Applied Reliability Engineering And Risk Analysis Probabilistic Models And Statistical Inferencereliability In Computer System Design

#reliability engineering #risk analysis #probabilistic models #statistical inference #computer system reliability

This resource explores the critical intersection of applied reliability engineering and comprehensive risk analysis, detailing how probabilistic models and statistical inference are essential for understanding and enhancing system resilience. It provides vital insights into ensuring robust reliability specifically within the complex domain of computer system design.

Applied Reliability Engineering and Risk Analysis

This complete resource on the theory and applications of reliability engineering, probabilistic models and risk analysis consolidates all the latest research, presenting the most up-to-date developments in this field. With comprehensive coverage of the theoretical and practical issues of both classic and modern topics, it also provides a unique commemoration to the centennial of the birth of Boris Gnedenko, one of the most prominent reliability scientists of the twentieth century. Key features include: expert treatment of probabilistic models and statistical inference from leading scientists, researchers and practitioners in their respective reliability fields detailed coverage of multi-state system reliability, maintenance models, statistical inference in reliability, systemability, physics of failures and reliability demonstration many examples and engineering case studies to illustrate the theoretical results and their practical applications in industry Applied Reliability Engineering and Risk Analysis is one of the first works to treat the important areas of degradation analysis, multi-state system reliability, networks and large-scale systems in one comprehensive volume. It is an essential reference for engineers and scientists involved in reliability analysis, applied probability and statistics, reliability engineering and maintenance, logistics, and quality control. It is also a useful resource for graduate students specialising in reliability analysis and applied probability and statistics. Dedicated to the Centennial of the birth of Boris Gnedenko, renowned Russian mathematician and reliability theorist

Reliability

An elementary introduction to the probabilistic models and statistical methods used by reliability engineers as applied to, for example, electrical or mechanical systems. Leemis offers explanations of how the mathematical models and results apply to engineering design and the analysis of lifetime

data sets, with simple, supplementary proofs and derivations provided when necessary. Applications are drawn from a variety of disciplines.

Reliability and Risk Analysis in Engineering and Medicine

This graduate textbook imparts the fundamentals of reliability and risk that can be connected mathematically and applied to problems in engineering and medical science and practice. The book is divided into eight chapters, the first three of which deal with basic fundamentals of probability theory and reliability methods. The fourth chapter illustrates simulation methods needed to solve complex problems. Chapters 5-7 explain reliability codes and system reliability (which uses the component reliabilities discussed in previous chapters). The book concludes in chapter 8 with an examination of applications of reliability within engineering and medical fields. Presenting a highly relevant competency for graduates entering product research and development, or facilities operations sectors, this text includes many examples and end of chapter study questions to maximize student comprehension. Explains concepts of reliability and risk estimation techniques in the context of medicine and engineering; Elucidates the interplay between reliability and risk from design to operation phases; Uses real world examples from engineering structures and medical devices and protocols; Adopts a lucid yet rigorous presentation of reliability and risk calculations; Reinforces students understanding of concepts covered with end-of-chapter exercises.

Safety and Risk Modeling and Its Applications

Safety and Risk Modeling presents the latest theories and methods of safety and risk with an emphasis on safety and risk in modeling. It covers applications in several areas including transportations and security risk assessments, as well as applications related to current topics in safety and risk. Safety and Risk Modeling is a valuable resource for understanding the latest developments in both qualitative and quantitative methods of safety and risk analysis and their applications in operating environments. Each chapter has been written by active researchers or experienced practitioners to bridge the gap between theory and practice and to trigger new research challenges in safety and risk. Topics include: safety engineering, system maintenance, safety in design, failure analysis, and risk concept and modelling. Postgraduate students, researchers, and practitioners in many fields of engineering, operations research, management, and statistics will find Safety and Risk Modeling a state-of-the-art survey of reliability and quality in design and practice.

