

Discrete Event Simulation First Course

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Advanced Analytics in Mining Engineering - Ali Soofastaei

2022-03-27

In this book, Dr. Soofastaei and his colleagues reveal how all mining managers can effectively deploy advanced analytics in their day-to-day operations- one business decision at a time. Most mining companies have a massive amount of data at their disposal. However, they cannot use the stored data in any meaningful way. The powerful new business tool- advanced analytics enables many mining companies to aggressively leverage their data in key business decisions and processes with impressive results. From statistical analysis to machine learning and artificial intelligence, the authors show how many analytical tools can improve decisions about everything in the mine value chain, from exploration to marketing. Combining the science of advanced analytics with the mining industrial business solutions, introduce the “Advanced Analytics in Mining Engineering Book” as a practical road map and tools for unleashing the potential buried in your company’s data. The book is aimed at providing mining executives, managers, and research and development teams with an understanding of the business value and applicability of different analytic approaches and helping data analytics leads by giving them a business framework in which to assess the value, cost, and risk of potential analytical solutions. In addition, the book will provide the next generation of miners - undergraduate and graduate IT

and mining engineering students - with an understanding of data analytics applied to the mining industry. By providing a book with chapters structured in line with the mining value chain, we will provide a clear, enterprise-level view of where and how advanced data analytics can best be applied. This book highlights the potential to interconnect activities in the mining enterprise better. Furthermore, the book explores the opportunities for optimization and increased productivity offered by better interoperability along the mining value chain - in line with the emerging vision of creating a digital mine with much-enhanced capabilities for modeling, simulation, and the use of digital twins - in line with leading “digital” industries.

Simulation Modeling and Arena - Manuel D. Rossetti 2015-06-10
Emphasizes a hands-on approach to learning statistical analysis and model building through the use of comprehensive examples, problems sets, and software applications With a unique blend of theory and applications, Simulation Modeling and Arena®, Second Edition integrates coverage of statistical analysis and model building to emphasize the importance of both topics in simulation. Featuring introductory coverage on how simulation works and why it matters, the Second Edition expands coverage on static simulation and the applications of spreadsheets to perform simulation. The new edition also introduces the use of the open source statistical package, R, for both

performing statistical testing and fitting distributions. In addition, the models are presented in a clear and precise pseudo-code form, which aids in understanding and model communication. Simulation Modeling and Arena, Second Edition also features: Updated coverage of necessary statistical modeling concepts such as confidence interval construction, hypothesis testing, and parameter estimation Additional examples of the simulation clock within discrete event simulation modeling involving the mechanics of time advancement by hand simulation A guide to the Arena Run Controller, which features a debugging scenario New homework problems that cover a wider range of engineering applications in transportation, logistics, healthcare, and computer science A related website with an Instructor's Solutions Manual, PowerPoint® slides, test bank questions, and data sets for each chapter Simulation Modeling and Arena, Second Edition is an ideal textbook for upper-undergraduate and graduate courses in modeling and simulation within statistics, mathematics, industrial and civil engineering, construction management, business, computer science, and other departments where simulation is practiced. The book is also an excellent reference for professionals interested in mathematical modeling, simulation, and Arena.

Foundations and Methods of Stochastic Simulation - Barry Nelson
2013-01-31

This graduate-level text covers modeling, programming and analysis of simulation experiments and provides a rigorous treatment of the foundations of simulation and why it works. It introduces object-oriented programming for simulation, covers both the probabilistic and statistical basis for simulation in a rigorous but accessible manner (providing all necessary background material); and provides a modern treatment of experiment design and analysis that goes beyond classical statistics. The book emphasizes essential foundations throughout, rather than providing a compendium of algorithms and theorems and prepares the reader to use simulation in research as well as practice. The book is a rigorous, but concise treatment, emphasizing lasting principles but also providing specific training in modeling, programming and analysis. In addition to teaching readers how to do simulation, it also prepares them to use

simulation in their research; no other book does this. An online solutions manual for end of chapter exercises is also provided.

Medical Device Data and Modeling for Clinical Decision Making - John R. Zaleski 2011

This cutting-edge volume is the first book that provides you with practical guidance on the use of medical device data for bioinformatics modeling purposes. You learn how to develop original methods for communicating with medical devices within healthcare enterprises and assisting with bedside clinical decision making. The book guides in the implementation and use of clinical decision support methods within the context of electronic health records in the hospital environment. This highly valuable reference also teaches budding biomedical engineers and bioinformaticists the practical benefits of using medical device data. Supported with over 100 illustrations, this all-in-one resource discusses key concepts in detail and then presents clear implementation examples to give you a complete understanding of how to use this knowledge in the field.

