

Handbook Of Markov Decision Processes Methods And Applications International Series In Operations Research Management Science

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Nonlinearly Perturbed Semi-Markov

Processes - Dmitrii Silvestrov 2017-09-06

The book presents new methods of asymptotic analysis for nonlinearly perturbed semi-Markov processes with a finite phase space. These methods are based on special time-space screening procedures for sequential phase space reduction of semi-Markov processes combined with the systematical use of operational calculus for Laurent asymptotic expansions. Effective recurrent algorithms are composed for getting asymptotic expansions, without and with explicit upper bounds for remainders, for power moments of hitting times, stationary and conditional quasi-stationary distributions for nonlinearly perturbed semi-Markov processes. These results are illustrated by asymptotic expansions for birth-death-type semi-Markov processes, which play an important role in various applications. The book will be a useful contribution to the continuing intensive studies in the area. It is an essential reference for theoretical and applied researchers in the field of stochastic processes and their applications that will contribute to continuing extensive studies in the area and remain relevant for years

to come.

Level Crossing Methods in Stochastic Models - Percy H. Brill 2008-12-03

From 1972 to 1974, I was working on a PhD thesis entitled Multiple Server Queues with Service Time Depending on Waiting Time. The method of analysis was the embedded Markov chain technique, described in the papers [82] and [77]. My analysis involved lengthy, tedious derivations of systems of integral equations for the probability density function (pdf) of the waiting time. After pondering for many months whether there might be a faster, easier way to derive the integral equations, I finally discovered the basic theorems for such a method in August, 1974. The theorems establish a connection between sample-path level-crossing rates of the virtual wait process and the pdf of the waiting time. This connection was not found anywhere else in the literature at the time. I immediately developed a comprehensive new methodology for deriving the integral equations based on these theorems, and called it system point theory. (Subsequently it was called system point method, or system point level crossing method: SPLC or simply LC.) I rewrote the entire PhD

thesis from November 1974 to March 1975, using LC to reach solutions. The new thesis was called System Point Theory in Exponential Queues. On June 12, 1975 I presented an invited talk on the new methodology at the Fifth Conference on Stochastic Processes and their Applications at the University of Maryland. Many queueing theorists were present.

Simulation-Based Algorithms for Markov Decision Processes - Hyeong Soo Chang
2013-02-26

Markov decision process (MDP) models are widely used for modeling sequential decision-making problems that arise in engineering, economics, computer science, and the social sciences. Many real-world problems modeled by MDPs have huge state and/or action spaces, giving an opening to the curse of dimensionality and so making practical solution of the resulting models intractable. In other cases, the system of interest is too complex to allow explicit specification of some of the MDP model parameters, but simulation samples are readily available (e.g., for random transitions and costs). For these settings, various sampling and population-based algorithms have been developed to overcome the difficulties of computing an optimal solution in terms of a policy and/or value function. Specific approaches include adaptive sampling, evolutionary policy iteration, evolutionary random policy search, and model reference adaptive search. This substantially enlarged new edition reflects the latest developments in novel algorithms and their underpinning theories, and presents an updated account of the topics that have emerged since the publication of the first edition. Includes: innovative material on MDPs, both in constrained settings and with uncertain transition properties; game-theoretic method for solving MDPs; theories for developing roll-out based algorithms; and details of approximation stochastic annealing, a population-based on-line simulation-based algorithm. The self-contained approach of this book will appeal not only to researchers in MDPs, stochastic modeling, and control, and simulation but will be a valuable source of tuition and reference for students of control and operations research.

Multiple Criteria Decision Analysis: State of the Art Surveys - Salvatore Greco 2006-01-20

Multiple Criteria Decision Analysis: State of the Art Surveys provides survey articles and references of the seminal or state-of-the-art research on MCDA. The material covered ranges from the foundations of MCDA, over various MCDA methodologies (outranking methods, multiattribute utility and value theories, non-classical approaches) to multiobjective mathematical programming, MCDA applications, and software. This vast amount of material is organized in 8 parts, with a total of 25 chapters. More than 2000 references are listed.