Reliability Assessment of Safety and Production Systems

This book provides, as simply as possible, sound foundations for an in-depth understanding of reliability engineering with regard to qualitative analysis, modelling, and probabilistic calculations of safety and production systems. Drawing on the authors' extensive experience within the field of reliability engineering, it addresses and discusses a variety of topics, including: • Background and overview of safety and dependability studies; • Explanation and critical analysis of definitions related to core concepts; • Risk identification through qualitative approaches (preliminary hazard analysis, HAZOP, FMECA, etc.); • Modelling of industrial systems through static (fault tree, reliability block diagram), sequential (cause-consequence diagrams, event trees, LOPA, bowtie), and dynamic (Markov graphs, Petri nets) approaches; • Probabilistic calculations through state-of-the-art analytical or Monte Carlo simulation techniques; • Analysis, modelling, and calculations of common cause failure and uncertainties; • Linkages and combinations between the various modelling and calculation approaches; • Reliability data collection and standardization. The book features illustrations, explanations, examples, and exercises to help readers gain a detailed understanding of the topic and implement it into their own work. Further, it analyses the production availability of production systems and the functional safety of safety systems (SIL calculations), showcasing specific applications of the general theory discussed. Given its scope, this book is a valuable resource for engineers, software designers, standard developers, professors, and students.

System Reliability Theory

A thoroughly updated and revised look at system reliability theory Since the first edition of this popular text was published nearly a decade ago, new standards have changed the focus of reliability engineering and introduced new concepts and terminology not previously addressed in the engineering literature. Consequently, the Second Edition of System Reliability Theory: Models, Statistical Methods, and Applications has been thoroughly rewritten and updated to meet current standards. To maximize its

value as a pedagogical tool, the Second Edition features: Additional chapters on reliability of maintained systems and reliability assessment of safety-critical systems Discussion of basic assessment methods for operational availability and production regularity New concepts and terminology not covered in the first edition Revised sequencing of chapters for better pedagogical structure New problems, examples, and cases for a more applied focus An accompanying Web site with solutions, overheads, and supplementary information With its updated practical focus, incorporation of industry feedback, and many new examples based on real industry problems and data, the Second Edition of this important text should prove to be more useful than ever for students, instructors, and researchers alike.

Stochastic Models in Reliability

This book provides a comprehensive up-to-date presentation of some of the classical areas of reliability, based on a more advanced probabilistic framework using the modern theory of stochastic processes. This framework allows analysts to formulate general failure models, establish formulae for computing various performance measures, as well as determine how to identify optimal replacement policies in complex situations. In this second edition of the book, two major topics have been added to the original version: copula models which are used to study the effect of structural dependencies on the system reliability; and maintenance optimization which highlights delay time models under safety constraints. Terje Aven is Professor of Reliability and Risk Analysis at University of Stavanger, Norway. Uwe Jensen is working as a Professor at the Institute of Applied Mathematics and Statistics of the University of Hohenheim in Stuttgart, Germany. Review of first edition: "This is an excellent book on mathematical, statistical and stochastic models in reliability. The authors have done an excellent job of unifying some of the stochastic models in reliability. The book is a good reference book but may not be suitable as a textbook for students in professional fields such as engineering. This book may be used for graduate level seminar courses for students who have had at least the first course in stochastic processes and some knowledge of reliability mathematics. It should be a good reference book for researchers in reliability mathematics." --Mathematical Reviews (2000)

Statistical Methods for Reliability Data

Bringing statistical methods for reliability testing in line with the computer age This volume presents state-of-the-art, computer-based statistical methods for reliability data analysis and test planning for industrial products. Statistical Methods for Reliability Data updates and improves established techniques as it demonstrates how to apply the new graphical, numerical, or simulation-based methods to a broad range of models encountered in reliability data analysis. It includes methods for planning reliability studies and analyzing degradation data, simulation methods used to complement large-sample asymptotic theory, general likelihood-based methods of handling arbitrarily censored data and truncated data, and more. In this book, engineers and statisticians in industry and academia will find: A wealth of information and procedures developed to give products a competitive edgeSimple examples of data analysis computed with the S-PLUS system?for which a suite of functions and commands is available over the InternetEnd-of-chapter, real-data exercise setsHundreds of computer graphics illustrating data, results of analyses, and technical concepts An essential resource for practitioners involved in product reliability and design decisions, Statistical Methods for Reliability Data is also an excellent textbook for on-the-job training courses, and for university courses on applied reliability data analysis at the graduate level. "Amstat News" asked three review editors to rate their top five favorite books in the September 2003 issue. "Statistical Methods for Reliability Data" was among those chosen.

