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An Introduction to Uncertainty in Measurement Uncertainty in Risk Assessment An Introduction to Error Analysis Uncertainty in Remote Sensing and GIS Introduction To Error Analysis Representing Scientific Knowledge Uncertainty Delay and Uncertainty in Human Balancing Tasks Measurement Uncertainties Uncertainty in Geographical Information Uncertainty in Industrial Practice Experimental Uncertainty Analysis: A Textbook for Science and Engineering Students Measurement Uncertainty Uncertainties in Modern Power Systems NIS 80 The Modeling of Uncertainty in Control Systems Uncertainty Quantification Uncertainty in Geometric Computations Quantifying Uncertainty in Subsurface Systems Questioning Misfortune The Certainty of Uncertainty Uncertainty and Feedback Measurement Uncertainty in Chemical Analysis Uncertainty Quantification and Predictive Computational Science The Art of Uncertainty An Introduction to Error Analysis Doubt-Free Uncertainty In Measurement Management of Uncertainty The Politics of Climate Change and Uncertainty in India The Politics of Uncertainty Uncertainties in Nist Noise-Temperature Measurements (Classic Reprint) Uncertainties in Numerical Weather Prediction Uncertainty in Knowledge-Based Systems Confidence Bounds and Propagation of Uncertainties in System Availability and Reliability Computations Uncertainty in Medicine Management and Minimisation of Uncertainties and Errors in Numerical Aerodynamics The Effect of Uncertainties in Physical Properties on Chemical Process Design The Flaw of Averages Stochastic Models of Uncertainties in Computational Mechanics Uncertainty in Post-Reformation Catholicism

This paper develops bounds on the uncertainties in system availabilities or reliabilities which have been computed from structural (series, parallel, etc.) relations among uncertain subsystem availabilities or reliabilities. It is assumed that the highly available (reliable) subsystems have been tested or simulated to determine their unavailabilities (unreliabilities) to within some small percentages of uncertainty. It is shown that series, parallel and r out of n structures which are nominally highly available will have unavailability uncertainties whose percentage errors are of the same order as the subsystem uncertainties. Thus overall system analysis errors, even for large systems, are of the same order of magnitude as the uncertainties in the component probabilities. Both systematic (bias type) uncertainties and independent random uncertainties are considered. Explores methods for the representation and treatment of uncertainty in risk assessment In providing guidance for practical decision-making situations concerning high-consequence technologies (e.g., nuclear, oil and gas, transport, etc.), the theories and methods studied in Uncertainty in Risk Assessment have wide-ranging applications from engineering and medicine to environmental impacts and natural disasters, security, and financial risk management. The main focus, however, is on engineering applications. While requiring some fundamental background in risk assessment, as well as a basic knowledge of probability theory and statistics, Uncertainty in Risk Assessment can be read profitably by a broad audience of professionals in the field, including researchers and graduate students on courses within risk analysis, statistics, engineering, and the physical sciences. Uncertainty in Risk Assessment: Illustrates the need for seeing beyond probability to represent uncertainties in risk assessment contexts. Provides simple explanations (supported by straightforward numerical examples) of the meaning of different types of probabilities, including interval probabilities, and the fundamentals of possibility theory and evidence theory. Offers guidance on when to use probability and when to use an alternative representation of uncertainty. Presents and discusses methods for the representation and characterization of uncertainty in risk assessment. Uses examples to clearly illustrate ideas and concepts. Uncertainties in Modern Power Systems combines several aspects of uncertainty management in power systems at the planning and operation stages within an integrated framework. This book provides the state-of-the-art in electric network planning, including time-scales, reliability, quality, optimal allocation of compensators and distributed generators, mathematical formulation, and search algorithms. The book introduces innovative research outcomes, programs, algorithms, and approaches that consolidate the present status and future opportunities and challenges of power systems. The book also offers a comprehensive description of the overall process in terms of understanding, creating, data gathering, and managing complex electrical engineering applications with uncertainties. This reference is useful for researchers, engineers, and operators in power distribution systems. Includes innovative research outcomes, programs, algorithms, and approaches that consolidate current status and future of modern power systems Discusses how uncertainties will impact on the performance of power systems Offers solutions to significant challenges in power systems planning to achieve the best operational performance of the different electric power sectors LNMech 2 presents the main concepts, formulations, and recent advances in the use of a