Real-Time Management of Resource Allocation Systems - Spyros A. Reveliotis 2006-07-18

Real-Time Management of Resource Allocation Systems focuses on the problem of managing the resource allocation taking place within the operational context of many contemporary technological applications, including flexibly automated production systems, automated railway and/or monorail transportation systems, electronic workflow management systems, and business transaction supporting systems. A distinct trait of all these applications is that they limit the role of the human element to remote high-level supervision, while placing the burden of the real-time monitoring and coordination of the ongoing activity upon a computerized control system. Hence, any applicable control paradigm must address not only the issues of throughput maximization, work-in-process inventory reduction, and delay and cost minimization, that have been the typical concerns for past studies on resource allocation, but it must also guarantee the operational correctness and the behavioral consistency of the underlying automated system. The resulting problem is rather novel for the developers of these systems, since, in the past, many of its facets were left to the jurisdiction of the present human intelligence. It is also complex, due to the high levels of choice – otherwise known as flexibility – inherent in the operation of these environments.

Foundations of Average-Cost Nonhomogeneous Controlled Markov Chains - Xi-Ren Cao 2020-09-09

This Springer brief addresses the challenges encountered in the study of the optimization of time-nonhomogeneous Markov chains. It develops new insights and new methodologies for systems in which concepts such as

stationarity, ergodicity, periodicity and connectivity do not apply. This brief introduces the novel concept of confluency and applies a relative optimization approach. It develops a comprehensive theory for optimization of the long-run average of time-nonhomogeneous Markov chains. The book shows that confluency is the most fundamental concept in optimization, and that relative optimization is more suitable for treating the systems under consideration than standard ideas of dynamic programming. Using confluency and relative optimization, the author classifies states as confluent or branching and shows how the under-selectivity issue of the long-run average can be easily addressed, multi-class optimization implemented, and Nth biases and Blackwell optimality conditions derived. These results are presented in a book for the first time and so may enhance the understanding of optimization and motivate new research ideas in the area.

Uncertainty and Environmental Decision Making - Jerzy A. Filar 2010-05-03

The 21st century promises to be an era dominated by international response to certain global environmental challenges such as climate change, depleting biodiversity and biocapacity as well as general atmospheric, water and soil pollution problems. Consequently, Environmental decision making (EDM) is a socially important field of development for Operations Research and Management Science (OR/MS). Uncertainty is an important feature of these decision problems and it intervenes at very different time and space scales. The Handbook on "Uncertainty and Environmental Decision Making" provides a guided tour of selected methods and tools that OR/MS offer to deal with these issues. Below, we briefly introduce, peer reviewed, chapters of this handbook and the topics that are treated by the invited authors. The first chapter is a general introduction to the challenges of environmental decision making, the use of OR/MS techniques and a range of tools that are used to deal with uncertainty in this domain.

Constrained Markov Decision Processes - Eitan Altman 1999-03-30

This book provides a unified approach for the study of constrained Markov decision processes with a finite state space and unbounded costs.

Unlike the single controller case considered in many other books, the author considers a single controller with several objectives, such as minimizing delays and loss, probabilities, and maximization of throughputs. It is desirable to design a controller that minimizes one cost objective, subject to inequality constraints on other cost objectives. This framework describes dynamic decision problems arising frequently in many engineering fields. A thorough overview of these applications is presented in the introduction. The book is then divided into three sections that build upon each other. The first part explains the theory for the finite state space. The author characterizes the set of achievable expected occupation measures as well as performance vectors, and identifies simple classes of policies among which optimal policies exist. This allows the reduction of the original dynamic into a linear program. A Lagrangian approach is then used to derive the dual linear program using dynamic programming techniques. In the second part, these results are extended to the infinite state space and action spaces. The author provides two frameworks: the case where costs are bounded below and the contracting framework. The third part builds upon the results of the first two parts and examines asymptotical results of the convergence of both the value and the policies in the time horizon and in the discount factor. Finally, several state truncation algorithms that enable the approximation of the solution of the original control problem via finite linear programs are given.

Emerging Intelligent Computing Technology and Applications. With Aspects of Artificial Intelligence - De-Shuang Huang 2009-09-19

The International Conference on Intelligent Computing (ICIC) was formed to provide an annual forum dedicated to the emerging and challenging topics in artificial intelligence, machine learning, bioinformatics, and computational biology, etc. It aims to bring together researchers and practitioners from both academia and industry to share ideas, problems, and solutions related to the multifaceted aspects of intelligent computing. ICIC 2009, held in Ulsan, Korea, September 16-19, 2009, constituted the 5th International Conference on

Intelligent Computing. It built upon the success of ICIC 2008, ICIC 2007, ICIC 2006, and ICIC 2005 held in Shanghai, Qingdao, Kunming, and Hefei, China, 2008, 2007, 2006, and 2005, respectively. This year, the conference concentrated mainly on the theories and methodologies as well as the emerging applications of intelligent computing. Its aim was to unify the picture of contemporary intelligent computing techniques as an integral concept that highlights the trends in advanced computational intelligence and bridges theoretical research with applications. Therefore, the theme for this conference was "Emerging Intelligent Computing Technology and Applications." Papers focusing on this theme were solicited, addressing theories, methodologies, and applications in science and technology.