Process Simulation Using WITNESS - Raid Al-Aomar 2015-08-11

Teaches basic and advanced modeling and simulation techniques to both undergraduate and postgraduate students and serves as a practical guide and manual for professionals learning how to build simulation models using WITNESS, a free-standing software package. This book discusses the theory behind simulation and demonstrates how to build simulation models with WITNESS. The book begins with an explanation of the concepts of simulation modeling and a "guided tour" of the WITNESS modeling environment. Next, the authors cover the basics of building simulation models using WITNESS and modeling of material-handling systems. After taking a brief tour in basic probability and statistics, simulation model input analysis is then examined in detail, including the importance and techniques of fitting closed-form distributions to observed data. Next, the authors present simulation output analysis including determining run controls and statistical analysis of simulation outputs and show how to use these techniques and others to undertake simulation model verification and validation.

Effective techniques for managing a simulation project are analyzed, and case studies exemplifying the use of simulation in manufacturing and services are covered. Simulation-based optimization methods and the use of simulation to build and enhance lean systems are then discussed. Finally, the authors examine the interrelationships and synergy between simulation and Six Sigma. Emphasizes real-world applications of simulation modeling in both services and manufacturing sectors. Discusses the role of simulation in Six Sigma projects and Lean Systems. Contains examples in each chapter on the methods and concepts presented. Process Simulation Using WITNESS is a resource for students, researchers, engineers, management consultants, and simulation trainers.

Discrete-Event Modeling and Simulation - Gabriel A. Wainer 2017-12-19
Complex artificial dynamic systems require advanced modeling techniques that can accommodate their asynchronous, concurrent, and highly non-linear nature. Discrete Event systems Specification (DEVS) provides a formal framework for hierarchical construction of discrete-event models in a modular manner, allowing for model re-use and reduced development time. Discrete Event Modeling and Simulation presents a practical approach focused on the creation of discrete-event applications. The book introduces the CD++ tool, an open-source framework that enables the simulation of discrete-event models. After setting up the basic theory of DEVS and Cell-DEVS, the author focuses on how to use the CD++ tool to define a variety of models in biology, physics, chemistry, and artificial systems. They also demonstrate how to map different modeling techniques, such as Finite State Machines and VHDL, to DEVS. The in-depth coverage elaborates on the creation of simulation software for DEVS models and the 3D visualization environments associated with these tools. A much-needed practical approach to creating discrete-event applications, this book offers world-class instruction on the field's most useful modeling tools.

Stochastic Simulation: Algorithms and Analysis - Søren Asmussen 2007-07-14

Sampling-based computational methods have become a fundamental part

of the numerical toolset of practitioners and researchers across an enormous number of different applied domains and academic disciplines. This book provides a broad treatment of such sampling-based methods, as well as accompanying mathematical analysis of the convergence properties of the methods discussed. The reach of the ideas is illustrated by discussing a wide range of applications and the models that have found wide usage. The first half of the book focuses on general methods; the second half discusses model-specific algorithms. Exercises and illustrations are included.

Discrete-Event Simulation - George S. Fishman 2013-03-09

"This is an excellent and well-written text on discrete event simulation with a focus on applications in Operations Research. There is substantial attention to programming, output analysis, pseudo-random number generation and modelling and these sections are quite thorough. Methods are provided for generating pseudo-random numbers (including combining such streams) and for generating random numbers from most standard statistical distributions." --ISI Short Book Reviews, 22:2, August 2002

Simulation of Dynamic Systems with MATLAB and Simulink - Harold Klee 2018-10-03

Simulation is increasingly important for students in a wide variety of fields, from engineering and physical sciences to medicine, biology, economics, and applied mathematics. Current trends point toward interdisciplinary courses in simulation intended for all students regardless of their major, but most textbooks are subject-specific and consequent

Simulation of Local Area Networks - Matthew N. O. Sadiku 2018-01-18

A fast-growing area in the communications industry is the internetworking of an ever-increasing proliferation of computers, particularly via local area networks (LANs). The LAN is a resource-sharing data communications network being used by many offices to interchange information such as electronic mail, word processing, and files among computers and other devices. This unique book shows the user how to establish the performance characteristics of a LAN before

putting it to use in a particular type of situation. Simulation of Local Area Networks consists of eight chapters, each with its own extensive list of references. The first chapter provides a brief review of local area networks, and the second chapter gives the analytical models of popular LANs-token-passing bus and ring networks, CSMA/CD LANs, and star networks. Chapter 3 covers general principles of simulation, and Chapter 4 discusses fundamental concepts in probability and statistics relating to simulation modeling. Materials in Chapters 3 and 4 are specifically applied in developing simulation models on token-passing LANs, CSMA/CD LANs, and star LANs in Chapters 5 through 7. The computer code in Chapters 5, 6, and 7 is divided into segments, and a detailed explanation of each segment is provided. The last chapter reviews special-purpose languages such as GPSS, SIMSCRIPT, GASP, SIMULA, SLAM, and RESQ. Helpful criteria for language selection are included. The entire code is put together in the appendixes. This book has two major advantages over existing texts. First, it uses C, a well-developed general-purpose language that is familiar to most analysts. Second, the text specifically applies the simulation principles to local area networks. No other book available shows the systems analyst how to evaluate the performance of existing or proposed systems under different kinds of conditions.