mathematical-mechanical modeling process to predict the responses of a real structural system in its environment. This book brings together diverse perspectives concerning uncertainty and climate change in India. Uncertainty is a key factor shaping climate and environmental policy at international, national and local levels. Climate change and events such as cyclones, floods, droughts and changing rainfall patterns create uncertainties that planners, resource managers and local populations are regularly confronted with. In this context, uncertainty has emerged as a "wicked problem" for scientists and policymakers, resulting in highly debated and disputed decision-making. The book focuses on India, one of the most climatically vulnerable countries in the world, where there are stark socio-economic inequalities in addition to diverse geographic and climatic settings. Based on empirical research, it covers case studies from coastal Mumbai to dryland Kutch and the Sundarbans delta in West Bengal. These localities offer ecological contrasts, rural–urban diversity, varied exposure to different climate events, and diverse state and official responses. The book unpacks the diverse discourses, practices and politics of uncertainty and demonstrates profound differences through which the "above", "middle" and "below" understand and experience climate change and uncertainty. It also makes a case for bringing together diverse knowledges and approaches to understand and embrace climate-related uncertainties in order to facilitate transformative change. Appealing to a broad professional and student audience, the book draws on wide-ranging theoretical and conceptual approaches from climate science, historical analysis, science, technology and society studies, development studies and environmental studies. By looking at the intersection between local and diverse understandings of climate change and uncertainty with politics, culture, history and ecology, the book argues for plural and socially just ways to tackle climate change in India and beyond. Counsels readers to accept uncertainties in life in order to enable positive opportunities and excitement, sharing strategies for accepting unpredictable circumstances and letting go of the need to control. By the author of The Art of Being. Original. 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. This book demonstrates how delay differential equations (DDEs) can be used to compliment the laboratory investigation of human balancing tasks. This approach is made accessible to non-specialists by comparing mathematical predictions and experimental observations. For example, the observation that a longer pole is easier to balance on a fingertip than a shorter one demonstrates the essential role played by a time delay in the balance control mechanism. Another balancing task

considered is postural sway during quiet standing. With the inverted pendulum as the driver and the feedback control depending on state variables or on an internal model, the feedback can be identified by determining a critical pendulum length and/or a critical delay. This approach is used to identify the nature of the feedback for the pole balancing and postural sway examples. Motivated by the question of how the nervous system deals with these feedback control challenges, there is a discussion of ''microchaotic'' fluctuations in balance control and how robust control can be achieved in the face of uncertainties in the estimation of control parameters. The final chapter suggests some topics for future research. Each chapter includes an abstract and a point-by-point summary of the main concepts that have been established. A particularly useful numerical integration method for the DDEs that arise in balance control is semi-discretization. This method is described and a MATLAB template is provided. This book will be a useful source for anyone studying balance in humans, other bipedal organisms and humanoid robots. Much of the material has been used by the authors to teach senior undergraduates in computational neuroscience and students in bio-systems, biomedical, mechanical and neural engineering. The world is full of people who are very certain--in politics, in religion, in all manner of things. In addition, political, religious, and social organizations are marketing certainty as a cure all to all life's problems. But is such certainty possible? Or even good? The Certainty of Uncertainty explores the question of certainty by looking at the reasons human beings crave certainty and the religious responses we frequently fashion to help meet that need. The book takes an in-depth view of religion, language, our senses, our science, and our world to explore the inescapable uncertainties they reveal. We find that the certainty we crave does not exist. As we reflect on the unavoidable uncertainties in our world, we come to understand that letting go of certainty is not only necessary, it's beneficial. For, in embracing doubt and uncertainty, we find a more meaningful and courageous religious faith, a deeper encounter with mystery, and a way to build strong relationships across religious and philosophical lines. In The Certainty of Uncertainty, we see that embracing our belief systems with humility and uncertainty can be transformative for ourselves and for our world. 