An Introduction To Uncertainty In Measurement Usin

In the 2000s, Laos was treated as a model country for the efficacy of privatized, "sustainable" hydropower projects as viable options for World Bank-led development. By viewing hydropower as a process that creates ecologically uncertain environments, Jerome Whitington reveals how new forms of managerial care have emerged in the context of a privatized dam project successfully targeted by transnational activists. Based on ethnographic work inside the hydropower company, as well as with Laotians affected by the dam, he investigates how managers, technicians and consultants grapple with unfamiliar environmental obligations through new infrastructural configurations, locally-inscribed ethical practices, and forms of flexible experimentation informed by American management theory. Far from the authoritative expertise that characterized classical modernist hydropower, sustainable development in Laos has been characterized by a shift from the risk politics of the 1990s to an ontological politics in which the institutional conditions of infrastructure investment are pervasively undermined by sophisticated 'hactivism.' Whitington demonstrates how late industrial environments are infused with uncertainty inherent in the anthropogenic ecologies themselves. Whereas 'anthropogenic' usually describes human-induced environmental change, it can also show how new capacities for being human are generated when people live in ecologies shot through with uncertainty. Implementing what Foucault called a "historical ontology of ourselves," Anthropogenic Rivers formulates a new materialist critique of the dirty ecologies of late industrialism by pinpointing the opportunistic, ambitious and speculative ontology of capitalist natures.

This is a major, and deeply thoughtful, contribution to understanding uncertainty and risk. Our world and its unprecedented challenges need such ways of thinking! Much more than a set of contributions from different disciplines, this book leads you to explore your own way of perceiving your own area of work. An outstanding contribution that will stay on my shelves for many years. Dr Neil T. M. Hamilton, Director, WWF International Arctic Programme This collection of essays provides a unique and fascinating overview of perspectives on uncertainty and risk across a wide variety of disciplines. It is a valuable and accessible sourcebook for specialists and laypeople alike. Professor Renate Schubert, Head of the Institute for Environmental Decisions and Chair of Economics at the Swiss Federal Institute of Technology This comprehensive collection of disciplinary perspectives on uncertainty is a definitive guide to contemporary insights into this Achilles heel of modernity and the endemic hubris of institutional science in its role as public authority. It gives firm foundations to the fundamental historic shift now underway in the world, towards normalizing acceptance of the immanent condition of ignorance and of its practical corollaries: contingency, uncontrol, and respect for difference. Brian Wynne, Professor of Science Studies, Lancaster University Bammer and Smithson have assembled a fascinating, important collection of papers on uncertainty and its management. The integrative nature of Uncertainty and Risk makes it a landmark in the intellectual history of this vital cross-disciplinary concept. George Cvetkovich, Director, Center for Cross-Cultural Research, Western Washington University Uncertainty governs our lives. From the unknowns of living with the risks of terrorism to developing policies on genetically modified foods, or disaster planning for catastrophic climate change, how we conceptualize, evaluate and cope with uncertainty drives our actions and deployment of resources, decisions and priorities. In this thorough and wide-ranging volume, theoretical perspectives are drawn from art history, complexity science, economics, futures, history, law, philosophy, physics, psychology, statistics and theology. On a practical level, uncertainty is examined in emergency management, intelligence, law enforcement, music, policy and politics. Key problems that are a subject of focus are environmental management, communicable diseases and illicit drugs. Opening and closing sections of the book provide major conceptual strands in uncertainty thinking and develop an integrated view of the nature of uncertainty, uncertainty as a motivating or de-motivating force, and strategies for coping and managing under uncertainty.

Uncertainty in Economics: Readings and Exercises provides information pertinent to the fundamental aspects of the economics of uncertainty. This book discusses ho uncertainty affects both individual behavior and standard equilibrium theory. Organized into three parts encompassing 30 chapters, this book begins with an overview of the relevance of expected utility maximization for positive and normative theories of individual choice. This text then examines the biases in judgments, which reveal some heuristics of thinking under uncertainty. Other chapters consider the effect of restricting trade in contingent commodities to those trades that can be affected through the stock and bond markets. This book discusses as well the individual problem of sequential choice and equilibria, which are built around the notion of sequential choice. The final chapter deals with an entirely different aspect of the economics of information and reverts to the assumption that markets are perfect and costless. This book is a valuable resource for economists and students.