Reliability and Risk Models

Presenting a radically new approach and technology for setting reliability requirements, this superb book also provides the first comprehensive overview of the M/F-FOP philosophy and its applications. * Each chapter covers probabilistic models, statistical and numerical procedures, applications and/or case studies * Comprehensively examines a new methodology for problem solving in the context of real reliability engineering problems * All models have been implemented in C++ * The algorithms and programming code supplied can be used as a software toolbox for setting MFFOP * Case studies are taken from the nuclear, automotive and offshore industry to provide 'real-world' applications.

Simulation Methods for Reliability and Availability of Complex Systems

Simulation Methods for Reliability and Availability of Complex Systems discusses the use of computer simulation-based techniques and algorithms to determine reliability and availability (R and A) levels

in complex systems. The book: shares theoretical or applied models and decision support systems that make use of simulation to estimate and to improve system R and A levels, forecasts emerging technologies and trends in the use of computer simulation for R and A and proposes hybrid approaches to the development of efficient methodologies designed to solve R and A-related problems in real-life systems. Dealing with practical issues, Simulation Methods for Reliability and Availability of Complex Systems is designed to support managers and system engineers in the improvement of R and A, as well as providing a thorough exploration of the techniques and algorithms available for researchers, and for advanced undergraduate and postgraduate students.

Global Sensitivity Analysis

Complex mathematical and computational models are used in all areas of society and technology and yet model based science is increasingly contested or refuted, especially when models are applied to controversial themes in domains such as health, the environment or the economy. More stringent standards of proofs are demanded from model-based numbers, especially when these numbers represent potential financial losses, threats to human health or the state of the environment. Quantitative sensitivity analysis is generally agreed to be one such standard. Mathematical models are good at mapping assumptions into inferences. A modeller makes assumptions about laws pertaining to the system, about its status and a plethora of other, often arcane, system variables and internal model settings. To what extent can we rely on the model-based inference when most of these assumptions are fraught with uncertainties? Global Sensitivity Analysis offers an accessible treatment of such problems via quantitative sensitivity analysis, beginning with the first principles and guiding the reader through the full range of recommended practices with a rich set of solved exercises. The text explains the motivation for sensitivity analysis, reviews the required statistical concepts, and provides a guide to potential applications. The book: Provides a self-contained treatment of the subject, allowing readers to learn and practice global sensitivity analysis without further materials. Presents ways to frame the analysis, interpret its results, and avoid potential pitfalls. Features numerous exercises and solved problems to help illustrate the applications. Is authored by leading sensitivity analysis practitioners, combining a range of disciplinary backgrounds. Postgraduate students and practitioners in a wide range of subjects, including statistics, mathematics, engineering, physics, chemistry, environmental sciences, biology, toxicology, actuarial sciences, and econometrics will find much of use here. This book will prove equally valuable to engineers working on risk analysis and to financial analysts concerned with pricing and hedging.

Modern Mathematical Tools and Techniques in Capturing Complexity

Real-life problems are often quite complicated in form and nature and, for centuries, many different mathematical concepts, ideas and tools have been developed to formulate these problems theoretically and then to solve them either exactly or approximately. This book aims to gather a collection of papers dealing with several different problems arising from many disciplines and some modern mathematical approaches to handle them. In this respect, the book offers a wide overview on many of the current trends in Mathematics as valuable formal techniques in capturing and exploiting the complexity involved in real-world situations. Several researchers, colleagues, friends and students of Professor María Luisa Menéndez have contributed to this volume to pay tribute to her and to recognize the diverse contributions she had made to the fields of Mathematics and Statistics and to the profession in general. She had a sweet and strong personality, and instilled great values and work ethics in her students through her dedication to teaching and research. Even though the academic community lost her prematurely, she would continue to provide inspiration to many students and researchers worldwide through her published work.