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. This book is a collection of work arising from a NSF/ AFOSR sponsored workshop held at the University of California, Santa Barbara, 18-20th June 1992. Sixty-nine researchers, from nine countries, participated. Twelve keynote essays give an overview of the field and speculate on future directions and nineteen technical papers delineate the state of the art in the field. This book serves both as in introduction to the topic and as a reference on the current technical problems and approaches. This book presents the fundamental notions and advanced mathematical tools in the stochastic modeling of uncertainties and their quantification for large-scale computational models in sciences and engineering. In particular, it focuses in parametric uncertainties, and non-parametric uncertainties with applications from the structural dynamics and vibroacoustics of complex mechanical systems, from micromechanics and multiscale mechanics of heterogeneous materials. Resulting from a course developed by the author, the book begins with a description of the fundamental mathematical tools of probability and statistics that are directly useful for uncertainty quantification. It proceeds with a well carried out description of some basic and advanced methods for constructing stochastic models of uncertainties, paying particular attention to the problem of calibrating and identifying a stochastic model of uncertainty when experimental data is available. This book is intended to be a graduate-level textbook for students as well as professionals interested in the theory, computation, and applications of risk and prediction in science and engineering fields. Uncertainties are inevitable in any experimental measurement. Therefore, it is essential for science and engineering graduates to design and develop reliable experiments and estimate the uncertainty in the measurements. This book describes the methods and application of uncertainty analysis during the planning, data analysis, and reporting stages of an experiment. This book is aimed at postgraduate and advanced undergraduate students of various branches of science and engineering. The book teaches methods for estimating random and systematic uncertainties and combining them to determine the overall uncertainty in a measurement. In addition, the method for propagating measurement uncertainties in the calculated result is discussed. The book also discusses methods of reducing the uncertainties through proper instrumentation, data acquisition, and experiment planning. This book provides detailed background and assumptions underlying the uncertainty analysis techniques for the reader to understand their applicability. Various solved examples are provided to demonstrate the application of the uncertainty analysis techniques. The exercises at the end of the chapters have been chosen carefully to reinforce the concepts discussed in the text. Uncertainties in Numerical Weather Prediction is a comprehensive work on the most current understandings of uncertainties and predictability in numerical simulations of the atmosphere. It provides general knowledge on all aspects of uncertainties in the weather prediction models in a single, easy to use reference. The book illustrates particular uncertainties in observations and data assimilation, as well as the errors associated with numerical integration methods. Stochastic methods in parameterization of subgrid processes are also assessed, as are uncertainties associated with surface-atmosphere exchange, orographic flows and processes in the atmospheric boundary layer. Through a better understanding of the uncertainties to watch for, readers will be able to produce more precise and accurate forecasts. This is an essential work for anyone who wants to improve the accuracy of weather and climate forecasting and interested parties developing tools to enhance the quality of such forecasts. Provides a comprehensive overview of the state of numerical weather prediction at spatial scales, from hundreds of meters, to thousands of kilometers Focuses on short-term 1-15 day atmospheric predictions, with some coverage appropriate for longer-term forecasts Includes references to climate prediction models to allow applications of these techniques for climate simulations This book is written for anyone who is interested in how a field of research evolves and the fundamental role of understanding uncertainties involved in different levels of analysis, ranging from macroscopic views to meso- and microscopic ones. We introduce a series of computational and visual analytic techniques, from research areas such as text mining, deep learning, information visualization and science mapping, such that readers can apply these tools to the study of a subject matter of their choice. In addition, we set the diverse set of methods in an integrative context, that draws upon insights from philosophical, sociological, and evolutionary theories of what drives the advances of science, such that the readers of the book can guide their own research with their enriched theoretical foundations. Scientific knowledge is complex. A subject matter is typically built on its own set of concepts, theories, methodologies and findings, discovered by generations of researchers and practitioners. Scientific knowledge, as known to the scientific community as a whole, experiences constant changes. Some changes are long-lasting, whereas others may be short lived. How