This edited volume looks at whether it is possible to be more transparent about uncertainty in scientific evidence without undermining public understanding and trust. With contributions from leading experts in the field, this book explores the communication of risk and decision-making in an increasingly post-truth world. Drawing on case studies from climate change to genetic testing, the authors argue for better quality evidence synthesis to cut through the noise and highlight the need for more structured public dialogue. For uncertainty in scientific evidence to be communicated effectively, they conclude that trustworthiness is vital: the data and methods underlying statistics must be transparent, valid, and sound, and the numbers need to demonstrate practical utility and add social value to people's lives. Presenting a conceptual framework to help navigate the reader through the key social and scientific challenges of a post-truth era, this book will be of great relevance to students, scholars, and policy makers with an interest in risk analysis and communication.

A Practical Guide

An Introduction to Uncertainty in Measurement

Uncertainty Quantification

An Introduction to the Analysis and Presentation of Data

Decision Making Under Uncertainty

Multidisciplinary Perspectives

The Uncertainty in Physical Measurements

A timeless classic of economic theory that remains fascinating and pertinent today, this is Frank Knight's famous explanation of why perfect competition cannot eliminate profits, the important differences between "risk" and "uncertainty," and the vital role of the entrepreneur in profitmaking. Based on Knight's PhD dissertation, this 1921 work, balancing theory with fact to come to stunning insights, is a distinct pleasure to read. FRANK H. KNIGHT (1885-1972) is considered by some the greatest American scholar of economics of the 20th century. An economics professor at the University of Chicago from 1927 until 1955, he was one of the founders of the Chicago school of economics, which influenced Milton Friedman and George Stigler.

This book fulfills the global need to evaluate measurement results along with the associated uncertainty. In the book, together with the details of uncertainty calculations for many physical parameters, probability distributions and their properties are discussed. Definitions of various terms are given and will help the practicing metrologists to grasp the subject. The book helps to establish international standards for the evaluation of the quality of raw data obtained from various laboratories for interpreting the results of various national metrology institutes in an international

inter-comparisons. For the routine calibration of instruments, a new idea for the use of pooled variance is introduced. The uncertainty calculations are explained for (i) independent linear inputs, (ii) non-linear inputs and (iii) correlated inputs. The merits and limitations of the Guide to the Expression of Uncertainty in Measurement (GUM) are discussed. Monte Carlo methods for the derivation of the output distribution from the input distributions are introduced. The Bayesian alternative for calculation of expanded uncertainty is included. A large number of numerical examples is included.

In 1932 Norbert Wiener gave a series of lectures on Fourier analysis at the Univer sity of Cambridge. One result of Wiener's visit to Cambridge was his well-known text The Fourier Integral and Certain of its Applications; another was a paper by G. H. Hardy in the 1933 Journalofthe London Mathematical Society. As Hardy says in the introduction to this paper, This note originates from a remark of Prof. N. Wiener, to the effect that "a f and g [= j] cannot both be very small". ... The theo pair of transforms rems which follow give the most precise interpretation possible ofWiener's remark. Hardy's own statement of his results, lightly paraphrased, is as follows, in which f is an integrable function on the real line and f is its Fourier transform: x 2 m If f and j are both 0 (Ix1e- /2) for large x and some m, then each is a finite linear combination ofHermite functions. In particular, if f and j are x2 x 2 2 2 both O(e- /), then f = j = Ae- / , where A is a constant; and if one x 2 2 is0(e- /), then both are null.