Reliability and Safety Analyses under Fuzziness

This book provides a comprehensive, up-to-date account on recent applications of fuzzy sets and possibility theory in reliability and safety analysis. Various aspects of system's reliability, quality control, reliability and safety of man-machine systems fault analysis, risk assessment and analysis, structural, seismic, safety, etc. are discussed. The book provides new tools for handling non-probabilistic aspects of uncertainty in these problems. It is the first in this field in the world literature.

Probabilistic Mechanical Design

Focuses on the problem of engineering design based on the behavior of random variables. Gives numerous examples for determining reliability specifications in which both over- and under-designing can be avoided. Presents design methods that be adapted to nuclear, electrical and mining engineering as well as mechanical engineering specialities.

Environmental Modelling

Uncertainty in the predictions of science when applied to the environment is an issue of great current relevance in relation to the impacts of climate change, protecting against natural and man-made disasters, pollutant transport and sustainable resource management. However, it is often ignored both by scientists and decision makers, or interpreted as a conflict or disagreement between scientists. This is not necessarily the case, the scientists might well agree, but their predictions would still be uncertain and knowledge of that uncertainty might be important in decision making. Environmental Modelling: An Uncertain Future? introduces students, scientists and decision makers to: the different concepts and techniques of uncertainty estimation in environmental prediction the philosophical background to different concepts of uncertainty the constraint of uncertainties by the collection of observations and data assimilation in real-time forecasting techniques for decision making under uncertainty. This book will be relevant to environmental modellers, practitioners and decision makers in hydrology, hydraulics, ecology, meteorology and oceanography, geomorphology, geochemistry, soil science, pollutant transport and climate change. A companion website for the book can be found at www.uncertain-future.org.uk

Nonlinear Models for Repeated Measurement Data

Nonlinear measurement data arise in a wide variety of biological and biomedical applications, such as longitudinal clinical trials, studies of drug kinetics and growth, and the analysis of assay and laboratory data. Nonlinear Models for Repeated Measurement Data provides the first unified development of methods and models for data of this type, with a detailed treatment of inference for the nonlinear mixed effects and its extensions. A particular strength of the book is the inclusion of several detailed case studies from the areas of population pharmacokinetics and pharmacodynamics, immunoassay and bioassay development and the analysis of growth curves.

Probabilistic Approaches to Design

Sensitivity analysis should be considered a pre-requisite for statistical model building in any scientific discipline where modelling takes place. For a non-expert, choosing the method of analysis for their model is complex, and depends on a number of factors. This book guides the non-expert through their problem in order to enable them to choose and apply the most appropriate method. It offers a review of the state-of-the-art in sensitivity analysis, and is suitable for a wide range of practitioners. It is focussed on the use of SIMLAB – a widely distributed freely-available sensitivity analysis software package developed by the authors – for solving problems in sensitivity analysis of statistical models. Other key features: Provides an accessible overview of the current most widely used methods for sensitivity analysis. Opens with a detailed worked example to explain the motivation behind the book. Includes a range of examples to help illustrate the concepts discussed. Focuses on implementation of the methods in the software SIMLAB - a freely-available sensitivity analysis software package developed by the authors. Contains a large number of references to sources for further reading. Authored by the leading authorities on sensitivity analysis.