Uncertainty in the Electric Power Industry - Christoph Weber 2005

Around the world, liberalization and privatization in the electricity industry have led to increased competition among utilities. At the same time, utilities are now exposed more than ever to risk and uncertainties, which they cannot pass on to their customers through price increases as in a regulated environment. Especially electricity-generating companies have to face volatile wholesale prices, fuel price uncertainty, limited long-term hedging possibilities and huge, to a large extent, sunk investments. In this context, *Uncertainty in the Electric Power Industry: Methods and Models for Decision Support* aims at an integrative view on the decision problems that power companies have to tackle. It systematically examines the uncertainties power companies are facing and develops models to describe them - including an innovative approach combining fundamental and finance models for price modeling. The optimization of generation and trading portfolios under uncertainty is discussed with particular focus on CHP and is linked to risk management. Here the concept of integral earnings at risk is developed to provide a theoretically sound combination of value at risk and profit at risk approaches, adapted to real market structures and market liquidity. Also methods for supporting long-term investment decisions are presented: technology assessment based on

experience curves and operation simulation for fuel cells and a real options approach with endogenous electricity prices.

Handbook on Data Envelopment Analysis - William W. Cooper 2006-04-11

Data Envelopment Analysis (DEA) is a relatively new "data-oriented" approach for evaluating the performances of a set of entities called Decision-Making Units (DMUs) which convert multiple inputs into multiple outputs. DEA has been used in evaluating the performances of many different kinds of entities engaged in many different kinds of activities in many different contexts. It has opened up possibilities for use in cases which have been resistant to other approaches because of the complex and often unknown nature of the relations between the multiple inputs and outputs involved in many of these activities, which are often reported in non-commeasurable units. DEA has also been used to supply new insights into activities and entities that have previously been evaluated by other methods. This handbook is intended to represent a milestone in the progression of DEA. Written by experts, who are often major contributors to the topics to be covered, it includes a comprehensive review and discussion of basic DEA models, extensions to the basic DEA methods, and a collection of DEA applications in the areas of banking, education, sports, retail, health care, and a review of current DEA software technology. This handbook's chapters are organized into three categories: (i) basic DEA models, concepts, and their extensions; (ii) DEA applications; and (iii) xii Preface DEA software packages. The first category consists of eleven chapters.

Computer Aided Verification - Sharon Shoham 2022

This open access two-volume set LNCS 13371 and 13372 constitutes the refereed proceedings of the 34rd International Conference on Computer Aided Verification, CAV 2022, which was held in Haifa, Israel, in August 2022. The 40 full papers presented together with 9 tool papers and 2 case studies were carefully reviewed and selected from 209 submissions. The papers were organized in the following topical sections: Part I: Invited papers; formal methods for probabilistic programs; formal methods for neural networks; software Verification and model checking; hyperproperties and security;

formal methods for hardware, cyber-physical, and hybrid systems. Part II: Probabilistic techniques; automata and logic; deductive verification and decision procedures; machine learning; synthesis and concurrency. This is an open access book.

Computational Techniques of the Simplex Method - István Maros 2002-12-31

Computational Techniques of the Simplex Method is a systematic treatment focused on the computational issues of the simplex method. It provides a comprehensive coverage of the most important and successful algorithmic and implementation techniques of the simplex method. It is a unique source of essential, never discussed details of algorithmic elements and their implementation. On the basis of the book the reader will be able to create a highly advanced implementation of the simplex method which, in turn, can be used directly or as a building block in other solution algorithms.

Hidden Markov Models in Finance - Rogemar S. Mamon 2007-04-26

A number of methodologies have been employed to provide decision making solutions globalized markets. Hidden Markov Models in Finance offers the first systematic application of these methods to specialized financial problems: option pricing, credit risk modeling, volatility estimation and more. The book provides tools for sorting through turbulence, volatility, emotion, chaotic events - the random "noise" of financial markets - to analyze core components.

