Stochastic Process Variation In Deep Submicron Cmos

This book provides a rigorous yet accessible introduction to the theory of stochastic processes. A significant part of the book is devoted to the classic theory of stochastic processes. In turn, it also presents proofs of well-known results, sometimes together with new approaches. Moreover, the book explores topics not previously covered elsewhere, such as distributions of functionals of diffusions stopped at different random times, the Brownian local time, diffusions with jumps, and an invariance principle for random walks and local times. Supported by carefully selected material, the book showcases a wealth of examples that demonstrate how to solve concrete problems by applying theoretical results. It addresses a broad range of applications, focusing on concrete computational techniques rather than on abstract theory. The content presented here is largely self-contained, making it suitable for researchers and graduate students alike.

The last 50 years have seen a tremendous progress in the research on quasars. From a time when quasars were unforeseen oddities, we have come to a view that considers quasars as active galactic nuclei, with nuclear activity a coming-of-age experienced by most or all galaxies in their evolution. We have passed from a few tens of known quasars of the early 1970s to the 500,000 listed in the catalogue of the Data Release 14 of the Sloan Digital Sky Survey. Not surprisingly, accretion processes on the central black holes in the nuclei of galaxies the key concept in our understanding of quasars and active nuclei in general have gained an outstanding status in present-day astrophysics. Accretion produces a rich spectrum of phenomena in all bands of the electromagnetic spectrum. The power output of highly-accreting quasars has impressive effects on their host galaxies. All the improvement in telescope light gathering and in computing power notwithstanding, we still miss a clear connection between observational properties and theory for quasars, as provided, for example, by the H-R diagram for stars. We do not yet have a complete self-consistent view of nuclear activity with predictive power, as we do for main-sequence stellar sources. At the same time quasars offer many windows open onto the unknown". On small scales, quasar properties depend on phenomena very close to the black hole event horizon. On large scales, quasars may effect evolution of host galaxies and their circum-galactic environments. Quasars potential to map the matter density of the Universe and help reconstruct the Universes spacetime geometry is still largely unexploited. The times are ripe for a critical assessment of our present knowledge of quasars as accreting black holes and of their evolution across the cosmic time. The foremost aim of this research topic is to review and contextualize the main observational scenarios following an empirical approach, to present and discuss the accretion scenario, and then to analyze how a closer connection between theory and observation can be achieved, identifying those aspects of our understanding that are still on a shaky terrain and are therefore uncertain knowledge. This research topic covers topics ranging from the nearest environment of the black hole, to the environment of the host galaxies of active nuclei, and to the quasars as markers of the large scale structure and of the geometry of spacetime of the Universe. The spatial domains encompass the accretion disk, the emission and absorption regions, circum-nuclear starbursts, the host galaxy and its interaction with other galaxies. Systematic attention is devoted to some key problems that remain outstanding and are clearly not yet solved: the existence of two quasar classes, radio quiet and radio loud, and in general, the systematic contextualization of quasar properties the properties of the central black hole, the dynamics of the accretion flow in the inner parsecs and the origin of the accretion matter, the quasars small and large scale environment, the feedback processes produced by the black hole into the host galaxy, quasar evolutionary patterns from seed black holes to the present-day Universe, and the use of quasars as cosmological standard candles. The timing is appropriate as we are now witnessing a growing body of results from major surveys in the optical, UV X, near and far IR, and radio spectral domains. Radio instrumentation has been upgraded to linear detector a change that resembles the introduction of CCDs for optical astronomy making it possible to study radio-quiet quasars at radio frequencies. Herschel and ALMA are especially suited to study the circum-nuclear star formation processes. The new generation of 3D magnetohydrodynamical models offers the prospective of a full physical modeling of the whole quasar emitting regions. At the same time, on the forefront of optical astronomy, applications of adaptive optics to long-slit spectroscopy is yielding unprecedented results on high redshift quasars. Other measurement techniques like 2D and photometric reverberation mapping are also yielding an unprecedented amount of data thanks to dedicated experiments and instruments. Thanks to the instrumental advances, ever growing computing power as well as the coming of age of statistical and analysis techniques, the smallest spatial scales are being probed at unprecedented resolution for wide samples of quasars. On large scales, feedback processes are going out of the realm of single-object studies and are entering into the domain of issues involving efficiency and prevalence over a broad range of cosmic epochs. The Research Topic "Quasars at all Cosmic Epochs" collects a large fraction of the contributions presented at a meeting held in Padova, sponsored jointly by the National Institute for Astrophysics, the Padova Astronomical Observatory, the Department of Physics and Astronomy of the University of Padova, and the Instito de Astrofísica de Andalucía (IAA) of the Consejo Superiór de Investigación Cientifica (CSIC). The meeting has been part of the events meant to celebrate the 250th anniversary of the foundation of the Padova Observatory.