Modeling Uncertainty in the Earth Sciences highlights the various issues, techniques and practical modeling tools available for modeling the uncertainty of complex Earth systems and the impact that it has on practical situations. The aim of the book is to provide an introductory overview which covers a broad range of tried-and-tested tools. Descriptions of concepts, philosophies, challenges, methodologies and workflows give the reader an understanding of the best way to make decisions under uncertainty for Earth Science problems. The book covers key issues such as: Spatial and time aspect; large complexity and dimensionality; computation power; costs of 'engineering' the Earth; uncertainty in the modeling and decision process. Focusing on reliable and practical methods this book provides an invaluable primer for the complex area of decision making with uncertainty in the Earth Sciences.

The Politics of Uncertainty

Risk, Uncertainty and Profit

Experimental Methods for Science and Engineering Students

Measurement, Uncertainty and Lasers

An Introduction to Error Analysis

A Guide to Dealing with Uncertainty in Quantitative Risk and Policy Analysis

An Introduction to the Uncertainty Principle

The need to understand the theories and applications of economic and finance risk has been clear to everyone since the financia crisis, and this collection of original essays proffers broad, high-level explanations of risk and uncertainty. The economics of risk a uncertainty is unlike most branches of economics in spanning from the individual decision-maker to the market (and indeed, socia decisions), and ranging from purely theoretical analysis through individual experimentation, empirical analysis, and applied and policy decisions. It also has close and sometimes conflicting relationships with theoretical and applied statistics, and psychology. aim of this volume is to provide an overview of diverse aspects of this field, ranging from classical and foundational work through current developments. Presents coherent summaries of risk and uncertainty that inform major areas in economics and finance Divides coverage between theoretical, empirical, and experimental findings Makes the economics of risk and uncertainty accessib to scholars in fields outside economics

This volume presents measurement uncertainty and uncertainty budgets in a form accessible to practicing engineers and enginee students from across a wide range of disciplines. The book gives a detailed explanation of the methods presented by NIST in the “GUM” – Guide to Uncertainty of Measurement. Emphasis is placed on explaining the background and meaning of the topics, whi keeping the level of mathematics at the minimum level necessary. Dr. Colin Ratcliffe, USNA, and Bridget Ratcliffe, Johns Hopkins develop uncertainty budgets and explain their use. In some examples, the budget may show a process is already adequate and w costs can be saved. In other examples, the budget may show the process is inadequate and needs improvement. The book demonstrates how uncertainty budgets help identify the most cost effective place to make changes. In addition, an extensive fully worked case study leads readers through all issues related to an uncertainty analysis, including a variety of different types of uncertainty budgets. The book is ideal for professional engineers and students concerned with a broad range of measurement assurance challenges in applied sciences. This book also: Facilitates practicing engineers’ understanding of uncertainty budgets, essential to calculating cost-effective savings to a wide variety of processes contingent on measurement Presents uncertainty bu in an accessible style suitable for all undergraduate STEM courses that include a laboratory component Provides a highly adapta supplement to graduate textbooks for courses where students’ work includes reporting on experimental results Includes an expan case study developing uncertainty from transducers though measurands and propagated to the final measurement that can be us a template for the analysis of many processes Stands as a useful pocket reference for all engineers and experimental scientists

Measurement shapes scientific theories, characterises improvements in manufacturing processes and promotes efficient comme In concert with measurement is uncertainty, and students in science and engineering need to identify and quantify uncertainties in measurements they make. This book introduces measurement and uncertainty to second and third year students of science and engineering. Its approach relies on the internationally recognised and recommended guidelines for calculating and expressing uncertainty (known by the acronym GUM). The statistics underpinning the methods are considered and worked examples and exercises are spread throughout the text. Detailed case studies based on typical undergraduate experiments are included to reinf the principles described in the book. This guide is also useful to professionals in industry who are expected to know the contempo methods in this increasingly important area. Additional online resources are available to support the book at www.cambridge.org/9780521605793.

The field of uncertainty quantification is evolving rapidly because of increasing emphasis on models that require quantified uncertainties for large-scale applications, novel algorithm development, and new computational architectures that facilitate implementation of these algorithms. Uncertainty Quantification: Theory, Implementation, and Applications provides readers with th basic concepts, theory, and algorithms necessary to quantify input and response uncertainties for simulation models arising in a broad range of disciplines. The book begins with a detailed discussion of applications where uncertainty quantification is critical fo both scientific understanding and policy. It then covers concepts from probability and statistics, parameter selection techniques, frequentist and Bayesian model calibration, propagation of uncertainties, quantification of model discrepancy, surrogate model

construction, and local and global sensitivity analysis. The author maintains a complementary web page where readers can find c
used in the exercises and other supplementary material.