Project Scheduling - Erik Leuven

Demeulemeester 2006-04-11

Our objectives in writing Project Scheduling: A Research Handbook are threefold: (1) Provide a unified scheme for classifying the numerous project scheduling problems occurring in practice and studied in the literature; (2) Provide a unified and up-to-date treatment of the state-of-the-art procedures developed for their solution; (3) Alert the reader to various important problems that are still in need of considerable research effort. Project Scheduling: A Research Handbook has been divided into four parts. Part I consists of three chapters on the scope and relevance of project scheduling, on the nature of project scheduling, and finally on the introduction of a unified scheme that will be used in subsequent chapters for the

identification and classification of the project scheduling problems studied in this book. Part II focuses on the time analysis of project networks. Part III carries the discussion further into the crucial topic of scheduling under scarce resources. Part IV deals with robust scheduling and stochastic scheduling issues. Numerous tables and figures are used throughout the book to enhance the clarity and effectiveness of the discussions. For the interested and motivated reader, the problems at the end of each chapter should be considered as an integral part of the presentation.

Evolutionary Optimization - Ruhul Sarker 2006-04-11

Evolutionary computation techniques have attracted increasing attention in recent years for solving complex optimization problems. They are more robust than traditional methods based on formal logics or mathematical programming for many real world OR/MS problems. Evolutionary computation techniques can deal with complex optimization problems better than traditional optimization techniques. However, most papers on the application of evolutionary computation techniques to Operations Research /Management Science (OR/MS) problems have scattered around in different journals and conference proceedings. They also tend to focus on a very special and narrow topic. It is the right time that an archival book series publishes a special volume which includes critical reviews of the state-of-art of those evolutionary computation techniques which have been found particularly useful for OR/MS problems, and a collection of papers which represent the latest development in tackling various OR/MS problems by evolutionary computation techniques. This special volume of the book series on Evolutionary Optimization aims at filling in this gap in the current literature. The special volume consists of invited papers written by leading researchers in the field. All papers were peer reviewed by at least two recognised reviewers. The book covers the foundation as well as the practical side of evolutionary optimization.

The Theory of Search Games and

Rendezvous - Steve Alpern 2006-04-10

Search Theory is one of the original disciplines within the field of Operations Research. It deals with the problem faced by a Searcher who

wishes to minimize the time required to find a hidden object, or “target. ” The Searcher chooses a path in the “search space” and finds the target when he is sufficiently close to it. Traditionally, the target is assumed to have no motives of its own regarding when it is found; it is simply stationary and hidden according to a known distribution (e. g. , oil), or its motion is determined stochastically by known rules (e. g. , a fox in a forest). The problems dealt with in this book assume, on the contrary, that the “target” is an independent player of equal status to the Searcher, who cares about when he is found. We consider two possible motives of the target, and divide the book accordingly. Book I considers the zero-sum game that results when the target (here called the Hider) does not want to be found. Such problems have been called Search Games (with the “ze- sum” qualifier understood). Book II considers the opposite motive of the target, namely, that he wants to be found. In this case the Searcher and the Hider can be thought of as a team of agents (simply called Player I and Player II) with identical aims, and the coordination problem they jointly face is called the Rendezvous Search Problem.

Artificial Intelligence XXXV - Max Bramer
2018-11-27

This book constitutes the proceedings of the 38th SGAI International Conference on Innovative Techniques and Applications of Artificial Intelligence, AI 2018, held in Cambridge, UK, in December 2018. The 25 full papers and 12 short papers presented in this volume were carefully reviewed and selected from 46 submissions. There are technical and application papers which were organized in topical sections named: Neural Networks; Planning and Scheduling; Machine Learning; Industrial Applications of Artificial Intelligence; Planning and Scheduling in Action; Machine Learning in Action; Applications of Machine Learning; and Applications of Agent Systems and Genetic Algorithms.

Multiple Criteria Optimization - Xavier Gandibleux
2006-04-11

The generalized area of multiple criteria decision making (MCDM) can be defined as the body of methods and procedures by which the concern for multiple conflicting criteria can be formally incorporated into the analytical

process. MCDM consists mostly of two branches, multiple criteria optimization and multi-criteria decision analysis (MCDA). While MCDA is typically concerned with multiple criteria problems that have a small number of alternatives often in an environment of uncertainty (location of an airport, type of drug rehabilitation program), multiple criteria optimization is typically directed at problems formulated within a mathematical programming framework, but with a stack of objectives instead of just one (river basin management, engineering component design, product distribution). It is about the most modern treatment of multiple criteria optimization that this book is concerned. I look at this book as a nicely organized and well-rounded presentation of what I view as “new wave” topics in multiple criteria optimization. Looking back to the origins of MCDM, most people agree that it was not until about the early 1970s that multiple criteria optimization co-geared as a field. At this time, and for about the following fifteen years, the focus was on theories of multiple objective linear programming that subsume conventional (single criterion) linear programming, algorithms for characterizing the efficient set, theoretical vector-maximum developments, and interactive procedures.