In the past half-century the theory of probability has grown from a minor isolated theme into a broad and intensive discipline interacting with many other branches of mathematics. At the same time it is playing a central role in the mathematization of various applied sciences such as statistics, opera tions research, biology, economics and psychology-to name a few to which the prefix "mathematical" has so far been firmly attached. The coming-of-age of probability has been reflected in the change of contents of textbooks on the subject. In the old days most of these books showed a visible split personality torn between the combinatorial games of chance and the so-called "theory of errors" centering in the normal distribution. This period ended with the appearance of Feller's classic treatise (see [Feller l]t) in 1950, from the manuscript of which I gave my first substantial course in probability. With the passage of time probability theory and its applications have won a place in the college curriculum as a mathematical discipline essential to many fields of study. The elements of the theory are now given at different levels, sometimes even before calculus. The present textbook is intended for a course at about the sophomore level. It presupposes no prior acquaintance with the subject and the first three chapters can be read largely without the benefit of calculus.

Stochastic Process Variation in Deep-Submicron CMOSCircuits and AlgorithmsSpringer Science & Business Media

Hydrodynamics of Estuaries and Fjords

Markov processes are among the most important stochastic processes for both theory and applications. This book develops the general theory of these processes, and applies this theory to various special examples. The initial chapter is devoted to the most important classical example - one dimensional Brownian motion. This, together with a chapter on continuous time Markov chains, provides the motivation for the general setup based on semigroups and generators. Chapters on stochastic calculus and probabilistic potential theory give an introduction to some of the key areas of application of Brownian motion and its relatives. A chapter on interacting particle systems treats a more recently developed class of Markov processes that have as their origin problems in physics and biology. This is a textbook for a graduate course that can follow one that covers basic probabilistic limit theorems and discrete time processes.

Simulation of brain neurons in real-time using biophysically-meaningful models is a pre-requisite for comprehensive understanding of how neurons process information and communicate with each other, in effect efficiently complementing in-vivo experiments. In spiking neural networks (SNNs), propagated information is not just encoded by the firing rate of each neuron in the network, as in artificial neural networks (ANNs), but, in addition, by amplitude, spike-train patterns, and the transfer rate. The high level of realism of SNNs and more significant computational and analytic capabilities in comparison with ANNs, however, limit the size of the realized networks. Consequently, the main challenge in building complex and biophysically-accurate SNNs is largely posed by the high computational and data transfer demands. Real-Time Multi-Chip Neural Network for Cognitive Systems presents novel real-time, reconfigurable, multi-chip SNN system architecture based on localized communication, which effectively reduces the communication cost to a linear growth. The system use double floating-point arithmetic for the most biologically accurate cell behavior simulation, and is flexible enough to offer an easy implementation of various neuron network topologies, cell communication schemes, as well as models and kinds of cells. The system offers a high run-time configurability, which reduces the need for resynthesizing the system. In addition, the simulator features configurable on- and off-chip communication latencies as well as neuron calculation latencies. All parts of the system are generated automatically based on the neuron interconnection scheme in use. The simulator allows exploration of different system configurations, e.g. the interconnection scheme between the neurons, the intracellular concentration of different chemical compounds (ions), which affect how action potentials are initiated and propagate.

