback information. The performance of the proposed schemes is tested on a variety of examples. Hardware implementations will be covered if time permits.