The Statistics of Scientific and Industrial Measurement

Measurement Uncertainty

Hardy's Theorem on Lie Groups

Uncertainty Analysis for Engineers and Scientists

Arbeits-Und Dienstrecht Der Krankenhausartze Von A-Z

A Guide to Error Analysis

An Introduction to Uncertainty in Measurement Using the GUM (guide to the Expression of Uncertainty in Measurement)

Based on the seminar that took place in Dagstuhl, Germany in June 2011, this contributed volume studies the four important topics within the scientific visualization field: uncertainty visualization, multifield visualization, biomedical visualization and scalable visualization. • Uncertainty visualization deals with uncertain data from simulations or sampled data, uncertainty due to the mathematical processes operating on the data, and uncertainty in the visual representation, • Multifield visualization addresses the need to depict multiple data at individual locations and the combination of multiple datasets, • Biomedical is a vast field with select subtopics addressed from scanning methodologies to structural applications to biological applications, • Scalability in scientific visualization is critical as data grows and computational devices range from hand-held mobile devices to exascale computational platforms. Scientific Visualization will be useful to practitioners of scientific visualization, students interested in both overview and advanced topics, and those interested in knowing more about the visualization process.

This book presents the need for clarity, consistancy, and accuracy when making measurements; some of the GUM guidelines are presented in this book. A background in first-year calculus and some basic statistics is necessary for understanding.

Uncertainties are pervasive in natural hazards, and it is crucial to develop robust and meaningful approaches to characterize and communicate uncertainties to inform modeling efforts. In this monograph we provide a broad, cross-disciplinary overview of issues relating to uncertainties faced in natural hazard and risk assessment. We introduce some basic tenets of uncertainty analysis, discuss issues related to communication and decision support, and offer numerous examples of analyses and modeling approaches that vary by context and scope. Contributors include scientists from across the full breath of the natural hazard scientific community, from those in real-time analysis of natural hazards to those in the research community from academia and government. Key themes and highlights include: Substantial breadth and depth of analysis in terms of the types of natural hazards addressed, the disciplinary perspectives represented, and the number of studies included Targeted, application-centered analyses with a focus on development and use of modeling techniques to address various sources of uncertainty Emphasis on the impacts of climate change on natural hazard processes and outcomes Recommendations for cross-disciplinary and science transfer across natural hazard sciences This volume will be an excellent resource for those interested in the current work on uncertainty classification/quantification and will document common and emergent research themes to allow all to learn from each other and build a more connected but still diverse and ever growing community of scientists.

It is now becoming recognized in the measurement community that it is as important to communicate the uncertainty related to a specific measurement as it is to report the measurement itself. Without knowing the uncertainty, it is impossible for the users of the result to know what confidence can be placed in it; it is also impossible to assess the comparability of different measurements of the same parameter. This volume collects 20 outstanding papers on the topic, mostly published from 1999-2002 in the journal "Accreditation and Quality Assurance." They provide the rationale for why it is important to evaluate and report the uncertainty of a result in a consistent manner. They also describe the concept of uncertainty, the methodology for evaluating uncertainty, and the advantages of using suitable reference materials. Finally, the benefits to both the analytical laboratory and the user of the results are considered.

