

Monday 18 Sept 2017, 15:30 - 17:00 and Tuesday 19 Sept 2017, 11:00 - 12:30 Room B108, "A. G. Leventis", University of Cyprus

KIOS Distinguished Lecture Series

Approximate Dynamic Programming

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LECTURE ABSTRACT

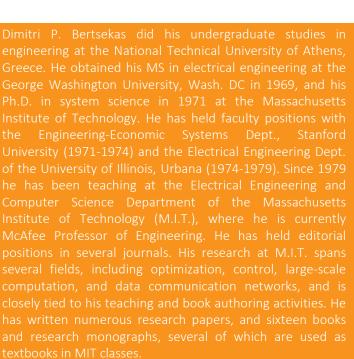
We will consider the Dynamic Programming (DP) algorithm for stochastic sequential decision problems, which arise in a broad variety of applications, such as control / robotics / planning, operations research, economics, artificial intelligence, and others. The algorithm in its exact form, computes the optimal cost-to-go functions and an associated optimal policy, but is very often impractical, because of overwhelming computational requirements. Thus, one often has to settle for a suboptimal control scheme that strikes a reasonable balance between practical implementation and adequate performance. In this lecture series, after a discussion of the exact DP algorithm, we will review several approaches for suboptimal control based on DP ideas. These come under two general categories:

Part A (18 Sep. 2017, 15:30-17:00): Approximation in value space, where we approximate the optimal cost-to-go functions with some other functions, in a scheme based on one-step or multistep look-ahead. There are various approaches here, such as problem approximation, aggregation, rollout, model predictive control, parametric approximation (possibly using neural networks), and others.

Part B (19 Sep. 2017, 11:00-12:30): Approximation in policy space, where we restrict the policy to lie within a given parametric class (such as a neural network, or other architecture) and we select the parameters by using a suitable optimization framework.

There are also mixtures of these two approaches, as exemplified by the recent spectacular successes of programs that, among others, have learned how to play challenging games, such as Go, at or above the level of the best humans. We will describe some of the currently popular approximate DP schemes, focusing mostly on finite horizon problems, and review their range of applications.

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Professor Bertsekas was awarded the INFORMS 1997 Prize for Research Excellence in the Interface Between Operations Research and Computer Science for his book "Neuro-Dynamic Programming" (co-authored with John Tsitsiklis), the 2000 Greek National Award for Operations Research, the 2001 ACC John R. Ragazzini Education Award, the 2009 INFORMS Expository Writing Award, the 2014 ACC Richard E. Bellman Control Heritage Award for "contributions to the foundations of deterministic and stochastic optimizationbased methods in systems and control," the 2014 Khachiyan Prize for Life-Time Accomplishments in Optimization, and the SIAM/MOS 2015 George B. Dantzig Prize. In 2001, Prof. Bertsekas was elected to the United States National Academy of Engineering for "pioneering contributions to fundamental research, practice and education of optimization/control theory, and especially its application to data communication networks." His recent books are "Introduction to Probability: 2nd Edition" (2008), "Convex Optimization Theory" (2009), "Dynamic Programming and Optimal Control," Vol. I, (2017), and Vol. II: (2S012), "Abstract Dynamic Programming" (2013), and "Convex Optimization Algorithms" (2015), all published by Athena Scientific.