Modeling Uncertainty - Moshe Dror
2002-01-31

Writing in honour of Sid Yakowitz, 50 internationally known scholars have collectively contributed 30 papers on modelling uncertainty to this volume. These include papers with a theoretical emphasis and others that focus on applications.

To Queue or Not to Queue - Refael Hassin 2003
To Queue Or Not To Queue: Equilibrium Behavior in Queueing Systems focuses on the highly interesting, practical viewpoint of customer behavior and its effect on the performance of the queueing system. The book's objectives are threefold: (1) It is a comprehensive survey of the literature on equilibrium behavior of customers and servers in queueing systems. The literature is rich and considerable, but lacks continuity. This book will provide the needed continuity and cover some issues that have not been adequately treated. (2) In addition, it will examine the known results of

the field, classify them and identify where and how they relate to each other. (3) And finally, it seeks to fill a number of the gaps in the literature with new results while explicitly outlining open problems in other areas. With this book, it is the authors' paramount purpose is to motivate further research and to help researchers identify new and interesting open problems.

Intelligent Support Systems for Marketing Decisions - Nikolaos F. Matsatsinis 2003

The implementation discussion is illustrated with a real-world example of the methods and system in use.

Dynamic Portfolio Strategies: quantitative methods and empirical rules for incomplete information - Nikolai Dokuchaev 2002-01-31

An investigation of optimal investment problems for stochastic financial market models, this book is addressed to academics and students who are interested in the mathematics of finance, stochastic processes and optimal control. It should also be useful to practitioners in risk management and quantitative analysis who are interested in new strategies and methods of stochastic analysis.

Handbook of Markov Decision Processes - Eugene A. Feinberg 2012-10-29

Eugene A. Feinberg Adam Schwartz This volume deals with the theory of Markov Decision Processes (MDPs) and their applications. Each chapter was written by a leading expert in the respective area. The papers cover major research areas and methodologies, and discuss open questions and future research directions. The papers can be read independently, with the basic notation and concepts of Section 1.2. Most chapters should be accessible by graduate or advanced undergraduate students in fields of operations research, electrical engineering, and computer science. 1.1 AN OVERVIEW OF MARKOV DECISION PROCESSES The theory of Markov Decision Processes-also known under several other names including sequential stochastic optimization, discrete-time stochastic control, and stochastic dynamic programming-studies sequential optimization of discrete time stochastic systems. The basic object is a discrete-time stochastic system whose transition mechanism can be controlled over time. Each control policy defines the stochastic process and

values of objective functions associated with this process. The goal is to select a "good" control policy. In real life, decisions that humans and computers make on all levels usually have two types of impacts: (i) they cost or save time, money, or other resources, or they bring revenues, as well as (ii) they have an impact on the future, by influencing the dynamics. In many situations, decisions with the largest immediate profit may not be good in view of future events. MDPs model this paradigm and provide results on the structure and existence of good policies and on methods for their calculation.

Handbook of Transportation Science - Randolph Hall 2006-04-11

Over the past thirty-five years, a substantial amount of theoretical and empirical scholarly research has been developed across the discipline domains of Transportation. This research has been synthesized into a systematic handbook that examines the scientific concepts, methods, and principles of this growing and evolving field. The Handbook of Transportation Science outlines the field of transportation as a scientific discipline that transcends transportation technology and methods.

Whether by car, truck, airplane - or by a mode of transportation that has not yet been conceived - transportation obeys fundamental properties. The science of transportation defines these properties, and demonstrates how our knowledge of one mode of transportation can be used to explain the behavior of another. Transportation scientists are motivated by the desire to explain spatial interactions that result in movement of people or objects from place to place. Its methodologies draw from physics, operations research, probability and control theory.