Uncertainty, Multifield, Biomedical, and Scalable Visualization

Measurement, Prediction and Assessment

Theory, Implementation, and Applications

Introduction to Uncertainty Quantification

Introduction to Risk and Uncertainty in Hydrosystem Engineering

Modeling and Decision Support

A Computational Modeling Approach

This text provides a framework in which the main objectives of the field of uncertainty quantification (UQ) are defined and an overview of the range of mathematical methods by which they can be achieved. Complete with exercises throughout, the book will

equip readers with both theoretical understanding and practical experience of the key mathematical and algorithmic tools underlying the treatment of uncertainty in modern applied mathematics. Students and readers alike are encouraged to apply the mathematical methods discussed in this book to their own favorite problems to understand their strengths and weaknesses, also making the text suitable for a self-study. Uncertainty quantification is a topic of increasing practical importance at the intersection of applied mathematics, statistics, computation and numerous application areas in science and engineering. This text is designed as an introduction to UQ for senior undergraduate and graduate students with a mathematical or statistical background and also for researchers from the mathematical sciences or from applications areas who are interested in the field. T. J. Sullivan was Warwick Zeeman Lecturer at the Mathematics Institute of the University of Warwick, United Kingdom, from 2012 to 2015. Since 2015, he is Junior Professor of Applied Mathematics at the Free University of Berlin, Germany, with specialism in Uncertainty and Risk Quantification.

Information is precious. It reduces our uncertainty in making decisions. Knowledge about the outcome of an uncertain event gives the possessor an advantage. It changes the course of lives, nations, and history itself. Information is the food of Maxwell's demon. His power comes from know ing which particles are hot and which particles are cold. His existence was paradoxical to classical physics and only the realization that information too was a source of power led to his taming. Information has recently become a commodity, traded and sold like or ange juice or hog bellies. Colleges give degrees in information science and information management. Technology of the computer age has provided access to information in overwhelming quantity. Information has become something worth studying in its own right. The purpose of this volume is to introduce key developments and results in the area of generalized information theory, a theory that deals with uncertainty-based information within mathematical frameworks that are broader than classical set theory and probability theory. The volume is organized as follows.

Build the skills for determining appropriate error limits for quantities that matter with this essential toolkit. Understand how to handle a complete project and how uncertainty enters into various steps. Provides a systematic, worksheet-based process to determine error limits on measured quantities, and all likely sources of uncertainty are explored, measured or estimated. Features instructions on how to carry out error analysis using Excel and MATLAB®, making previously tedious calculations easy. Whether you are new to the sciences or an experienced engineer, this useful resource provides a practical approach to performing error analysis. Suitable as a text for a junior or senior level laboratory course in aerospace, chemical and mechanical engineering, and for professionals.

Dealing with Uncertainties is an innovative monograph that lays special emphasis on the deductive approach to uncertainties and on the shape of uncertainty distributions. This perspective has the potential for dealing with the uncertainty of a single data point and with sets of data that have different weights. It is shown that the inductive approach that is commonly used to estimate uncertainties is in fact not suitable for these two cases. The approach that is used to understand the nature of uncertainties is novel in that it is completely decoupled from measurements. Uncertainties which are the consequence of modern science provide a measure of confidence both in scientific data and in information in everyday life. Uncorrelated uncertainties and correlated uncertainties are fully covered and the weakness of using statistical weights in regression analysis is discussed. The text is abundantly illustrated with examples and includes more than 150 problems to help the reader master the subject.

Elements of Generalized Information Theory

The Production of Uncertainty in Lao Hydropower

Measurement Uncertainties

Uncertainty Theory

Theory and Application

Handbook of the Economics of Risk and Uncertainty

Uncertainty

Water engineers require knowledge of stochastic, frequency concepts, uncertainty analysis, risk assessment, and the processes that predict unexpected events. This book presents the basics of stochastic, risk and uncertainty analysis, and random sampling techniques in conjunction with straightforward examples which are solved step by step. In addition, appropriate Excel functions are included as an alternative to solve the examples, and two real case studies is presented in the last chapters of book.

The expression of uncertainty in measurement poses a challenge since it involves physical, mathematical, and philosophical issues. This problem is intensified by the limitations of the probabilistic approach used by the current standard (the GUM Instrumentation Standard). This text presents an alternative approach. It makes full use of the mathematical theory of evidence to express the uncertainty in measurements. Coverage provides an overview of the current standard, then pinpoints and constructively resolves its limitations. Numerous examples throughout help explain the book’s unique approach.

