Dynamic Programming and Optimal Control (2 Vol Set)

By Dimitri P. Bertsekas

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A two-volume set, consisting of the latest editions of the two volumes (4th edition (2017) for Vol. I, and 4th edition (2012) for Vol. II). Much supplementary material can be found at the book's web page. The first volume is oriented towards modeling, conceptualization, and finite-horizon problems, but also includes a substantive introduction to infinite horizon problems that is suitable for classroom use, as well as an up-to-date account of some of the most interesting developments in approximate dynamic programming. The second volume is oriented towards mathematical analysis and computation, treats infinite horizon problems extensively, and provides a detailed account of approximate large-scale dynamic programming and reinforcement learning. This is a textbook on the far-ranging algorithmic methododogy of Dynamic Programming, which can be used for optimal control, Markovian decision problems, planning and sequential decision making under uncertainty, and discrete/combinatorial optimization. The treatment focuses on basic unifying themes, and conceptual foundations. It illustrates the versatility, power, and generality of the method with many examples and applications from engineering, operations research, and other fields. It also addresses extensively the practical application of the methodology, possibly through the use of approximations, and provides an introduction to the methodology of Neuro-Dynamic Programming, which is the focus of much recent research.

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Editorial Review

Review
Review of Vol. I, 3rd Edition: In addition to being very well written and organized, the material has several special features that make the book unique in the class of introductory textbooks on dynamic programming. For instance, it presents both deterministic and stochastic control problems, in both discrete- and continuous-time, and it also presents the Pontryagin minimum principle for deterministic systems together with several extensions. It contains problems with perfect and imperfect information, as well as minimax control methods (also known as worst-case control problems or games against nature). I also has a full chapter on suboptimal control and many related techniques, such as open-loop feedback controls, limited lookahead policies, rollout algorithms, and model predictive control, to name a few. ... In conclusion the book is highly recommendable for an introductory course on dynamic programming and its applications. --Onesimo Hernandez Lerma, in Math Reviews

In this two-volume work Bertsekas caters equally effectively to theoreticians who care for proof of such concepts as the existence and the nature of optimal policies and to practitioners interested in the modeling and the quantitative and numerical solution aspects of stochastic dynamic programming. --Michael Caramanis, in Interfaces

In conclusion, this book is an excellent source of reference ... The main strengths of the book are the clarity of the exposition, the quality and variety of the examples, and its coverage of the most recent advances. --T. W. Archibald, in IMA Jnl. of Mathematics

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About the Author
Dimitri Bertsekas is Professor of Electrical Engineering and Computer Science at the Massachusetts Institute of Technology, and a member of the US National Academy of Engineering. He is the recipient of the 2001 A. R. Raggazini AACC education award, the 2009 INFORMS expository writing award, the 2014 Kachiyan Prize, the 2014 AACC Bellman Heritage Award, and the 2015 Dantzig Prize. He has researched a broad variety of subjects from optimization theory, control theory, parallel and distributed computation, systems analysis, and data communication networks. He has written numerous papers in each of these areas, and he has authored or coauthored sixteen textbooks.

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