Sensitivity Analysis in Practice

We all like to know how reliable and how risky certain situations are, and our increasing reliance on technology has led to the need for more precise assessments than ever before. Such precision has resulted in efforts both to sharpen the notions of risk and reliability, and to quantify them. Quantification is required for normative decision-making, especially decisions pertaining to our safety and wellbeing. Increasingly in recent years Bayesian methods have become key to such quantifications. Reliability and Risk provides a comprehensive overview of the mathematical and statistical aspects of risk and reliability analysis, from a Bayesian perspective. This book sets out to change the way in which we think about reliability and survival analysis by casting them in the broader context of decision-making. This is achieved by: Providing a broad coverage of the diverse aspects of reliability, including: multivariate failure models, dynamic reliability, event history analysis, non-parametric Bayes, competing risks, co-operative and competing systems, and signature analysis. Covering the essentials

of Bayesian statistics and exchangeability, enabling readers who are unfamiliar with Bayesian inference to benefit from the book. Introducing the notion of “composite reliability”, or the collective reliability of a population of items. Discussing the relationship between notions of reliability and survival analysis and econometrics and financial risk. Reliability and Risk can most profitably be used by practitioners and research workers in reliability and survivability as a source of information, reference, and open problems. It can also form the basis of a graduate level course in reliability and risk analysis for students in statistics, biostatistics, engineering (industrial, nuclear, systems), operations research, and other mathematically oriented scientists, wherein the instructor could supplement the material with examples and problems.

Reliability and Risk

This comprehensive handbook provides readers with a single-source reference to the theoretical fundamentals, physical mechanisms and principles of operation of all known microwave devices and various radars. The author discusses proven methods of computation and design development, process, schematic, schematic-technical and construction peculiarities of each breed of the microwave devices, as well as the most popular and original technical solutions for radars. Coverage also includes the history of creation of the most widely used radars, as well as guidelines for their potential upgrading. Offers readers a comprehensive, systematized view of all contemporary knowledge, acquired during the last 20 years, on radars and related disciplines; Provides a single-source reference on the physical mechanisms and principles of operation of the basic components of radio location devices, including theoretical aspects of designing the necessary, high-efficiency electronic devices and systems, as well as key, practical methods of computation and design; Presents complex topics using simple language, minimizing mathematics.

Handbook of Microwave and Radar Engineering

"This classic textbook builds theoretical statistics from the first principles of probability theory. Starting from the basics of probability, the authors develop the theory of statistical inference using techniques, definitions, and concepts that are statistical and are natural extensions, and consequences, of previous concepts. It covers all the topics from a standard inference course, including distributions, random variables, data reduction, point estimation, hypothesis testing, interval estimation, and regression"--

The Manual for Bridge Evaluation

Learn the tools to assess product reliability! Haldar and Mahadevan crystallize the research and experience of the last few decades into the most up-to-date book on risk-based design concepts in engineering available. The fundamentals of reliability and statistics necessary for risk-based engineering analysis and design are clearly presented. And with the help of many practical examples integrated throughout the text, the material is made very relevant to today's practice. Key Features * Covers all the fundamental concepts and mathematical skills needed to conduct reliability assessments. * Presents the most widely-used reliability assessment methods. * Concepts that are required for the implementation of risk-based design in practical problems are developed gradually. * Both risk-based and deterministic design concepts are included to show the transition from traditional to modern design practice.

Statistical Inference

Summarizes proposals for generating synthetic streamflows, presents numerical calculations, and offers proposals for hydraulic engineering applications.

Probability, Reliability, and Statistical Methods in Engineering Design

Predictive distributions; Decisive prediction; Informative prediction; Mean coverage tolerance prediction; Guaranteed coverage tolerance prediction; Other approaches to prediction; Sampling inspection; Regulation and optimisation; Calibration; Diagnosis; Treatment allocation.