Operations Research and Health Care - Margaret L. Brandeau 2006-04-05

In both rich and poor nations, public resources for health care are inadequate to meet demand. Policy makers and health care providers must determine how to provide the most effective health care to citizens using the limited resources that are available. This chapter describes current and future challenges in the delivery of health care, and outlines the role that operations research (OR) models can play in helping to solve those problems. The chapter

concludes with an overview of this book - its intended audience, the areas covered, and a description of the subsequent chapters. KEY WORDS Health care delivery, Health care planning HEALTH CARE DELIVERY: PROBLEMS AND CHALLENGES 3 1.1 WORLDWIDE HEALTH: THE PAST 50 YEARS Human health has improved significantly in the last 50 years. In 1950, global life expectancy was 46 years [1]. That figure rose to 61 years by 1980 and to 67 years by 1998 [2]. Much of these gains occurred in low- and middle-income countries, and were due in large part to improved nutrition and sanitation, medical innovations, and improvements in public health infrastructure.

Project Selection Under Uncertainty - Stylianos Kavadias 2004-01-31

Project Selection Under Uncertainty is the result of a five-year research program on the selection of projects in New Product Development (NPD). Choosing the New Product Development portfolio is of critical importance in today's business environment. The NPD portfolio has considerable strategic effect on the "middle term" success of a business. This book takes a step in developing a theory that addresses the need for quantitative prioritization criteria within the broader strategic context of the R&D portfolios. Its foundation lies in mathematical theory of resource-constrained optimization with the goal to maximize quantitative returns. The book seeks to broaden the portfolio discussion in two ways. First, simplified models - appropriate for the data-poor NPD context - are developed, which attempt to illuminate the structure of the choice problem and robust qualitative rules of thumb, rather than detailed algorithmic decision support. Such robust rules can be applied in the R&D environment of poor data availability. Second, the annual portfolio review is not the only important choice in resource allocation. In addition, the book discusses how ideas might be pre-screened as they emerge, and how projects should be prioritized once they are funded and ongoing.

Evaluation and Decision Models with Multiple Criteria - Denis Bouyssou 2006-06-07

Formal decision and evaluation models are so widespread that almost no one can pretend not to have used or suffered the consequences of

one of them. This book is a guide aimed at helping the analyst to choose a model and use it consistently. A sound analysis of techniques is proposed and the presentation can be extended to most decision and evaluation models as a "decision aiding methodology".

Handbook of Metaheuristics - Fred W. Glover 2006-04-11

This book provides both the research and practitioner communities with a comprehensive coverage of the metaheuristic methodologies that have proven to be successful in a wide variety of real-world problem settings.

Moreover, it is these metaheuristic strategies that hold particular promise for success in the future. The various chapters serve as stand alone presentations giving both the necessary background underpinnings as well as practical guides for implementation.

Potential Function Methods for Approximately Solving Linear Programming Problems: Theory and Practice - Daniel Bienstock 2006-04-11

Potential Function Methods For Approximately Solving Linear Programming Problems breaks new ground in linear programming theory. The book draws on the research developments in three broad areas: linear and integer programming, numerical analysis, and the computational architectures which enable speedy, high-level algorithm design. During the last ten years, a new body of research within the field of optimization research has emerged, which seeks to develop good approximation algorithms for classes of linear programming problems. This work both has roots in fundamental areas of mathematical programming and is also framed in the context of the modern theory of algorithms. The result of this work, in which Daniel Bienstock has been very much involved, has been a family of algorithms with solid theoretical foundations and with growing experimental success. This book will examine these algorithms, starting with some of the very earliest examples, and through the latest theoretical and computational developments.

Process Optimization - Enrique del Castillo 2007-09-14

This book covers several bases at once. It is useful as a textbook for a second course in experimental optimization techniques for

industrial production processes. In addition, it is a superb reference volume for use by professors and graduate students in Industrial Engineering and Statistics departments. It will also be of huge interest to applied statisticians, process engineers, and quality engineers working in the electronics and biotech manufacturing industries. In all, it provides an in-depth presentation of the statistical issues that arise in optimization problems, including confidence regions on the optimal settings of a process, stopping rules in experimental optimization, and more.

Models & Methods for Project Selection - Samuel Bean Graves 2003

Models & Methods for Project Selection systematically examines in this book treatment the latest work in the field of project selection modeling. The models presented are drawn from mathematical programming, decision theory, and finance. These models are examined in two categorical streams: the management science stream and the financial model stream. The book describes the assumptions and limitations of each model and provides appropriate solution methodologies. Its organization follows three main themes: *Criteria for Choice: Chapters 1-3 investigate the effect of the choice of optimization criteria on the results of the portfolio optimization problem. *Risk and Uncertainty: Chapters 4-7 deal with uncertainty in the project selection problem. *Non-Linearity and Interdependence: These chapters deal with problems of non-linearity and interdependence as they arise in the project selection problem. Chapters 8, 9 and 10 present solution methodologies, which can be used to solve these most general project selection models.