can we keep abreast of the state of the art as science advances? How can we effectively and precisely convey the status of the current science to the general public as well as scientists across different disciplines? The study of scientific knowledge in general has been overwhelmingly focused on scientific knowledge per se. In contrast, the status of scientific knowledge at various levels of granularity has been largely overlooked. This book aims to highlight the role of uncertainties, in developing a better understanding of the status of scientific knowledge at a particular time, and how its status evolves over the course of the development of research. Furthermore, we demonstrate how the knowledge of the types of uncertainties associated with scientific claims serves as an integral and critical part of our domain expertise. Under the Earth's surface is a rich array of geological resources, many with potential use to humankind. However, extracting and harnessing them comes with enormous uncertainties, high costs, and considerable risks. The valuation of subsurface resources involves assessing discordant factors to produce a decision model that is functional and sustainable. This volume provides real-world examples relating to oilfields, geothermal systems, contaminated sites, and aquifer recharge. Volume highlights include: A multi-disciplinary treatment of uncertainty quantification Case studies with actual data that will appeal to methodology developers A Bayesian evidential learning framework that reduces computation and modeling time Quantifying Uncertainty in

Subsurface Systems is a multidisciplinary volume that brings together five major fields: information science, decision science, geosciences, data science and computer science. It will appeal to both students and practitioners, and be a valuable resource for geoscientists, engineers and applied mathematicians. Read the Editors' Vox: https://eos.org/editors-vox/quantifying-uncertainty-about-earths-resources Reviews, The Leading Edge, SEG, May 2020 The subsurface medium created by geologic processes is not always well understood. The data we collect in an attempt to characterize the subsurface can be incomplete and inaccurate. However, if we understand the uncertainty of our data and the models we generate from them, we can make better decisions regarding the management of subsurface resources. Modeling and managing subsurface resources, and properly characterizing and understanding the uncertainties, requires the integration of a variety of scientific and engineering disciplines. Five case studies are outlined in the introductory chapter, which are used to demonstrate various methods throughout the book. The second chapter introduces the basic notions in decision analysis. Uncertainty quantification is only relevant within the decision framework used. Models alone do not quantify uncertainty, but do allow the determination of key variables that influence models and decisions. Next, an overview of the various data science methods relevant to uncertainty quantification in the subsurface is provided. Sensitivity analysis is then covered, specifically Monte Carlo-based sensitivity analysis. The next three chapters develop the Bayesian approach to uncertainty quantification, and this is the focus of the book. All of this is brought together in Chapter 8, which describes a solution regarding quantifying the uncertainties for each of the problems presented in the first chapter. The authors admit that it is not the only solution. No single solution fits all problems of uncertainty quantification. The results in this chapter allow the reader to see the previously described methods applied and how choices influence models and decisions. The final two chapters discuss various software components necessary to implement the strategies presented in the book and challenges faced in the future of uncertainty quantification. The book uses a number of relevant subsurface problems to explore the various aspects of uncertainty quantification. Understanding uncertainty, and how it affects modeling and decision outcomes, is not always straightforward. However, it is necessary in order to make good, consistent decisions. The book is not an easy read. Some portions require good mathematical understanding of the underlying principles. However, the book is well documented and organized. I would say that is not a good book for a beginner, but it is a good resource for someone to get a grounding to go further into the subject. I appreciate the authors putting together this book on a complex problem that is important to our industry. -- David Bartel, Houston, Texas As Geographic Information Systems (GIS) have developed and their applications have been extended, the issue of uncertainty has become increasingly recognized. It is highlighted by the need to demystify the inherently complex geographical world to facilitate computerization in GIS, by the inaccuracies that emerge from man-machine interactions in dat This volume presents measurement uncertainty and uncertainty budgets in a form accessible to practicing engineers and engineering 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, while 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 where 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 budgets in an accessible style suitable for all undergraduate STEM courses that include a laboratory