Simulation Modeling and Arena - Manuel D. Rossetti 2015-05-26

Emphasizes a hands-on approach to learning statistical analysis and model building through the use of comprehensive examples, problems sets, and software applications With a unique blend of theory and applications, Simulation Modeling and Arena®, Second Edition integrates coverage of statistical analysis and model building to emphasize the importance of both topics in simulation. Featuring introductory coverage on how simulation works and why it matters, the Second Edition expands coverage on static simulation and the applications of spreadsheets to perform simulation. The new edition also introduces the use of the open source statistical package, R, for both performing statistical testing and fitting distributions. In addition, the models are presented in a clear and precise pseudo-code form, which

aids in understanding and model communication. Simulation Modeling and Arena, Second Edition also features: Updated coverage of necessary statistical modeling concepts such as confidence interval construction, hypothesis testing, and parameter estimation Additional examples of the simulation clock within discrete event simulation modeling involving the mechanics of time advancement by hand simulation A guide to the Arena Run Controller, which features a debugging scenario New homework problems that cover a wider range of engineering applications in transportation, logistics, healthcare, and computer science A related website with an Instructor's Solutions Manual, PowerPoint® slides, test bank questions, and data sets for each chapter Simulation Modeling and Arena, Second Edition is an ideal textbook for upper-undergraduate and graduate courses in modeling and simulation within statistics, mathematics, industrial and civil engineering, construction management, business, computer science, and other departments where simulation is practiced. The book is also an excellent reference for professionals interested in mathematical modeling, simulation, and Arena.

Discrete-Event Simulation and System Dynamics for Management Decision Making - Sally Brailsford 2014-03-31

In recent years, there has been a growing debate, particularly in the UK and Europe, over the merits of using discrete-event simulation (DES) and system dynamics (SD); there are now instances where both methodologies were employed on the same problem. This book details each method, comparing each in terms of both theory and their application to various problem situations. It also provides a seamless treatment of various topics--theory, philosophy, detailed mechanics, practical implementation--providing a systematic treatment of the methodologies of DES and SD, which previously have been treated separately.

Performance Evaluation of Industrial Systems - David Elizandro 2012-04-11

Basic approaches to discrete simulation have been process simulation languages (e.g., GPSS) and event-scheduling type (e.g., SIMSCRIPT). The trade-offs are that event-scheduling languages offer more modeling

flexibility and process-oriented languages are more intuitive to the user. With these considerations in mind, authors David Elizandro and Hamd *System Simulation and Modeling* - Sankar Sengupta

Computer simulation models a real-life or hypothetical situation on a computer to study how the system works. System Simulation and Modeling discusses system modeling and simulation through examples and applications from computer systems, statistics, manufacturing and insurance. It discusses materials for building a simulation model, evaluating results and taking decisions based on results. Also, Arena and step-by-step approach to convert a problem statement into an Arena simulation model are discussed along with commercially-available software on simulation like GPSS, SIMSCRIPT and DYNAMO.

AnyLogic 7 in Three Days - Ilya Grigoryev 2015-03-20

The first practical textbook on AnyLogic 7 from AnyLogic developers. AnyLogic is the unique simulation software that supports three simulation modeling methods: system dynamics, discrete event, and agent based modeling and allows you to create multi-method models. The book is structured around four examples: a model of a consumer market, an epidemic model, a job shop model and an airport model. We also give some theory on different modeling methods. You can consider this book as your first guide in studying AnyLogic 7.

Principles of Modeling and Simulation - John A. Sokolowski 2011-09-20

Explores wide-ranging applications of modeling and simulation techniques that allow readers to conduct research and ask "Whatif??" Principles of Modeling and Simulation: A Multidisciplinary Approach is the first book to provide an introduction to modeling and simulation techniques across diverse areas of study. Numerous researchers from the fields of social science, engineering, computer science, and business have collaborated on this work to explore the multifaceted uses of computational modeling while illustrating their applications in common spreadsheets. The book is organized into three succinct parts: Principles of Modeling and Simulation provides a brief history of modeling and simulation, outlines its many functions, and explores the advantages and disadvantages of