The scienti c method is based on the measurement of di erent physical qu- tities and the search for relations between their values. All measured values of physical quantities are, however, a ected by uncertainty. Understanding the origin of uncertainty, evaluating its extent, and suitably taking it into account in data analysis, are fundamental steps for assessing the global accuracy of physical laws and the degree of reliability of their technological applications. The introduction to uncertainty evaluation and data analysis procedures is generally made in laboratory courses for freshmen. During my long-lasting teaching experience, I had the feeling of some sort of gap between the ava- able tutorial textbooks, and the specialized monographs. The present work aims at lling this gap, and has been tested and modi ed through a feedback interaction with my students for several years. I have tried to maintain as much as possible a tutorial approach, that, starting from a phenomenolo- cal introduction, progressively leads to an accurate de nition of uncertainty and to some of the most common procedures of data analysis, facilitating the access to advanced monographs. This book is mainly addressed to - dergraduate students, but can be a useful reference for researchers and for secondary school teachers. The book is divided into

three parts and a series of appendices. Part I is devoted to a phenomenological introduction to measurement and uncertainty. In Chap.

This guide to estimating uncertainties in the measurement, prediction and assessment of noise and vibration applies across environmental noise and vibration, occupational noise and vibration exposure, and building and architectural acoustics. The book collates information from the various Standards and from research, with explanation, examples and case studies. It enables estimation of uncertainty in the measurement and prediction of acoustic quantities, suitable for use in environmental impact and occupational exposure assessments. It is for acoustic consultants, mechanical and building service engineers, architect and building professionals and environmental health officers. Bob Peters worked for more than forty years in acoustics and noise control – teaching, research, consultancy. He was a principal acoustic consultant with Applied Acoustic Design, a senior research fellow at London South Bank University, and a tutor on Institute of Acoustics distance learning courses.

Challenges of Transformation

Anthropogenic Rivers

Introduction To Error Analysis

Readings and Exercises

Modeling Uncertainty in the Earth Sciences

Uncertainty in Biology

Uncertainty-Based Information

Learning with uncertainty covers a broad range of scenarios in machine learning, this book mainly focuses on: (1) Decision tree learning with uncertainty, (2) Clustering under uncertainty environment, (3) Active learning based on uncertainty criterion, and (4) Ensemble learning in a framework of uncertainty. The book starts with the introduction to uncertainty including randomness, roughness, fuzziness and non-specificity and then comprehensively discusses a number of key issues in learning with uncertainty, such as uncertainty representation in learning, the influence of uncertainty on the performance of learning system, the heuristic design with uncertainty, etc. Most contents of the book are our research results in recent decades. The purpose of this book is to help the readers to understand the impact of uncertainty on learning processes. It comes with many examples to facilitate understanding. The book can be used as reference book or textbook for researcher fellows, senior undergraduates and postgraduates majored in computer science and technology, applied mathematics, automation, electrical engineering, etc.

An introduction to decision making under uncertainty from a computational perspective, covering both theory and applications ranging from speech recognition to airborne collision avoidance. Many important problems involve decision making under uncertainty—that is, choosing actions based on often imperfect observations, with unknown outcomes. Designers of automated decision support systems must take into account the various sources of uncertainty while balancing the multiple objectives of the system. This book provides an introduction to the challenges of decision making under uncertainty from a computational perspective. It presents both the theory behind decision making models and algorithms and a collection of example applications that range from speech recognition to aircraft collision avoidance. Focusing on two methods for designing decision agents, planning and reinforcement learning, the book covers probabilistic models, introducing Bayesian networks as a graphical model that captures probabilistic relationships between variables; utility theory as a framework for understanding optimal decision making under uncertainty; Markov decision processes as a method for modeling sequential problems; model uncertainty; state uncertainty; and cooperative decision making involving multiple interacting agents. A series of applications shows how the theoretical concepts can be applied to systems for attribute-based person search, speech applications, collision avoidance, and unmanned aircraft persistent surveillance. Decision Making Under Uncertainty unifies research from different communities using consistent notation, and is accessible to students and researchers across engineering disciplines who have some prior exposure to probability theory and calculus. It can be used as a text for advanced undergraduate and graduate students in fields including computer science, aerospace and electrical engineering, and management science. It will also be a valuable professional reference for researchers in a variety of disciplines.