component Provides a highly adaptable supplement to graduate textbooks for courses where students’ work includes reporting on experimental results Includes an expanded case study developing uncertainty from transducers though measurands and propagated to the final measurement that can be used as a template for the analysis of many processes Stands as a useful pocket reference for all engineers and experimental scientists Problems after each chapter Remote sensing and geographical information science (GIS) have advanced considerably in recent years. However, the potential of remote sensing and GIS within the environmental sciences is limited by uncertainty, especially in connection with the data sets and methods used. In many studies, the issue of uncertainty has been incompletely addressed. The situation has arisen in part from a lack of appreciation of uncertainty and the problems it can cause as well as of the techniques that may be used to accommodate it. This book provides general overviews on uncertainty in remote sensing and GIS that illustrate the range of uncertainties that may occur, in addition to describing the means of measuring uncertainty and the impacts of uncertainty on analyses and interpretations made. Uncertainty in Remote Sensing and GIS provides readers with comprehensive coverage of this largely undocumented subject: * Relevant to a broad variety of disciplines including geography, environmental science, electrical engineering and statistics * Covers range of material from base overviews to specific applications * Focuses on issues connected with uncertainty at various points along typical data analysis chains used in remote sensing and GIS Written by an international team of researchers drawn from a variety of disciplines, Uncertainty in Remote Sensing and GIS provides focussed discussions on topics of considerable importance to a broad research and user community. The book is invaluable reading for researchers, advanced students and practitioners who want to understand the nature of uncertainty in remote sensing and GIS, its limitations and methods of accommodating it. 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. Uncertainty in Post-Reformation Catholicism provides a historical account of early modern probabilism and its theological, intellectual, and cultural implications. First developed in the second half of the sixteenth century, probabilism represented a significant and controversial novelty in Catholic moral theology. By the second half of the seventeenth century, probabilism became and has since been associated with moral, intellectual, and cultural decadence. Stefania Tutino challenges this understanding and claims that probabilism played a central role in addressing the challenges that geographical and cultural expansions posed to traditional Catholic theology. Tutino argues that early modern theologians used probabilism to integrate major changes within the post-Reformation Catholic theological and intellectual system. Probabilist theologians realized that their time was characterized by many changes that traditional theology was not equipped to deal with, which consequently provoked an exponential growth of uncertainties, doubts, and dilemmas of conscience. Probabilism represented the result of their efforts to appreciate, come to terms with, and manage that uncertainty. Uncertainty in Post-Reformation Catholicism reinterprets probabilism as a way of dealing with moral and epistemological doubts in quickly changing times, a way that still may be useful today. Uncertainty in Post-Reformation Catholicism argues that probabilism played a central role in addressing the challenges that a geographically and intellectually expanding world posed to traditional Catholic theology. Early modern probabilist theologians realized that their time was characterized by many changes and novelties that traditional theology was not equipped to deal with, and that consequently provoked an exponential growth of

uncertainties, doubts, and dilemmas of conscience. These theologians used probabilism as a means to integrate changes and novelties within the post-Reformation Catholic theological and intellectual system. Seen in this light, probabilism represented the result of their attempts to appreciate, come to terms with, and manage uncertainty. The problem of uncertainty was not only crucial then, but remains central even today. Despite the unprecedented amount of information available to us, we are becoming less able to formulate arguments based on facts, and more dependent on a cacophony of opinions that often simply reproduce our own implicit or explicit biases, prejudices, and preconceived preferences. This book contains the proceedings of the workshop Uncertainty in Geomet ric Computations that was held in Sheffield, England, July 5-6, 2001. A total of 59 delegates from 5 countries in Europe, North America and Asia attended the workshop. The workshop provided a forum for the discussion of com putational methods for quantifying, representing and assessing the effects of uncertainty in geometric computations. It was organised around lectures by invited speakers, and presentations in poster form from participants. Computer simulations and modelling are used frequently in science and engi neering, in applications ranging from the understanding of natural and artificial phenomena, to the design, test and manufacturing