using models in problem solving. Two major reasons to employ modeling and simulation are illustrated through the study of a specific problem in conjunction with the use of related applications, thus gaining insight into complex concepts. Theoretical Underpinnings examines various modeling techniques and introduces readers to two significant simulation concepts: discrete event simulation and simulation of continuous systems. This section details the two primary methods in which humans interface with simulations, and it also distinguishes the meaning, importance, and significance of verification and validation. Practical Domains delves into specific topics related to transportation, business, medicine, social science, and enterprise decision support. The challenges of modeling and simulation are discussed, along with advanced applied principles of modeling and simulation such as representation techniques, integration into the application infrastructure, and emerging technologies. With its accessible style and wealth of real-world examples, Principles of Modeling and Simulation: A Multidisciplinary Approach is a valuable book for modeling and simulation courses at the upper-undergraduate and graduate levels. It is also an indispensable reference for researchers and practitioners working in statistics, mathematics, engineering, computer science, economics, and the social sciences who would like to further develop their understanding and knowledge of the field.

Cost Analysis Of Electronic Systems (Second Edition) - Peter Sandborn 2016-12-15

This book provides an introduction to the cost modeling for electronic systems that is suitable for advanced undergraduate and graduate students in electrical, mechanical and industrial engineering, and professionals involved with electronics technology development and management. This book melds elements of traditional engineering economics with manufacturing process and life-cycle cost management concepts to form a practical foundation for predicting the cost of electronic products and systems. Various manufacturing cost analysis methods are addressed including: process-flow, parametric, cost of ownership, and activity based costing. The effects of learning curves,

data uncertainty, test and rework processes, and defects are considered. Aspects of system sustainment and life-cycle cost modeling including reliability (warranty, burn-in), maintenance (sparing and availability), and obsolescence are treated. Finally, total cost of ownership of systems, return on investment, cost-benefit analysis, and real options analysis are addressed.

Modelling and Simulation - Louis G. Birta 2020-01-01

This hands-on textbook/reference presents an introduction to the fundamental aspects of modelling and simulation, both for those wishing to learn about this methodology and also for those who have a need to apply it in their work. The text is supported by illustrative examples, drawn from projects formulated within the domains of discrete-event dynamic systems (DEDS) and continuous-time dynamic systems (CTDS). This updated new edition has been enhanced with new illustrative case studies, and additional examples demonstrating some new features and the effectiveness of the ABCmod conceptual modelling framework. Changes that facilitate the development of simulation models with ABSmod/J are illustrated. New material includes a presentation of the experimentation strategy called "design of experiments" and three new chapters that explore the optimization-simulation interface. Topics and features: presents a goal-based and project-oriented perspective of modelling and simulation; describes the ABCmod framework, an activity-based conceptual modelling framework for DEDS; examines the simulation-optimization interface in both the CTDS and DEDS domains; provides numerous illustrative examples, case studies and useful algorithms, as well as exercises and projects at the end of most chapters; includes appendices on probability and statistics, the GPSS programming environment, and relevant MATLAB features; provides supplementary software and teaching support material at an associated website, including lecture slides and a methodology for organizing student projects. Serving as an essential guide to the foundations of modelling and simulation, this practical primer is ideal for senior undergraduate and junior graduate-level students. Also suitable for self-study, the book will be of great benefit to professionals seeking insight into the vast

potential of this rapidly evolving problem-solving paradigm.

Modeling and Simulation of Discrete Event Systems - Byoung Kyu Choi 2013-08-07

Computer modeling and simulation (M&S) allows engineers to study and analyze complex systems. Discrete-event system (DES)-M&S is used in modern management, industrial engineering, computer science, and the military. As computer speeds and memory capacity increase, so DES-M&S tools become more powerful and more widely used in solving real-life problems. Based on over 20 years of evolution within a classroom environment, as well as on decades-long experience in developing simulation-based solutions for high-tech industries, *Modeling and Simulation of Discrete-Event Systems* is the only book on DES-M&S in which all the major DES modeling formalisms - activity-based, process-oriented, state-based, and event-based - are covered in a unified manner: A well-defined procedure for building a formal model in the form of event graph, ACD, or state graph. Diverse types of modeling templates and examples that can be used as building blocks for a complex, real-life model. A systematic, easy-to-follow procedure combined with sample C# codes for developing simulators in various modeling formalisms. Simple tutorials as well as sample model files for using popular off-the-shelf simulators such as SIGMA®, ACE®, and Arena®. Up-to-date research results as well as research issues and directions in DES-M&S. *Modeling and Simulation of Discrete-Event Systems* is an ideal textbook for undergraduate and graduate students of simulation/industrial engineering and computer science, as well as for simulation practitioners and researchers.