Problems after each chapter

A risk analysis textbook which is intended as a basic text for students as well as a reference for practitioners and researchers. It provides a basis for policy analysis and draws upon a variety of case studies.

An Introduction

Uncertainty and Risk

Measurement Uncertainty in Chemical Analysis

Scientific Visualization

An Introduction to Data Analysis and Uncertainty Quantification for Inverse Problems

Doubt-Free Uncertainty In Measurement

Learning with Uncertainty

All measurements are subject to error because no quantity can be known exactly; hence, any measurement has a probability of lying within a

certain range. The more precise the measurement, the smaller the range of uncertainty. Uncertainty, Calibration and Probability is a comprehensive treatment of the statistics and methods of estimating these calibration uncertainties. The book features the general theory of uncertainty involving the combination (convolution) of non-Gaussian, student t, and Gaussian distributions; the use of rectangular distributions to represent systematic uncertainties; and measurable and nonmeasurable uncertainties that require estimation. The author also discusses sources of measurement errors and curve fitting with numerous examples of uncertainty case studies. Many useful tables and computational formulae are included as well. All formulations are discussed and demonstrated with the minimum of mathematical knowledge assumed. This second edition offers additional examples in each chapter, and detailed additions and alterations made to the text. New chapters consist of the general theory of uncertainty and applications to industry and a new section discusses the use of orthogonal polynomials in curve fitting. Focusing on practical problems of measurement, Uncertainty, Calibration and Probability is an invaluable reference tool for R&D laboratories in the engineering/manufacturing industries and for undergraduate and graduate students in physics, engineering, and metrology.

Inverse problems are found in many applications, such as medical imaging, engineering, astronomy, and geophysics, among others. To solve an inverse problem is to recover an object from noisy, usually indirect observations. Solutions to inverse problems are subject to many potential sources of error introduced by approximate mathematical models, regularization methods, numerical approximations for efficient computations, noisy data, and limitations in the number of observations; thus it is important to include an assessment of the uncertainties as part of the solution. Such assessment is interdisciplinary by nature, as it requires, in addition to knowledge of the particular application, methods from applied mathematics, probability, and statistics. This book bridges applied mathematics and statistics by providing a basic introduction to probability and statistics for uncertainty quantification in the context of inverse problems, as well as an introduction to statistical regularization of inverse problems. The author covers basic statistical inference, introduces the framework of ill-posed inverse problems, and explains statistical questions that arise in their applications. An Introduction to Data Analysis and Uncertainty Quantification for Inverse Problems÷includes many examples that explain techniques which are useful to address general problems arising in uncertainty quantification, Bayesian and non-Bayesian statistical methods and discussions of their complementary roles, and analysis of a real data set to illustrate the methodology covered throughout the book.

Computational modeling allows to reduce, refine and replace animal experimentation as well as to translate findings obtained in these experiments to the human background. However these biomedical problems are inherently complex with a myriad of influencing factors, which strongly complicates the model building and validation process. This book wants to address four main issues related to the building and validation of computational models of biomedical processes: 1. Modeling establishment under uncertainty 2. Model selection and parameter fitting 3. Sensitivity analysis and model adaptation 4. Model predictions under uncertainty In each of the abovementioned areas, the book discusses a number of key-techniques by means of a general theoretical description followed by one or more practical examples. This book is intended for graduate students and researchers active in the field of computational modeling of biomedical processes who seek to acquaint themselves with the different ways in which to study the parameter space of their model as well as its overall behavior.