Planning with Markov Decision Processes - Mausam 2012-06-01

Markov Decision Processes (MDPs) are widely popular in Artificial Intelligence for modeling sequential decision-making scenarios with probabilistic dynamics. They are the framework of choice when designing an intelligent agent that needs to act for long periods of time in an environment where its actions could have uncertain outcomes. MDPs are actively researched in two related subareas of AI, probabilistic planning and reinforcement learning. Probabilistic planning assumes known

models for the agent's goals and domain dynamics, and focuses on determining how the agent should behave to achieve its objectives. On the other hand, reinforcement learning additionally learns these models based on the feedback the agent gets from the environment. This book provides a concise introduction to the use of MDPs for solving probabilistic planning problems, with an emphasis on the algorithmic perspective. It covers the whole spectrum of the field, from the basics to state-of-the-art optimal and approximation algorithms. We first describe the theoretical foundations of MDPs and the fundamental solution techniques for them. We then discuss modern optimal algorithms based on heuristic search and the use of structured representations. A major focus of the book is on the numerous approximation schemes for MDPs that have been developed in the AI literature. These include determinization-based approaches, sampling techniques, heuristic functions, dimensionality reduction, and hierarchical representations. Finally, we briefly introduce several extensions of the standard MDP classes that model and solve even more complex planning problems. Table of Contents: Introduction / MDPs / Fundamental Algorithms / Heuristic Search Algorithms / Symbolic Algorithms / Approximation Algorithms / Advanced Notes

Lecture Notes in Computational Intelligence and Decision Making - Sergii Babichev 2021-07-22

This book is devoted to current problems of artificial and computational intelligence including decision-making systems. Collecting, analysis, and processing information are the current directions of modern computer science. Development of new modern information and computer technologies for data analysis and processing in various fields of data mining and machine learning creates the conditions for increasing effectiveness of the information processing by both the decrease of time and the increase of accuracy of the data processing. The book contains of 54 science papers which include the results of research concerning the current directions in the fields of data mining, machine learning, and decision making. The papers are divided in terms of their topic into three sections. The first section "Analysis and Modeling of Complex Systems and Processes"

contains of 26 papers, and the second section "Theoretical and Applied Aspects of Decision-Making Systems" contains of 13 papers. There are 15 papers in the third section "Computational Intelligence and Inductive Modeling". The book is focused to scientists and developers in the fields of data mining, machine learning and decision-making systems.

Markov Decision Processes in Practice - Richard J. Boucherie 2017-03-10

This book presents classical Markov Decision Processes (MDP) for real-life applications and optimization. MDP allows users to develop and formally support approximate and simple decision rules, and this book showcases state-of-the-art applications in which MDP was key to the solution approach. The book is divided into six parts. Part 1 is devoted to the state-of-the-art theoretical foundation of MDP, including approximate methods such as policy improvement, successive approximation and infinite state spaces as well as an instructive chapter on Approximate Dynamic Programming. It then continues with five parts of specific and non-exhaustive application areas. Part 2 covers MDP healthcare applications, which includes different screening procedures, appointment scheduling, ambulance scheduling and blood management. Part 3 explores MDP modeling within transportation. This ranges from public to private transportation, from airports and traffic lights to car parking or charging your electric car. Part 4 contains three chapters that illustrates the structure of approximate policies for production or manufacturing structures. In Part 5, communications is highlighted as an important application area for MDP. It includes Gittins indices, down-to-earth call centers and wireless sensor networks. Finally Part 6 is dedicated to financial modeling, offering an instructive review to account for financial portfolios and derivatives under proportional transactional costs. The MDP applications in this book illustrate a variety of both standard and non-standard aspects of MDP modeling and its practical use. This book should appeal to readers for practicing, academic research and educational purposes, with a background in, among others, operations research, mathematics, computer science, and industrial engineering.

Handbook of Markov Decision Processes -

Eugene A. Feinberg 2012-12-06

Eugene A. Feinberg Adam Schwartz This volume deals with the theory of Markov Decision Processes (MDPs) and their applications. Each chapter was written by a leading expert in the respective area. The papers cover major research areas and methodologies, and discuss open questions and future research directions. The papers can be read independently, with the basic notation and concepts of Section 1.2. Most chapters should be accessible by graduate or advanced undergraduate students in fields of operations research, electrical engineering, and computer science.