Discrete Event Simulation - Udo W. Pooch 1992-12-21

Discrete Event Simulation is a process-oriented text/reference that utilizes an eleven-step model to represent the simulation process from problem formulation to implementation and documentation. The book presents the necessary level of detail required to fully develop a model that produces meaningful results and considers the tools necessary to interpret those results. Sufficient background information is provided so that the underlying concepts of simulation are understood. Major topics

covered in Discrete Event Simulation include probability and distributional theory, statistical estimation and inference, the generation of random variates, verification and validation techniques, time management methods, experimental design, and programming language considerations. The book also examines distributed simulation and issues related to distributing the physical process over a network of tightly coupled processors. Topics covered in this area include deadlock, synchronization, rollback, event management, and communication processes. Fully worked examples and numerous practical exercises have been drawn from the engineering disciplines and computer science, although they have been structured so that they will be useful as well to other disciplines such as economics, business administration, and management science. The presentation of techniques and methods in Discrete Event Simulation make it an ideal text/reference for all practitioners of discrete event simulation.

Computer Performance Modeling Handbook - Stephen Lavenberg
1983-02-28

Computer Performance Modeling Handbook

[Fault-Tolerant Systems](#) - Israel Koren 2020-09-01

Fault-Tolerant Systems, Second Edition, is the first book on fault tolerance design utilizing a systems approach to both hardware and software. No other text takes this approach or offers the comprehensive and up-to-date treatment that Koren and Krishna provide. The book comprehensively covers the design of fault-tolerant hardware and software, use of fault-tolerance techniques to improve manufacturing yields, and design and analysis of networks. Incorporating case studies that highlight more than ten different computer systems with fault-tolerance techniques implemented in their design, the book includes critical material on methods to protect against threats to encryption subsystems used for security purposes. The text's updated content will help students and practitioners in electrical and computer engineering and computer science learn how to design reliable computing systems, and how to analyze fault-tolerant computing systems. Delivers the first book on fault tolerance design with a systems approach Offers

comprehensive coverage of both hardware and software fault tolerance, as well as information and time redundancy Features fully updated content plus new chapters on failure mechanisms and fault-tolerance in cyber-physical systems Provides a complete ancillary package, including an on-line solutions manual for instructors and PowerPoint slides
[Advancing the Frontiers of Simulation](#) - Christos Alexopoulos 2009-09-18
This Festschrift honors George Samuel Fishman, one of the founders of the field of computer simulation and a leader of the disciplines of operations research and the management sciences for the past few decades, on the occasion of his seventieth birthday. The papers in this volume span the theory, methodology, and application of computer simulation. The lead article is appropriately titled "George Fishman's Professional Career." In this article we discuss George's contributions to operations research and the management sciences, with special emphasis on his role in the advancement of the field of simulation since the 1960s. We also include a brief personal biography together with comments by several individuals about the extraordinary effect that George has had on all his students, colleagues, and friends.

This second article, titled "A Conversation with George Fishman," is the transcript of an extended interview with George that we conducted in October 2007. In the article titled "Computer Intensive Statistical Model Building," Russell Cheng studies resampling methods for building parsimonious multiple linear regression models so as to represent accurately the behavior of the dependent variable in terms of the smallest possible subset of explanatory (independent) variables. The author shows how bootstrap resampling can be used not only for rapid identification of good models but also for efficient comparison of competing models.

[Simulating Business Processes for Descriptive, Predictive, and Prescriptive Analytics](#) - Andrew Greasley 2019-10-21

This book outlines the benefits and limitations of simulation, what is involved in setting up a simulation capability in an organization, the steps involved in developing a simulation model and how to ensure that model results are implemented. In addition, detailed example

applications are provided to show where the tool is useful and what it can offer the decision maker. In *Simulating Business Processes for Descriptive, Predictive, and Prescriptive Analytics*, Andrew Greasley provides an in-depth discussion of Business process simulation and how it can enable business analytics. How business process simulation can provide speed, cost, dependability, quality, and flexibility metrics. Industrial case studies including improving service delivery while ensuring an efficient use of staff in public sector organizations such as the police service, testing the capacity of planned production facilities in manufacturing, and ensuring on-time delivery in logistics systems. State-of-the-art developments in business process simulation regarding the generation of simulation analytics using process mining and modeling people's behavior. Managers and decision makers will learn how simulation provides a faster, cheaper and less risky way of observing the future performance of a real-world system. The book will also benefit personnel already involved in simulation development by providing a business perspective on managing the process of simulation, ensuring simulation results are implemented, and that performance is improved.