Synthetic Streamflows

This book offers a detailed presentation of the principles and practice of life cycle impact assessment. As a volume of the LCA compendium, the book is structured according to the LCIA framework developed by the International Organisation for Standardisation (ISO)passing through the phases of defini-

tion or selection of impact categories, category indicators and characterisation models (Classification): calculation of category indicator results (Characterisation); calculating the magnitude of category indicator results relative to reference information (Normalisation); and converting indicator results of different impact categories by using numerical factors based on value-choices (Weighting). Chapter one offers a historical overview of the development of life cycle impact assessment and presents the boundary conditions and the general principles and constraints of characterisation modelling in LCA. The second chapter outlines the considerations underlying the selection of impact categories and the classification or assignment of inventory flows into these categories. Chapters three through thirteen exploreall the impact categories that are commonly included in LCIA, discussing the characteristics of each followed by a review of midpoint and endpoint characterisation methods, metrics, uncertainties and new developments, and a discussion of research needs. Chapter-length treatment is accorded to Climate Change; Stratospheric Ozone Depletion; Human Toxicity; Particulate Matter Formation; Photochemical Ozone Formation; Ecotoxicity; Acidification; Eutrophication; Land Use; Water Use; and Abiotic Resource Use. The final two chapters map out the optional LCIA steps of Normalisation and Weighting.

Statistical Prediction Analysis

This two-volume set (CCIS 1567-1568) constitutes the refereed proceedings of the 6h International Conference on Computer Vision and Image Processing, CVIP 2021, held in Rupnagar, India, in December 2021. The 70 full papers and 20 short papers were carefully reviewed and selected from the 260 submissions. The papers present recent research on such topics as biometrics, forensics, content protection, image enhancement/super-resolution/restoration, motion and tracking, image or video retrieval, image, image/video processing for autonomous vehicles, video scene understanding, human-computer interaction, document image analysis, face, iris, emotion, sign language and gesture recognition, 3D image/video processing, action and event detection/recognition, medical image and video analysis, vision-based human GAIT analysis, remote sensing, and more.

Seasonal Outliers in Time Series

Papers presented at various inter-disciplinary and multi-institutional training programmes, held at Andhra University during 23 January-4 February, 2006.

Life Cycle Impact Assessment

Clinical trials are an important part of medicine and healthcare today, deciding which treatments we use to treat patients. Anyone involved in healthcare today must know the basics of running and interpreting clinical trial data. Written in an easy-to-understand style by authors who have considerable expertise and experience in both academia and industry, Principles and Practice of Clinical Trial Medicine covers all of the basics of clinical trials, from legal and ethical issues to statistics, to patient recruitment and reporting results. Jargon-free writing style enables those with less experience to run their own clinical trials and interpret data Book contains an ideal mix of theory and practice so researchers will understand both the rationale and logistics to clinical trial medicine Expert authorship whose experience includes running clinical trials in an academic as well as industry settings Numerous illustrations reinforce and elucidate key concepts and add to the book's overall pedagogy

Computer Vision and Image Processing

The modern ecologist usually works in both the field and laboratory, uses statistics and computers, and often works with ecological concepts that are model-based, if not model-driven. How do we make the field and laboratory coherent? How do we link models and data? How do we use statistics to help experimentation? How do we integrate modeling and statistics? How do we confront multiple hypotheses with data and assign degrees of belief to different hypotheses? How do we deal with time series (in which data are linked from one measurement to the next) or put multiple sources of data into one inferential framework? These are the kinds of questions asked and answered by The Ecological Detective. Ray Hilborn and Marc Mangel investigate ecological data much as a detective would investigate a crime scene by trying different hypotheses until a coherent picture emerges. The book is not a set of pat statistical procedures but rather an approach. The Ecological Detective makes liberal use of computer programming for the generation of hypotheses, exploration of data, and the comparison of different models. The authors' attitude is one of exploration, both statistical and graphical.

The background required is minimal, so that students with an undergraduate course in statistics and ecology can profitably add this work to their tool-kit for solving ecological problems.