Cyclogenesis research is a central issue of meteorology and climatology. This book gives a deep specific view and fundamentally and effectively contributes to the discussion of the problem. It treats cyclogenisis as a stochastic process in a very fundamental way. Since the publication of the first edition of Global Tropical Cyclogenesis in 2001, a number of important scientific results has been obtained using methods and techniques proposed in that first edition. There is therefore a great need for a revised 2nd edition of this book. It is based on scientific findings from the performance of satellite data processing and a series of scientific marine expeditions to the tropics as part of major Russian Science Academy research projects. Professor Eugene A. Sharkov has proposed the main approaches, experimental techniques and theoretical explanations for many scientific findings as well as new methods of satellite processing. He is recognized as a leading scientist in the field of microwave remote sensing of terrestrial surfaces and atmosphere and in nonlinear geophysics (origination and evolution of atmospheric catastrophes) and has published around 100 scientific works on the problems of global tropical cyclogenesis structure and evolution.

Probability is the bedrock of machine learning. You cannot develop a deep understanding and application of machine learning without it. Cut through the equations, Greek letters, and confusion, and discover the topics in probability that you need to know. Using clear explanations, standard Python libraries, and step-by-step tutorial lessons, you will discover the importance of probability to machine learning, Bayesian probability, entropy, density estimation, maximum likelihood, and much more.

This work offers a highly useful, well developed reference on Markov processes, the universal model for random processes and evolutions. The wide range of applications, in exact sciences as well as in other areas like social studies, require a volume that offers a refresher on fundamentals before conveying the Markov processes and examples for applications. This work does just that, and with the necessary mathematical rigor.

Noise abatement is the key problem of small-scaled circuit design. New computational paradigms are needed -- as these circuits shrink, they become very vulnerable to noise and soft errors. In this lecture, we present a probabilistic computation framework for improving the resiliency of logic gates and circuits under random conditions induced by voltage or current fluctuation. Among many probabilistic techniques for modeling such devices, only a few models satisfy the requirements of efficient hardware implementation -- specifically, Boltzman machines and Markov Random Field (MRF) models. These models have similar built-in noise-immunity characteristics based on feedback mechanisms. In probabilistic models, the values 0 and 1 of logic functions are replaced by degrees of beliefs that these values occur. An appropriate metric for degree of belief is probability. We discuss various approaches for noise-resilient logic gate design, and propose a novel design taxonomy based on implementation of the MRF model by a new type of binary decision diagram (BDD), called a cyclic BDD. In this approach, logic gates and circuits are designed using 2-to-1 bi-directional switches. Such circuits are often modeled using Shannon expansions with the corresponding graph-based implementation, BDDs. Simulation experiments are reported to show the noise immunity of the proposed structures. Audiences who may benefit from this lecture include graduate students taking classes on advanced computing device design, and academic and industrial researchers. Table of Contents: Introduction to probabilistic computation models / Nanoscale circuits and fluctuation problems / Estimators and Metrics / MRF Models of Logic Gates / Neuromorphic models / Noise-tolerance via error correcting / Conclusion and future work

One of the most notable features of nanometer scale CMOS technology is the increasing magnitude of variability of the key device parameters affecting performance of integrated circuits. The growth of variability can be attributed to multiple factors, including the difficulty of manufacturing control, the emergence of new systematic variation-generating mechanisms, and most importantly, the increase in atomic-scale randomness, where device operation must be described as a stochastic process. In addition to wide-sense stationary stochastic device variability and temperature variation, existence of non-stationary stochastic electrical noise associated with fundamental processes in integrated-circuit devices represents an elementary limit on the performance of electronic circuits. In an attempt to address these issues, Stochastic Process Variation in Deep-Submicron CMOS: Circuits and Algorithms offers unique combination of mathematical treatment of random process variation, electrical noise and temperature and necessary circuit realizations for on-chip monitoring and performance calibration. The associated problems are addressed at various abstraction levels, i.e. circuit level, architecture level and system level. It therefore provides a broad view on the various solutions that have to be used and their possible combination in very effective complementary techniques for both analog/mixed-signal and digital circuits. The feasibility of the described algorithms and built-in circuitry has been verified by measurements from the silicon prototypes fabricated in standard 90 nm and 65 nm CMOS technology.