Introduction to Cryptography with Mathematical Foundations and Computer Implementations - Alexander Stanoyevitch 2010-08-09

From the exciting history of its development in ancient times to the present day, *Introduction to Cryptography with Mathematical Foundations and Computer Implementations* provides a focused tour of the central concepts of cryptography. Rather than present an encyclopedic treatment of topics in cryptography, it delineates cryptographic concepts in chronological order, developing the mathematics as needed. Written in an engaging yet rigorous style, each chapter introduces important concepts with clear definitions and theorems. Numerous examples explain key points while figures and tables help illustrate more difficult or subtle concepts. Each chapter is punctuated with "Exercises for the Reader;" complete solutions for these are included in an appendix. Carefully crafted exercise sets are also provided at the end of each chapter, and detailed solutions to most odd-numbered exercises can be found in a designated appendix. The

computer implementation section at the end of every chapter guides students through the process of writing their own programs. A supporting website provides an extensive set of sample programs as well as downloadable platform-independent applet pages for some core programs and algorithms. As the reliance on cryptography by business, government, and industry continues and new technologies for transferring data become available, cryptography plays a permanent, important role in day-to-day operations. This self-contained sophomore-level text traces the evolution of the field, from its origins through present-day cryptosystems, including public key cryptography and elliptic curve cryptography.

The Cable and Telecommunications Professionals' Reference - Goff Hill 2012-07-26

This book is for any telecommunications-convergence professional who needs to understand the structure of the industry, the structure of telephony networks and services, and the equipment involved. With the growing variety of networks and technologies now on offer it is inevitable that some convergence will take place between different networks, services and products. New VOIP (voice over internet protocol) networks must interwork with traditional networks. For instance, mobile phones can offer data services; wireless broadband connections to laptops will allow VOIP phone calls away from base; users could have the option of 'convergent phones' that can be used on a landline when at home or business, but which can be used as a mobile when on the move, and so on.

Discrete-event Simulation - Lawrence M. Leemis 2006

CONTENIDO: Models - Random-number generation - Discrete-event simulation - Statistics - Next-event simulation - Discrete random variables - Continuous random variables - Output analysis - Input modeling - Projects.

Encyclopedia of Measurement and Statistics - Neil J. Salkind 2007
Publisher Description

Fundamentals of Queueing Theory - John F. Shortle 2018-03-29

The definitive guide to queueing theory and its practical

applications—features numerous real-world examples of scientific, engineering, and business applications Thoroughly updated and expanded to reflect the latest developments in the field, *Fundamentals of Queueing Theory, Fifth Edition* presents the statistical principles and processes involved in the analysis of the probabilistic nature of queues. Rather than focus narrowly on a particular application area, the authors illustrate the theory in practice across a range of fields, from computer science and various engineering disciplines to business and operations research. Critically, the text also provides a numerical approach to understanding and making estimations with queueing theory and provides comprehensive coverage of both simple and advanced queueing models. As with all preceding editions, this latest update of the classic text features a unique blend of the theoretical and timely real-world applications. The introductory section has been reorganized with expanded coverage of qualitative/non-mathematical approaches to queueing theory, including a high-level description of queues in everyday life. New sections on non-stationary fluid queues, fairness in queueing, and Little's Law have been added, as has expanded coverage of stochastic processes, including the Poisson process and Markov chains. • Each chapter provides a self-contained presentation of key concepts and formulas, to allow readers to focus independently on topics relevant to their interests • A summary table at the end of the book outlines the queues that have been discussed and the types of results that have been obtained for each queue • Examples from a range of disciplines highlight practical issues often encountered when applying the theory to real-world problems • A companion website features QtsPlus, an Excel-based software platform that provides computer-based solutions for most queueing models presented in the book. Featuring chapter-end exercises and problems—all of which have been classroom-tested and refined by the authors in advanced undergraduate and graduate-level courses—*Fundamentals of Queueing Theory, Fifth Edition* is an ideal textbook for courses in applied mathematics, queueing theory, probability and statistics, and stochastic processes. This book is also a valuable reference for practitioners in applied mathematics, operations

research, engineering, and industrial engineering.

Foundations and Methods of Stochastic Simulation - Barry L. Nelson
2021-11-10

This graduate-level textbook covers modelling, programming and analysis of stochastic computer simulation experiments, including the mathematical and statistical foundations of simulation and why it works. The book is rigorous and complete, but concise and accessible, providing all necessary background material. Object-oriented programming of simulations is illustrated in Python, while the majority of the book is programming language independent. In addition to covering the foundations of simulation and simulation programming for applications, the text prepares readers to use simulation in their research. A solutions manual for end-of-chapter exercises is available for instructors.