stages of production. This widespread use necessarily implies that detailed knowledge of the limitations of computer simulations is required. In particular, the usefulness of a computer simulation is directly dependent on the user's knowledge of the uncertainty in the simulation. Although an understanding of the phenomena being modelled is an important requirement of a good computer simulation, the model will be plagued by deficiencies if the errors and uncertainties in it are not consid ered when the results are analysed. The applications of computer modelling are large and diverse, but the workshop focussed on the management of un certainty in three areas : Geometric modelling, computer vision, and computer graphics. Excerpt from Uncertainties in Nist Noise-Temperature Measurements The many different systems and our understanding of them have evolved considerably over the years, with concomitant changes m the uncertainty analyses. Even for systems whose uncertainties have not changed, the method of reporting the uncertainties has changed. Prior to about 1993 the common practice in the nist Noise Project was to compute and quote a worst-case or maximum possible error. This was done by estimating the maximum possible value for each component of the uncertainty and then forming the linear sum of the individual components. In 1992 nist officially adopted the policy of reporting uncertainties which conform to the iso guidelines Accordingly, the measurement services offered by the Noise Project now quote an expanded (20) uncertainty, corresponding to a 95 percent confidence level. This required a conversion from worst-case errors to standard uncertainties for the individual components of uncertainty, as well as a change in the manner of combining the components. As a result of all these changes - in the systems, the analyses, and the method of reporting the uncertainty - the uncertainty analysis for a typical system is now scattered in several different places, often rather inaccessible, and-there are sometimes conflicting forms for one analysis. The present paper addresses this problem; it assembles. About the Publisher Forgotten Books publishes hundreds of thousands of rare and classic books. Find more at www.forgottenbooks.com This book is a reproduction of an important historical work. Forgotten Books uses state-of-the-art technology to digitally reconstruct the work, preserving the original format whilst repairing imperfections present in the aged copy. In rare cases, an imperfection in the original, such as a blemish or missing page, may be replicated in our edition. We do, however, repair the vast majority of imperfections successfully; any imperfections that remain are intentionally left to preserve the state of such historical works. Some of the most interesting ethnographies of experience are concerned to highlight the indeterminate nature of life. Questioning Misfortune is very much within this tradition. Based on a long-term study of adversity and its social causes in Bunyole, eastern Uganda, it considers the way in which people deal with uncertainties of life, such as sickness, suffering, marital problems, failure, and death. Divination may identify causes of misfortune, ranging from ancestors and spirits to sorcerers. Sufferers and their families will then try out a variety of remedial measures, including pharmaceuticals, sorcery antidotes, and sacrifices. But remedies often fail, and doubt and uncertainty persist. Even the commercialisation of biomedicine, and the peril of AIDS can be understood in terms of a pragmatics of uncertainty. This textbook teaches the essential background and skills for understanding and quantifying uncertainties in a computational simulation, and for predicting the behavior of a system under those uncertainties. It addresses a critical knowledge gap in the widespread adoption of simulation in high-consequence decision-making throughout the engineering and physical sciences. Constructing sophisticated techniques for prediction from basic building blocks, the book first reviews the fundamentals that underpin later topics of the book including probability, sampling, and Bayesian statistics. Part II focuses on applying Local Sensitivity Analysis to apportion uncertainty in the model outputs to sources of uncertainty in its inputs. Part III demonstrates techniques for quantifying the impact of parametric uncertainties on a problem, specifically how input uncertainties affect outputs. The final section covers techniques for applying uncertainty quantification to make predictions under uncertainty, including treatment of epistemic uncertainties. It presents the theory and practice of predicting the behavior of a system based on the aggregation of data from simulation, theory, and experiment. The text focuses on simulations based on the solution of systems of partial differential equations and includes in-depth coverage of Monte Carlo methods, basic design of computer experiments, as well as regularized statistical techniques. Code references, in python, appear throughout the text and online as executable code, enabling readers to perform the analysis under discussion. Worked examples from realistic, model problems help readers understand the mechanics of applying the methods. Each chapter ends with several assignable problems. Uncertainty Quantification and Predictive Computational Science fills the growing need