Hydraulic fracturing has been and continues to be a major techno logical tool in oil and gas recovery, nuclear and other waste disposal, mining and particularly in-situ coal gasification, and, more recently, in geothermal heat recovery, particularly extracting heat from hot dry rock masses. The understanding of the fracture process under the ac tion of pressurized fluid at various temperatures is of fundamental scientific importance, which requires an adequate description of thermomechanical properties of subsurface rock, fluid-solid interaction effects, as well as degradation of the host rock due to temperature gradients introduced by heat extraction. Considerable progress has been made over the past several years in laboratory experiments, analytical and numerical modeling, and in-situ field studies in various aspects of hydraulic fracturing and geothermal energy extraction, by researchers in the United States and Japan and also elsewhere. However, the results have been scattered throughout the literature. Therefore, the time seemed ripe for bringing together selected researchers from the two countries, as well as observers from other countries, in order to survey the state of the art, exchange scientific information, and establish closer collaboration for further, better coordinated scientific effort in this important area of research and exploration.

Design considerations for low-power operations and robustness with respect to variations typically impose contradictory requirements. Low-power design techniques such as voltage scaling, dual-threshold assignment and gate sizing can have large negative impact on parametric yield under process variations. This book focuses on circuit/architectural design techniques for achieving low power operation under parameter variations. We consider both logic and memory design aspects and cover modeling and analysis, as well as design methodology to achieve simultaneously low power and variation tolerance, while minimizing design overhead. This book will discuss current industrial practices and emerging challenges at future technology nodes.

This book was first published in 2004. Many observed phenomena, from the changing health of a patient to values on the stock market, are characterised by quantities that vary over time: stochastic processes are designed to study them. This book introduces practical methods of applying stochastic processes to an audience knowledgeable only in basic statistics. It covers almost all aspects of the subject and presents the theory in an easily accessible form that is highlighted by application to many examples. These examples arise from dozens of areas, from sociology through medicine to engineering. Complementing these are exercise sets making the book suited for introductory courses in stochastic processes. Software (available from www.cambridge.org) is provided for the freely available R system for the reader to apply to all the models presented.

This eagerly awaited textbook covers everything the graduate student in probability wants to know about Brownian motion, as well as the latest research in the area. Starting with the construction of Brownian motion, the book then proceeds to sample path properties like continuity and nowhere differentiability. Notions of fractal dimension are introduced early and are used throughout the book to describe fine properties of Brownian paths. The relation of Brownian motion and random walk is explored from several viewpoints, including a development of the theory of Brownian local times from random walk embeddings. Stochastic integration is introduced as a tool and an accessible treatment of the potential theory of Brownian motion clears the path for an extensive treatment of intersections of Brownian paths. An investigation of exceptional points on the Brownian path and an appendix on SLE processes, by Oded Schramm and Wendelin Werner, lead directly to recent research themes.

Since 2007, the repeated financial crises around the world have brought to the headlines financial practices and models considered to fuel the economic instabilities. Deep Dive into Financial Models: Modeling Risk and Uncertainty comes handy in demystifying the underlying quantitative finance concepts. With a limited use of mathematical formalism, the book explains thoroughly the models, their hypotheses, principles and other building blocks. A particular care is given to model limitations and their misuse for investment strategies, asset pricing, or risk management. Its reader-friendly nature provides readers with a head start in quantitative finance. Request Inspection Copy Contents:Interest RatesCredit Risk ModelingPortfolio Management TheoriesNo-arbitrage TheoryThe Black-Scholes ModelVolatility ModelsNumerical MethodsValue at Risk (VaR)Non-Gaussian Models Readership: Undergraduate and graduate students who are taking up Quantitative Finance courses and those who possess college mathematical background.

This volume features a collection of contributed articles and lecture notes from the XI Symposium on Probability and Stochastic Processes, held at CIMAT Mexico in September 2013. Since the symposium was part of the activities organized in Mexico to celebrate the International Year of Statistics, the program included topics from the interface between statistics and stochastic processes.