Operations Research and Management Science Handbook - A. Ravi Ravindran
2016-04-19

Operations Research (OR) began as an interdisciplinary activity to solve complex military problems during World War II. Utilizing principles from mathematics, engineering, business, computer science, economics, and statistics, OR has developed into a full fledged academic discipline with practical application in business, industry, government and military. Currently regarded as a body of established mathematical models and methods essential to solving complicated management issues, OR provides quantitative analysis of problems from which managers can make objective decisions. Operations Research and Management Science (OR/MS) methodologies continue to flourish in numerous decision making fields. Featuring a mix of international authors, *Operations Research and Management Science Handbook* combines OR/MS models, methods, and applications into one comprehensive, yet concise volume. The first resource to reach for when confronting OR/MS difficulties, this text - Provides a single source guide in OR/MS Bridges theory and practice Covers all topics relevant to OR/MS Offers a quick reference guide for students, researchers and practitioners Contains unified and up-to-date coverage designed and edited with non-experts in mind Discusses software availability for all OR/MS techniques Includes

contributions from a mix of domestic and international experts The 26 chapters in the handbook are divided into two parts. Part I contains 14 chapters that cover the fundamental OR/MS models and methods. Each chapter gives an overview of a particular OR/MS model, its solution methods and illustrates successful applications. Part II of the handbook contains 11 chapters discussing the OR/MS applications in specific areas. They include airlines, e-commerce, energy systems, finance, military, production systems, project management, quality control, reliability, supply chain management and water resources. Part II ends with a chapter on the future of OR/MS applications.

Handbook of Monte Carlo Methods - Dirk P. Kroese 2013-06-06

A comprehensive overview of Monte Carlo simulation that explores the latest topics, techniques, and real-world applications More and more of today's numerical problems found in engineering and finance are solved through Monte Carlo methods. The heightened popularity of these methods and their continuing development makes it important for researchers to have a comprehensive understanding of the Monte Carlo approach. Handbook of Monte Carlo Methods provides the theory, algorithms, and applications that helps provide a thorough understanding of the emerging dynamics of this rapidly-growing field. The authors begin with a discussion of fundamentals such as how to generate random numbers on a computer. Subsequent chapters discuss key Monte Carlo topics and methods, including: Random variable and stochastic process generation Markov chain Monte Carlo, featuring key algorithms such as the Metropolis-Hastings method, the Gibbs sampler, and hit-and-run Discrete-event simulation Techniques for the statistical analysis of simulation data including the delta method, steady-state estimation, and kernel density estimation Variance reduction, including importance sampling, latin hypercube sampling, and conditional Monte Carlo Estimation of derivatives and sensitivity analysis Advanced topics including cross-entropy, rare events, kernel density estimation, quasi Monte Carlo, particle systems, and randomized optimization The presented theoretical concepts are illustrated with worked examples that use MATLAB®, a related Web site houses the MATLAB® code, allowing

readers to work hands-on with the material and also features the author's own lecture notes on Monte Carlo methods. Detailed appendices provide background material on probability theory, stochastic processes, and mathematical statistics as well as the key optimization concepts and techniques that are relevant to Monte Carlo simulation. Handbook of Monte Carlo Methods is an excellent reference for applied statisticians and practitioners working in the fields of engineering and finance who use or would like to learn how to use Monte Carlo in their research. It is also a suitable supplement for courses on Monte Carlo methods and computational statistics at the upper-undergraduate and graduate levels.

Introduction to Transportation Analysis, Modeling and Simulation

- Dietmar P.F. Möller 2014-10-13

This comprehensive textbook/reference provides an in-depth overview of the key aspects of transportation analysis, with an emphasis on modeling real transportation systems and executing the models. Topics and features: presents comprehensive review questions at the end of each chapter, together with detailed case studies, useful links, references and suggestions for further reading; supplies a variety of teaching support materials at the book's webpage on Springer.com, including a complete set of lecture slides; examines the classification of models used for multimodal transportation systems, and reviews the models and evaluation methods used in transportation planning; explains traffic assignment to road networks, and describes computer simulation integration platforms and their use in the transportation systems sector; provides an overview of transportation simulation tools, and discusses the critical issues in the design, development and use of the simulation models.

Object-Oriented Discrete-Event Simulation with Java - José M. Garrido 2012-12-06

Researches and developers of simulation models state that the Java program ming language presents a unique and significant opportunity for important changes in the way we develop simulation models today. The most important characteristics of the Java language that are advantageous for simulation are its multi-threading capabilities, its

facilities for executing programs across the Web, and its graphics facilities. It is feasible to develop compatible and reusable simulation components that will facilitate the construction of newer and more complex models. This is possible with Java development environments. Another important trend that begun very recently is web-based simulation, i.e., and the execution of simulation models using Internet browser software. This book introduces the application of the Java programming language in discrete-event simulation. In addition, the fundamental concepts and practical simulation techniques for modeling different types of systems to study their general behavior and their performance are introduced. The approaches applied are the process interaction approach to discrete-event simulation and object-oriented modeling. Java is used as the implementation language and UML as the modeling language. The first offers several advantages compared to C++, the most important being: thread handling, graphical user interfaces (GUI) and Web computing. The second language, UML (Unified Modeling Language) is the standard notation used today for modeling systems as a collection of classes, class relationships, objects, and object behavior.

