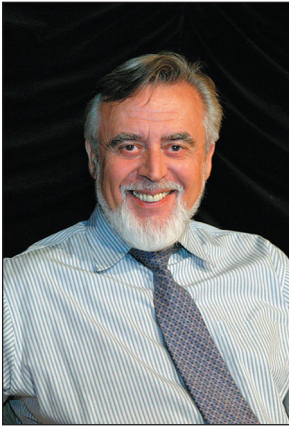


# DISTINGUISHED LECTURER SERIES

THE INSTITUTE FOR SYSTEMS RESEARCH



Wednesday, October 13, 5:00 p.m.

## A Unified View of Temporal Difference Methods for Neuro-Dynamic Programming

Dimitri P. Bertsekas

McAfee Professor of Engineering, Laboratory for Information  
and Decision Systems, Massachusetts Institute of Technology

We consider temporal difference algorithms within the context of infinite-horizon finite-state dynamic programming problems with discounted cost, and linear cost function approximation. We introduce a least squares-based temporal difference method and analyze its convergence. We discuss the connections of the method with Sutton's TD( $\lambda$ ), and show via analysis and experiment that our method is substantially and often dramatically faster, as well as simpler and more reliable. We also discuss the relation of our method with the LSTD method of Boyan, and Bradtke and Barto. The analysis provides a unifying vehicle for viewing TD methods as approximate value iteration methods. Emulation of the typical value iteration involves linear function approximation, a stochastic projected contraction iteration over the approximation subspace, and the solution of a least squares problem. Our method fully solves this problem, but only approximately, by a single gradient iteration (plus zero-mean noise), by TD( $\lambda$ ). This accounts for the substantially faster convergence of our method.

### Remaining lectures in the series

Tuesday, November 16

#### Cell Talk

**Dr. Bhubaneswar Mishra**, Professor  
of Computer Science, Mathematics  
and Cell Biology, New York University

**Current information:**  
[www.isr.umd.edu/ISR/  
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**Questions?**  
Call 301-405-6615

### Biography

Dimitri Bertsekas earned his Ph.D. at the Massachusetts Institute of Technology, where he is currently McAfee Professor of Engineering. His research includes optimization, control, large-scale computation, and data communication networks, and is closely tied to his teaching and book authoring activities. He has written numerous research papers, and authored or coauthored 13 textbooks, including *Nonlinear Programming*, *Dynamic Programming*, *Network Optimization*, *Neuro-Dynamic Programming*, *Introduction to Probability*, and *Convex Analysis and Optimization*, all published in the last eight years by Athena Scientific. He 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, and the 2001 ACC John R. Ragazzini Education Award. In 2000, he was elected to the National Academy of Engineering.

### Date and time

#### Lecture

October 13, 5:00 p.m.  
1115 Computer Science  
Instructional Center (CSIC)

#### Roundtable discussion

October 13, 10:00 a.m.  
2168 A.V. Williams Building

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