There is a widespread assumption that the universe in general, and life in particular, is 'getting more complex with time'. This book brings together a wide range of experts in science, philosophy and theology and unveils their joint effort in exploring this idea. They confront essential problems behind the theory of complexity and the role of life within it: what is complexity? When does it increase, and why? Is the universe evolving towards states of ever greater complexity and

diversity? If so, what is the source of this universal enrichment? This book addresses those difficult questions, and offers a unique cross-disciplinary perspective on some of the most profound issues at the heart of science and philosophy. Readers will gain insights in complexity that reach deep into key areas of physics, biology, complexity science, philosophy and religion.

Game theory involves multi-person decision making and differential dynamic game theory has been widely applied to n-person decision making problems, which are stimulated by a vast number of applications. This book addresses the gap to discuss general stochastic n-person noncooperative and cooperative game theory with wide applications to control systems, signal processing systems, communication systems, managements, financial systems, and biological systems. H∞ game strategy, n-person cooperative and noncooperative game strategy are discussed for linear and nonlinear stochastic systems along with some computational algorithms developed to efficiently solve these game strategies.

Modern survival analysis and more general event history analysis may be effectively handled within the mathematical framework of counting processes. This book presents this theory, which has been the subject of intense research activity over the past 15 years. The exposition of the theory is integrated with careful presentation of many practical examples, drawn almost exclusively from the authors'own experience, with detailed numerical and graphical illustrations. Although Statistical Models Based on Counting Processes may be viewed as a research monograph for mathematical statisticians and biostatisticians, almost all the methods are given in concrete detail for use in practice by other mathematically oriented researchers studying event histories (demographers, econometricians, epidemiologists, actuarial mathematicians, reliability engineers and biologists). Much of the material has so far only been available in the journal literature (if at all), and so a wide variety of researchers will find this an invaluable survey of the subject.

Computational neurosciences and systems biology are among the main domains of life science research where mathematical modeling made a difference. This book introduces the many different types of computational studies one can develop to study neuronal systems. It is aimed at undergraduate students starting their research in computational neurobiology or more senior researchers who would like, or need, to move towards computational approaches. Based on their specific project, the readers would then move to one of the more specialized excellent textbooks available in the field. The first part of the book deals with molecular systems biology. Functional genomics is introduced through examples of transcriptomics and proteomics studies of neurobiological interest. Quantitative modelling of biochemical systems is presented in homogeneous compartments and using spatial descriptions. A second part deals with the various approaches to model single neuron physiology, and naturally moves to neuronal networks. A division is focused on the development of neurons and neuronal systems and the book closes on a series of methodological chapters. From the molecules to the organ, thinking at the level of systems is transforming biology and its impact on society. This book will help the reader to hop on the train directly in the tank engine.

Stochastic processes have wide relevance in mathematics both for theoretical aspects and for their numerous real-world applications in various domains. They represent a very active research field which is attracting the growing interest of scientists from a range of disciplines. This Special Issue aims to present a collection of current contributions concerning various topics related to stochastic processes and their applications. In particular, the focus here is on applications of stochastic processes as models of dynamic phenomena in research areas certain to be of interest, such as economics, statistical physics, queuing theory, biology, theoretical neurobiology, and reliability theory. Various contributions dealing with theoretical issues on stochastic processes are also included.

The book presents, for the first time, a detailed analysis of harmonizable processes and fields (in the weak sense) that contain the corresponding stationary theory as a subclass. It also gives the structural and some key applications in detail. These include Levy's Brownian motion, a probabilistic proof of the longstanding Riemann's hypothesis, random fields indexed by LCA and hypergroups, extensions to bistochastic operators, Cramér-Karhunen classes, as well as bistochastic operators with some statistical applications.The material is accessible to graduate students in probability and statistics as well as to engineers in theoretical applications. There are numerous extensions and applications pointed out in the book that will inspire readers to delve deeper.

"Covers the areas of modern analysis and probability theory. Presents a collection of papers given at the Festschrift held in honor of the 65 birthday of M. M. Rao, whose prolific published research includes the well-received Marcel Dekker, Inc. books Theory of Orlicz Spaces and Conditional Measures and Applications. Features previously unpublished research articles by a host of internationally recognized scholars."