for a classroom text for senior undergraduate and early-career graduate students in the engineering and physical sciences and supports independent study by researchers and professionals who must include uncertainty quantification and predictive science in the simulations they develop and/or perform. The principal reason for using feedback is to reduce the effect of uncertainties in the description of a system which is to be controlled. H[infinity] loop-shaping is emerging as a powerful but straightforward method for designing robust feedback controllers for complex systems. However, in order to use this, or other modern design techniques, it is first necessary to generate an accurate model of the system (thus appearing to remove the reason for needing feedback in the first place). The v-gap metric is an attempt to resolve this paradox - by indicating in what sense a model should be accurate if it is to be useful for feedback design. This book develops in detail the H[infinity] loop-shaping design method, the v-gap metric and the relationship between the two, showing how they can be used together for successful feedback design. A wide-raging exploration of the place of uncertainty in our emotional and political lives. From climate change to the pandemic, uncertainty looms large over our public and personal lives. It is also the core feature of democratic life: while democratic governance seemingly heightens individual power, it exposes our life chances to the uncertain activity of others. We do not exercise control over those to whom we appeal, and yet we are constantly dependent on their actions for the goods in life we seek. Sheila Jasanoff opens a forum on uncertainty and democracy in this volume, arguing that ideas around our autonomy, our freedom, and our individual agency, particularly in the US, obscure our dependence on others in so many ways. To recognize this political emotion is to start to see the transformative potential in uncertainty. The debate that follows explores the ideas about uncertainty and experts in a democracy, as well its scientific, philosophic, and emotional aspects. Measurement shapes scientific theories, characterises improvements in manufacturing processes and promotes efficient commerce. In concert with measurement is uncertainty, and students in science and engineering need to identify and quantify uncertainties in the 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 reinforce the principles described in the book. This guide is also useful to professionals in industry who are expected to know the contemporary methods in this increasingly important area. Additional online resources are available to support the book at www.cambridge.org/9780521605793. This remarkable text by John R. Taylor has been a non-stop best-selling international hit since it was first published forty years ago. However, the two-plus decades since the second edition was released have seen two dramatic developments; the huge rise in popularity of Bayesian statistics, and the continued increase in the power and availability of

computers and calculators. In response to the former, Taylor has added a full chapter dedicated to Bayesian thinking, introducing conditional probabilities and Bayes' theorem. The several examples presented in the new third edition are intentionally very simple, designed to give readers a clear understanding of what Bayesian statistics is all about as their first step on a journey to become practicing Bayesians. In response to the second development, Taylor has added a number of chapter-ending problems that will encourage readers to learn how to solve problems using computers. While many of these can be solved using programs such as Matlab or Mathematica, almost all of them are stated to apply to commonly available spreadsheet programs like Microsoft Excel. These programs provide a convenient way to record and process data and to calculate quantities like standard deviations, correlation coefficients, and normal distributions; they also have the wonderful ability - if students construct their own spreadsheets and avoid the temptation to use built-in functions - to teach the meaning of these concepts. 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. Managing uncertainties in industrial systems is a daily challenge to ensure improved design, robust operation, accountable performance and responsive risk control. Authored by a leading European network of experts representing a cross section of industries, Uncertainty in Industrial Practice aims to provide a reference for the dissemination of uncertainty treatment in any type of industry. It is concerned with the quantification of uncertainties in the presence of data, model(s) and knowledge about the system, and offers a technical contribution to decision-making processes whilst acknowledging industrial constraints. The approach presented can be applied to a range of different business contexts, from research or early design through to certification or in-service processes. The authors aim to foster optimal trade-offs between literature-referenced methodologies and the simplified approaches often inevitable in practice, owing to data, time or budget limitations of technical decision-makers. Uncertainty in Industrial Practice: Features recent uncertainty case studies carried out in the nuclear, air & space, oil, mechanical and civil engineering industries set