1.1 AN OVERVIEW OF MARKOV DECISION PROCESSES

The theory of Markov Decision Processes-also known under several other names including sequential stochastic optimization, discrete-time stochastic control, and stochastic dynamic programming-studies sequential optimization of discrete time stochastic systems. The basic object is a discrete-time stochastic system whose transition mechanism can be controlled over time. Each control policy defines the stochastic process and values of objective functions associated with this process. The goal is to select a "good" control policy. In real life, decisions that humans and computers make on all levels usually have two types of impacts: (i) they cost or save time, money, or other resources, or they bring revenues, as well as (ii) they have an impact on the future, by influencing the dynamics. In many situations, decisions with the largest immediate profit may not be good in view of future events. MDPs model this paradigm and provide results on the structure and existence of good policies and on methods for their calculation.

Markov Chains: Models, Algorithms and Applications - Wai-Ki Ching 2006-06-05

Markov chains are a particularly powerful and widely used tool for analyzing a variety of stochastic (probabilistic) systems over time. This monograph will present a series of Markov models, starting from the basic models and then building up to higher-order models. Included in the higher-order discussions are multivariate models, higher-order multivariate models, and higher-order hidden models. In each case, the focus is on the important kinds of applications that can be made with the class of models being

considered in the current chapter. Special attention is given to numerical algorithms that can efficiently solve the models. Therefore, *Markov Chains: Models, Algorithms and Applications* outlines recent developments of Markov chain models for modeling queueing sequences, Internet, re-manufacturing systems, reverse logistics, inventory systems, bio-informatics, DNA sequences, genetic networks, data mining, and many other practical systems.

Quantitative Models for Performance Evaluation and Benchmarking - Joe Zhu 2003
Basic DEA models; Measure-specific DEA models; Returns-to-scale; DEA with preference; Modeling undesirable measures; Context-dependent Data Envelopment analysis; Benchmarking models; Models for evaluating value chains; Congestion; Super efficiency; Sensitivity analysis and its uses; DEA excel solver.

Markov Processes for Stochastic Modeling - Oliver Ibe 2013-05-22

Markov processes are processes that have limited memory. In particular, their dependence on the past is only through the previous state. They are used to model the behavior of many systems including communications systems, transportation networks, image segmentation and analysis, biological systems and DNA sequence analysis, random atomic motion and diffusion in physics, social mobility, population studies, epidemiology, animal and insect migration, queueing systems, resource management, dams, financial engineering, actuarial science, and decision systems. Covering a wide range of areas of application of Markov processes, this second edition is revised to highlight the most important aspects as well as the most recent trends and applications of Markov processes. The author spent over 16 years in the industry before returning to academia, and he has applied many of the principles covered in this book in multiple research projects. Therefore, this is an applications-oriented book that also includes enough theory to provide a solid ground in the

subject for the reader. Presents both the theory and applications of the different aspects of Markov processes. Includes numerous solved examples as well as detailed diagrams that make it easier to understand the principle being presented. Discusses different applications of hidden Markov models, such as DNA sequence analysis and speech analysis.

Tutorials on Emerging Methodologies and Applications in Operations Research -

Harvey J. Greenberg 2006-06-16

This volume reflects the theme of the INFORMS 2004 Meeting in Denver: Back to OR Roots. Emerging as a quantitative approach to problem-solving in World War II, our founders were physicists, mathematicians, and engineers who quickly found peace-time uses. It is fair to say that Operations Research (OR) was born in the same incubator as computer science, and it has spawned many new disciplines, such as systems engineering, health care management, and transportation science. Although people from many disciplines routinely use OR methods, many scientific researchers, engineers, and others do not understand basic OR tools and how they can help them. Disciplines ranging from finance to bioengineering are the beneficiaries of what we do — we take an interdisciplinary approach to problem-solving. Our strengths are modeling, analysis, and algorithm design. We provide a quantitative foundation for a broad spectrum of problems, from economics to medicine, from environmental control to sports, from e-commerce to computational geometry. We are both producers and consumers because the mainstream of OR is in the interfaces. As part of this effort to recognize and extend OR roots in future problem-solving, we organized a set of tutorials designed for people who heard of the topic and want to decide whether to learn it. The 90 minutes was spent addressing the questions: What is this about, in a nutshell? Why is it important? Where can I learn more? In total, we had 14 tutorials, and eight of them are published here.