The second of two volumes in the Electronic Design Automation for Integrated Circuits Handbook, Second Edition, Electronic Design Automation for IC Implementation, Circuit Design, and Process Technology thoroughly examines real-time logic (RTL) to GDSII (a file format used to transfer data of semiconductor physical layout) design flow, analog/mixed signal design, physical verification, and technology computer-aided design (TCAD). Chapters contributed by leading experts authoritatively discuss design for manufacturability (DFM) at the nanoscale, power supply network design and analysis, design modeling, and much more. New to This Edition: Major updates appearing in the initial phases of the design flow, where the level of abstraction keeps rising to support more functionality with lower non-recurring engineering (NRE) costs Significant revisions reflected in the final phases of the design flow, where the complexity due to smaller and smaller geometries is compounded by the slow progress of shorter wavelength lithography New coverage of cutting-edge applications and approaches realized in the decade since publication of the previous edition—these are illustrated by new

chapters on 3D circuit integration and clock design Offering improved depth and modernity, Electronic Design Automation for IC Implementation, Circuit Design, and Process Technology provides a valuable, state-of-the-art reference for electronic design automation (EDA) students, researchers, and professionals.

Praise for the First Edition ". . . an excellent textbook . . . well organized and neatly written." —Mathematical Reviews ". . . amazingly interesting . . ." —Technometrics Thoroughly updated to showcase the interrelationships between probability, statistics, and stochastic processes, Probability, Statistics, and Stochastic Processes, Second Edition prepares readers to collect, analyze, and characterize data in their chosen fields. Beginning with three chapters that develop probability theory and introduce the axioms of probability, random variables, and joint distributions, the book goes on to present limit theorems and simulation. The authors combine a rigorous, calculus-based development of theory with an intuitive approach that appeals to readers' sense of reason and logic. Including more than 400 examples that help illustrate concepts and theory, the Second Edition features new material on statistical inference and a wealth of newly added topics, including: Consistency of point estimators Large sample theory Bootstrap simulation Multiple hypothesis testing Fisher's exact test and Kolmogorov-Smirnov test Martingales, renewal processes, and Brownian motion One-way analysis of variance and the general linear model Extensively class-tested to ensure an accessible presentation, Probability, Statistics, and Stochastic Processes, Second Edition is an excellent book for courses on probability and statistics at the upper-undergraduate level. The book is also an ideal resource for scientists and engineers in the fields of statistics, mathematics, industrial management, and engineering.

Since their first introduction in natural sciences through the work of Einstein on Brownian motion in 1905 and further works, in particular by Langevin, Smoluchowski and others, stochastic processes have been used in several areas of science and technology. For example, they have been applied in chemical studies, or in fluid turbulence and for combustion and reactive flows. The articles in this book provide a general and unified framework in which stochastic processes are presented as modeling tools for various issues in engineering, physics and chemistry, with particular focus on fluid mechanics and notably dispersed two-phase flows. The aim is to develop what can referred to as stochastic modeling for a whole range of applications.

Prologue; Acknowledgments; Contents; 1. An Introduction to Mathematical Probability with Applications in Mendelian Genetics; 1.1 Introduction; 1.2 Mathematical Probability in Mendelian Genetics; 1.3 Examples of Finite Probability Spaces; Example 1.3.1: An Equal Frequency Model; Example 1.3.2: Partitions of an Abstract Set; Example 1.3.3: A Deterministic Case; Example 1.3.4: Inheritance of Eye Color and Sex; 1.4 Elementary Combinatorial Analysis; 1.5 The Binomial Distribution; Example 1.5.1: Distribution of Boys and Girls in Families of Size N.

This definitive textbook provides a solid introduction to discrete and continuous stochastic processes, tackling a complex field in a way that instils a deep understanding of the relevant mathematical principles, and develops an intuitive grasp of the way these principles can be applied to modelling real-world systems. It includes a careful review of elementary probability and detailed coverage of Poisson, Gaussian and Markov processes with richly varied queuing applications. The theory and applications of inference, hypothesis testing, estimation, random walks, large deviations, martingales and investments are developed. Written by one of the world's leading information theorists, evolving over twenty years of graduate classroom teaching and enriched by over 300 exercises, this is an exceptional resource for anyone looking to develop their understanding of stochastic processes.