Groundwater Flow and Mass Transport Modeling

Tropical peatlands are found mostly in South East Asia, but also in Africa and in Central and South America. They and peat-swamp forests store large amounts of carbon and their destruction, particularly through the development of plantations for oil palm and other forms of agriculture, releases large quantities of greenhouse gases which contribute to climate change. They are also complex and vulnerable ecosystems, home to great biodiversity and a number of endangered species such as the orang utan.The aim of this book is to introduce this little known but important and vulnerable ecosystem in a way that explains its long standing interaction with the global carbon cycle and how it is being destroyed by deforestation and inappropriate development. The authors describe the origin and formation of peat in the tropics, its current location, extent and amount of carbon stored in it, its biodiversity and natural resource functions and key ecological functions and processes. Appropriate hydrology is the key to the development and maintenance of peatlands and the unique aspects of tropical peatland water supply and management are also explored. In the same vein the nutrient dynamics and budgets of this ecosystem are explained in order to show how complex habitats can be maintained mainly by rainwater containing very low concentrations of essential chemical elements. Past and present impacts on tropical peatlands in SE Asia are discussed and the need for restoration and wise use highlighted. Finally, projections are made about the future of this ecosystem as a result of continuing human impacts and climate change.

Principles and Practice of Clinical Trial Medicine

Offers an innovative look at why science and technology cannot alone meet the needs of energy policy making in the future.

The Ecological Detective

The IWA Task Group for Mathematical Modelling of Anaerobic Digestion Processes was created with the aim to produce a generic model and common platform for dynamic simulations of a variety of anaerobic processes. This book presents the outcome of this undertaking and is the result of four years collaborative work by a number of international experts from various fields of anaerobic process technology. The purpose of this approach is to provide a unified basis for anaerobic digestion modelling. It is hoped this will promote increased application of modelling and simulation as a tool for research, design, operation and optimisation of anaerobic processes worldwide. This model was developed on the basis of the extensive but often disparate work in modelling and simulation of anaerobic digestion systems over the last twenty years. In developing ADM1, the Task Group have tried to establish common nomenclature, units and model structure, consistent with existing anaerobic modelling literature and the popular activated sludge models (See Activated Sludge Models ASM1, ASM2, ASM2d and ASM3, IWA Publishing, 2000, ISBN: 1900222248). As such, it is intended to promote widespread application of simulation from domestic (wastewater and sludge) treatment systems to specialised industrial applications. Outputs from the model include common process variables such gas flow and composition, pH, separate organic acids, and ammonium. The structure has been devised to encourage specific extensions or modifications where required, but still maintain a common platform. During development the model has been successfully tested on a range of systems from full-scale waste sludge digestion to laboratory-scale thermophilic high-rate UASB reactors. The model structure is presented in a readily applicable matrix format for implementation in many available differential equation solvers. It is expected that the model will be available as part of commercial wastewater simulation packages. ADM1 will be a valuable information source for practising engineers working in water treatment (both domestic and industrial) as well as academic researchers and students in Environmental Engineering and Science, Civil and Sanitary Engineering, Biotechnology, and Chemical and Process Engineering departments. Contents Introduction Nomenclature, State Variables and Expressions Biochemical Processes Physicochemical Processes Model Implementation in a Single Stage CSTR Suggested Biochemical Parameter Values, Sensitivity and Estimation Conclusions References Appendix A: Review of Parameters Appendix B: Supplementary Matrix Information Appendix C: Integration with the ASM Appendix D: Estimating Stoichiometric Coefficients for Fermentation Scientific & Technical Report No.13

Tropical Peatlands

Methods and guidelines for developing and using mathematical models Turn to Effective Groundwater Model Calibration for a set of methods and guidelines that can help produce more accurate and transparent mathematical models. The models can represent groundwater flow and transport and other natural and engineered systems. Use this book and its extensive exercises to learn methods to fully exploit the data on hand, maximize the model's potential, and troubleshoot any problems that arise. Use the methods to perform: Sensitivity analysis to evaluate the information content of data Data assessment to identify (a) existing measurements that dominate model development and predictions and (b) potential measurements likely to improve the reliability of predictions Calibration to develop models that are consistent with the data in an optimal manner Uncertainty evaluation to quantify and communicate errors in simulated results that are often used to make important societal decisions Most of the methods are based on linear and nonlinear regression theory. Fourteen guidelines show the reader how to use the methods advantageously in practical situations. Exercises focus on a groundwater flow system and management problem, enabling readers to apply all the methods presented in the text. The exercises can be completed using the material provided in the book, or as hands-on computer exercises using instructions and files available on the text's accompanying Web site. Throughout the book, the authors stress the need for valid statistical concepts and easily understood presentation methods required to achieve well-tested, transparent models. Most of the examples and all of the exercises focus on simulating groundwater systems; other examples come from surface-water hydrology and geophysics. The methods and guidelines in the text are broadly applicable and can be used by students, researchers, and engineers to simulate many kinds systems.