Operations Research Methodologies - A. Ravi Ravindran 2008-11-12

A single source guide to operations research (OR) techniques, this book covers emerging OR methodologies in a clear, concise, and unified manner. Building a bridge between theory and practice, it begins with coverage of fundamental models and methods such as linear, nonlinear, integer, and dynamic programming, networks, simulation, queuing, inventory, stochastic processes, and decision analysis. The book then explores emerging techniques including multiple criteria optimization, meta heuristics, robust optimization, and complexity and large scale networks. Each chapter gives an overview of a particular methodology, illustrates successful applications, and provides references to computer software availability.

Simulation of Industrial Systems - David Elizandro 2007-12-19

In any production environment, discrete event simulation is a powerful tool for the analysis, planning, and operating of a manufacturing facility.

Operations managers can use simulation to improve their production systems by eliminating bottlenecks, reducing cycle time and cost, and increasing capacity utilization. Offering a hands-on tutorial on h
Introduction to Discrete Event Systems - Christos G. Cassandras
2021-11-11

This unique textbook comprehensively introduces the field of discrete event systems, offering a breadth of coverage that makes the material accessible to readers of varied backgrounds. The book emphasizes a unified modeling framework that transcends specific application areas, linking the following topics in a coherent manner: language and automata theory, supervisory control, Petri net theory, Markov chains and queueing theory, discrete-event simulation, and concurrent estimation techniques. Topics and features: detailed treatment of automata and language theory in the context of discrete event systems, including application to state estimation and diagnosis comprehensive coverage of centralized and decentralized supervisory control of partially-observed systems timed models, including timed automata and hybrid automata stochastic models for discrete event systems and controlled Markov chains discrete event simulation an introduction to stochastic hybrid systems sensitivity analysis and optimization of discrete event and hybrid systems new in the third edition: opacity properties, enhanced coverage of supervisory control, overview of latest software tools This proven textbook is essential to advanced-level students and researchers in a variety of disciplines where the study of discrete event systems is relevant: control, communications, computer engineering, computer science, manufacturing engineering, transportation networks, operations research, and industrial engineering. Christos G. Cassandras is Distinguished Professor of Engineering, Professor of Systems Engineering, and Professor of Electrical and Computer Engineering at Boston University. Stéphane Lafortune is Professor of Electrical Engineering and Computer Science at the University of Michigan, Ann Arbor.

Modeling and Simulation Fundamentals - John A. Sokolowski
2010-07-13

An insightful presentation of the key concepts, paradigms, and applications of modeling and simulation. Modeling and simulation has become an integral part of research and development across many fields of study, having evolved from a tool to a discipline in less than two decades. *Modeling and Simulation Fundamentals* offers a comprehensive and authoritative treatment of the topic and includes definitions, paradigms, and applications to equip readers with the skills needed to work successfully as developers and users of modeling and simulation. Featuring contributions written by leading experts in the field, the book's fluid presentation builds from topic to topic and provides the foundation and theoretical underpinnings of modeling and simulation. First, an introduction to the topic is presented, including related terminology, examples of model development, and various domains of modeling and simulation. Subsequent chapters develop the necessary mathematical background needed to understand modeling and simulation topics, model types, and the importance of visualization. In addition, Monte Carlo simulation, continuous simulation, and discrete event simulation are thoroughly discussed, all of which are significant to a complete understanding of modeling and simulation. The book also features chapters that outline sophisticated methodologies, verification and validation, and the importance of interoperability. A related FTP site features color representations of the book's numerous figures. *Modeling and Simulation Fundamentals* encompasses a comprehensive study of the discipline and is an excellent book for modeling and simulation courses at the upper-undergraduate and graduate levels. It is also a valuable

reference for researchers and practitioners in the fields of computational statistics, engineering, and computer science who use statistical modeling techniques.

Dynamic Models and Discrete Event Simulation - W. Delaney
2020-11-26

This book aims to clarify exactly how simulation studies can be carried out in the system theory paradigm, while providing a realistically complete coverage of (discrete event) simulation in its more traditional aspects. It focuses on the subclass of predictive, generative and dynamic system models.

Using Simulation Tools to Model Renewable Resources - Janya Chanchaichujit
2017-06-27

This book provides a detailed study of the Thai rubber industry and its utilisation of renewable resources, focussing on the use of open source software in building supply chain models. By describing elements that the supply chain is composed of and relating this to Thailand's rubber industry, the authors then outline the construction of a Discrete Event Simulation (DES) model and use open source software to model renewable resources in this particular supply chain. Emphasis is placed on the way that modelling can aid the important decision-making required in the exploitation of natural resources. By taking a hands-on approach and offering a valuable guide for readers, this book not only appeals to academics in the fields of industrial engineering, operations, logistics and supply chain management, but also to practitioners, policy-makers and associations involved in the rubber industry.