in a common methodological framework. Presents methods for organizing and treating uncertainties in a generic and prioritized perspective. Illustrates practical difficulties and solutions encountered according to the level of complexity, information available and regulatory and financial constraints. Discusses best practice in uncertainty modeling, propagation and sensitivity analysis through a variety of statistical and numerical methods. Reviews recent standards, references and available software, providing an essential resource for engineers and risk analysts in a wide variety of industries. This book provides a guide to dealing with quantitative uncertainty in engineering and modelling and is aimed at practitioners, including risk-industry regulators and academics wishing to develop industry-realistic methodologies. Introduction : The Challenge of Uncertainty in Medicine -- The Nature and Etiology of Uncertainty -- The Anatomy of Uncertainty -- The Natural History of Uncertainty -- The Management of Uncertainty -- A Way Forward : Systematizing Uncertainty Tolerance. As I write, the financial systems of the world are collapsing with still no clear indication of what the consequences will be and which measures should be taken to avoid such a crisis in the future. There seems to be agreement though, that the financial instruments introduced in the past few decades entailed far too much complexity and uncertainty and that there was too little regulatory control over the use of these instruments. Management of uncertainty with the aim of achieving self-control is the core concern of this book. It was not written with a focus on financial systems, but many concepts developed in this book are applicable to this field as well. The - neric principles of reducing, maintaining or increasing uncertainties in view of the different contingencies an organization is faced with, the fundamental issue of how much control is possible and who should be in control, and the question of how much and what kind of regulation is necessary with the overall aim of finding an appropriate balance between system stability and flexibility are at the centre of heated debates on the future of finance. A must-read for anyone who makes business decisions that have a major financial impact. As the recent collapse on Wall Street shows, we are often ill-equipped to deal with uncertainty and risk. Yet every day we base our personal and business plans on uncertainties, whether they be next month’s sales, next year’s costs, or tomorrow’s stock price. In The Flaw of Averages, Sam Savageknown for his creative exposition of difficult subjects describes common avoidable mistakes in assessing risk in the face of uncertainty. Along the way, he shows why plans based on average assumptions are wrong, on average, in areas as diverse as healthcare, accounting, the War on Terror, and climate change. In his chapter on Sex and the Central Limit Theorem, he bravely grasps the literary third rail of gender differences. Instead of statistical jargon, Savage presents complex concepts in plain English. In addition, a tightly integrated web site contains numerous animations and simulations to further connect the seat of the reader’s intellect to the seat of their pants. The Flaw of Averages typically results when someone plugs a single number into a spreadsheet to represent an uncertain future quantity. Savage finishes the book with a discussion of the emerging field of Probability Management, which cures this problem though a new technology that can pack thousands of numbers into a single spreadsheet cell. Praise for The Flaw of Averages “Statistical uncertainties are pervasive in decisions we make every day in business, government, and our personal lives. Sam Savage’s lively and engaging book gives any interested reader the insight and the tools to deal effectively with those uncertainties. I highly recommend The Flaw of Averages.” —William J. Perry, Former U.S. Secretary of Defense “Enterprise analysis under uncertainty has long been an academic ideal. . . . In this profound and entertaining book, Professor Savage shows how to make all this practical, practicable, and comprehensible.” —Harry Markowitz, Nobel Laureate in Economics This volume reports results from the German research initiative MUNA (Management and Minimization of Errors and Uncertainties in Numerical Aerodynamics), which combined development activities of the German Aerospace Center (DLR), German universities and German aircraft industry. The main objective of this five year project was the development of methods and procedures aiming at reducing various types of uncertainties that are typical of numerical flow simulations. The activities were focused on methods for grid manipulation, techniques for increasing the simulation accuracy, sensors for turbulence modelling, methods for handling uncertainties of the geometry and grid deformation as well as stochastic methods for quantifying aleatoric uncertainties.

- Confidence Bounds And Propagation Of Uncertainties In System Availability And Reliability Computations
- Uncertainty In Medicine
- Management And Minimisation Of Uncertainties And Errors In Numerical Aerodynamics
- The Effect Of Uncertainties In Physical Properties On Chemical Process Design
- The Flaw Of Averages
- Stochastic Models Of Uncertainties In Computational Mechanics
- Uncertainty In Post Reformation Catholicism