In Search of Good Energy Policy

"MOP 144 provides guidance and underlying framework for creating consistency across hazards, systems, and sectors in the design of new infrastructure systems and in enhancing the resilience of existing ones"--

Anaerobic Digestion Model No.1 (ADM1)

Coagulation and Flocculation in Water and Wastewater Treatment provides a comprehensive account of coagulation and flocculation techniques and technologies in a single volume covering theoretical principles to practical applications. Thoroughly revised and updated since the 1st Edition it has been progressively modified and increased in scope to cater for the requirements of practitioners involved with water and wastewater treatment. A thorough gamut of treatment scenarios is attempted, including turbidity, color and organics removal, including the technical aspects of enhanced coagulation. The effects of temperature and ionic content are described as well as the removal of specific substances such as arsenic and phosphorus. Chemical phosphorus removal is dealt with in detail, Rapid mixing for efficient coagulant utilization, and flocculation are dealt with in specific chapters. Water treatment plant waste sludge disposal is dealt with in considerable detail, in an Appendix devoted to this subject. Invaluble for water scientists, engineers and students of this field, Coagulation and Flocculation in Water and Wastewater Treatment is a convenient reference handbook in the form of numerous examples and appended information.

Human Aspects of Software Engineering

This authoritative new volume treats a wide class of distributions that constitute plausible alternatives to normality -- such as short- and long-tailed symmetric distributions and moderately skewed distributions -- all having finite mean and variance. Robust Inference illustrates the appropriateness of various robust methods for solving both one-sample and multisample statistical inference problems ... develops Laguerre series expansions for Student's t and variance-ratio F statistic distributions ... analyzes normal and nonnormal distribution efficiencies ... works out modified maximum likelihood (MML) estimators based on type II censored samples for log-normal, logistic, exponential, and Rayleigh distributions ... uses MML estimators in constructing robust hypothesis-testing procedures ... considers the specialized topics of regression, analysis of variance, classification, and sample survey ... discusses goodness-of-fit tests ... describes Q-Q plots in a special appendix ... and much more. An outstanding, time-saving reference for theoreticians and practitioners of statistics, Robust Inference is also an excellent auxiliary text for an undergraduate- or graduate-level course on robustness. Book jacket.

Effective Groundwater Model Calibration

The behavior of a chemical system is affected by many physicochemical parameters. The sensitivity of the system's behavior to changes in parameters is known as parametric sensitivity. When a system operates in a parametrically sensitive region, its performance becomes unreliable and changes sharply with small variations in parameters. Thus, it is of great value to those who design and operate chemical systems to be able to analyze and predict their sensitivity behavior. This book is the first to provide a thorough treatment of the concept of parametric sensitivity and the mathematical tool it generated, sensitivity analysis. The emphasis is on applications to real situations. The book begins with definitions of various sensitivity indices and describes the numerical techniques most commonly used for their evaluation. Extensively illustrated chapters discuss sensitivity analysis in a variety of chemical reactors--batch, tubular, continuous-flow, fixed-bed--and in combustion systems, mechanistic studies, air pollution, and metabolic processes. Seniors and graduate students in various fields of science and engineering, researchers, and practicing engineers will welcome this valuable resource.

Identifying, Quantifying, and Proving Loss of Productivity

Coagulation and Flocculation in Water and Wastewater Treatment