Written by leading experts in the field, Social Theories of Risk and Uncertainty is an introduction to mainstream theorizing on risk and uncertainty in sociology. Provides an overview of the historical developments and conceptual aspects of risk Identifies why theorizing on risk is necessary and highlights specific sociological contributions to this field of research Explores key topics including risk society and reflexive modernization, culture and risk, governmentality and risk, systems theory and risk, and edgework and voluntary risk taking Offers a comprehensive look at the promises, pitfalls, and perspectives of risk theorizing

Social Theories of Risk and Uncertainty

An Approach via the Mathematical Theory of Evidence

Physical Parameters and Calibration of Instruments

An Introduction to Data Analysis in the Physics Laboratory

Uncertainty in Acoustics

Understanding Uncertainty

The Study of Uncertainties in Physical Measurements

This book provides a self-contained, comprehensive and up-to-date presentation of uncertainty theory. The purpose is to equip the readers with an axiomatic approach to deal with uncertainty. For this new edition the entire text has been totally rewritten. The chapters on chance theory and uncertainty theory are completely new. Mathematicians, researchers, engineers, designers, and students will find this work a stimulating and useful reference.

*A lively and informal introduction to the role of uncertainty and probability in people's lives from an everyday perspective From television game shows and gambling techniques to weather forecasting and the financial markets, virtually every aspect of modern life involves situations in which the outcomes are uncertain and of varying qualities. But as noted statistician Dennis Lindley writes in this distinctive text, "We want you to face up to uncertainty, not hide it away under false concepts, but to understand it and, moreover, to use the recent discoveries so that you can act in the face of uncertainty more sensibly than would have been possible without the skill." Accessibly written at an elementary level, this outstanding text examines uncertainty in various everyday situations and introduces readers to three rules--craftily laid out in the book--that prove uncertainty can be handled with as much confidence as ordinary logic. Combining a concept of utility with probability, the book insightfully demonstrates how uncertainty can be measured and used in everyday life, especially in decision-making and science. With a focus on understanding and using probability calculations, Understanding Uncertainty demystifies probability and: * Explains in straightforward detail the logic of uncertainty, its truths, and its falsehoods * Explores what has been learned in the twentieth century about uncertainty * Provides a logical, sensible method for acting in the face of uncertainty * Presents vignettes of great discoveries made in the twentieth century * Shows readers how to discern if another person--whether a lawyer, politician, scientist, or journalist--is talking sense, posing the right questions, or obtaining sound answers Requiring only a basic understanding of mathematical concepts and operations, Understanding Uncertainty is useful as a text for all students who have probability or statistics as part of their course, even at the most introductory level.*

Why is uncertainty so important to politics today? To explore the underlying reasons, issues and challenges, this book's chapters address finance and banking, insurance, technology regulation and critical infrastructures, as well as climate change, infectious disease responses, natural disasters, migration, crime and security and spirituality and religion. The book argues that uncertainties must be understood as complex constructions of knowledge, materiality, experience, embodiment and practice. Examining in particular how uncertainties are experienced in contexts of marginalisation and precarity, this book shows how sustainability and development are not just technical issues, but depend deeply on political values and choices. What burgeoning uncertainties require lies less in escalating efforts at control, but more in a new – more collective, mutualistic and convivial – politics of responsibility and care. If hopes of much-needed progressive transformation are to be realised, then currently blinkered understandings of uncertainty need to be met with renewed democratic struggle. Written in an accessible style and illustrated by multiple case studies from across the world, this book will appeal to a wide cross-disciplinary audience

in fields ranging from economics to law to science studies to sociology to anthropology and geography, as well as professionals working in risk management, disaster risk reduction, emergencies and wider public policy fields.
An overview of experimental methods providing practical advice to students seeking guidance with their experimental work.
Uncertainty, Calibration and Probability
Using the GUM (Guide to the Expression of Uncertainty in Measurement)
Risk and Uncertainty in a Post-Truth Society
An Introduction for Engineers and Students
Natural Hazard Uncertainty Assessment
Dealing with Uncertainties
Uncertainty in Economics

Measurement of values are fundamental in science and technology. Masatoshi's book includes the importance of uncertainty, accuracy and precision of measurement and explains how laser technology has helped improve measurement and in redefining standards. SI units, standards and the importance of lasers for measurement in modern metrology are covered, including the redefinition of the SI units over time.