ID de Contribution: **3** Type: **Non spécifié**

Solving the Hamilton Jacobi Bellman equation of optimal control: towards taming the curse of dimensionality

lundi 30 juin 2025 14:00 (45 minutes)

The characterization of optimal feedback for nonlinear dynamical systems involves solving a Hamilton-Jacobi-Bellman equation. This is a nonlinear first order hyperbolic equation in a space whose dimension is that of the state-space of the underlying system. Thus solving this system in practice one is confronted with a curse of dimensionality.

In this talk we present techniques which either, in part, circumvent the necessity of solving the HJB equations directly, or use system reduction techniques to alleviate the difficulty associated with high dimensions. Specifically, we briefly describe experience with a succinct use of policy iteration, we introduce a data-driven technique which exploits higher order information, and we explain the 'Averaged Feedback Learning Scheme'. - Frequently the solution to the HJB equation is semi-concave. This motivates the last point in our talk: an approximation scheme which is structure preserving.

This is joint work with
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