The 33rd Bernoulli Society Conference on Stochastic Processes and Their Applications was held in Berlin from July 27 to July 31, 2009. It brought together more than 600 researchers from 49 countries to discuss recent progress in the mathematical research related to stochastic processes, with applications ranging from biology to statistical mechanics, finance and climatology. This book collects survey articles highlighting new trends and focal points in the area written by plenary speakers of the conference, all of them outstanding international experts. A particular aim of this collection is to inspire young scientists to pursue research goals in the wide range of fields represented in this volume.

With the fast advancement of CMOS fabrication technology, more and more signal-processing functions are implemented in the digital domain for a lower cost, lower power consumption, higher yield, and higher re-configurability. This has recently generated a great demand for low-power, low-voltage A/D converters that can be realized in a mainstream deep-submicron CMOS technology. However, the discrepancies between lithography wavelengths and circuit feature sizes are increasing. Lower power supply voltages significantly reduce noise margins and increase variations in process, device and design parameters. Consequently, it is steadily more difficult to control the fabrication process precisely enough to maintain uniformity. The inherent randomness of materials used in fabrication at nanoscopic scales means that performance will be increasingly variable, not only from die-to-die but also within each individual die. Parametric variability will be compounded by degradation in nanoscale integrated circuits resulting in instability of parameters over time, eventually leading to the development of faults. Process variation cannot be solved by improving manufacturing tolerances; variability must be reduced by new device technology or managed by design in order for scaling to continue. Similarly, within-die performance variation also imposes new challenges for test methods. In an attempt to address these issues, Low-Power High-Resolution Analog-to-Digital Converters specifically focus on: i) improving the power efficiency for the high-speed, and low spurious spectral A/D conversion performance by exploring the potential of low-voltage analog design and calibration techniques, respectively, and ii)

development of circuit techniques and algorithms to enhance testing and debugging potential to detect errors dynamically, to isolate and confine faults, and to recover errors continuously. The feasibility of the described methods has been verified by measurements from the silicon prototypes fabricated in standard 180nm, 90nm and 65nm CMOS technology.

Theory for Applications
Real-Time Multi-Chip Neural Network for Cognitive Systems
Stochastic Processes and Functional Analysis
Brownian Motion
Low-Power High-Resolution Analog to Digital Converters
Continuous Time Markov Processes
Statistical Models Based on Counting Processes
Stochastic Game Strategies and their Applications
Discover How To Harness Uncertainty With Python
Proceedings of the First Japan-United States Joint Seminar on Hydraulic Fracturing and Geothermal Energy, Tokyo, Japan, November 2-5, 1982, and Symposium on Fracture Mechanics Approach to Hydraulic Fracturing and Geothermal Energy, Sendai, Japan November 8-9, 1982
Computer Experiments in the Quantification of Mutation and Selection

Stochastic Partial Differential Equations and Applications gives an overview of current state-of-the-art stochastic PDEs in several fields, such as filtering theory, stochastic quantization, quantum probability, and mathematical finance. Featuring contributions from leading expert participants at an international conference on the subject, this book presents valuable information for PhD students in probability and PDEs as well as for researchers in pure and applied mathematics. Coverage includes Navier-Stokes equations, Ornstein-Uhlenbeck semigroups, quantum stochastic differential equations, applications of SPDE, 3D stochastic Navier-Stokes equations, and nonlinear filtering.

This book provides a complete overview of significant design challenges in respect to circuit miniaturization and power reduction of the neural recording system, along with circuit topologies, architecture trends, and (post-silicon) circuit optimization algorithms. The introduced novel circuits for signal conditioning, quantization, and classification, as well as system configurations focus on optimized power-per-area performance, from the spatial resolution (i.e. number of channels), feasible wireless data bandwidth and information quality to the delivered power of implantable system.

This book focuses on two major challenges in the climate sciences: 1) to describe the decadal-to-centennial variations in instrumental and proxy records; and 2) to distinguish between anthropogenic variations and natural variability. The National Taiwan University invited some of the world's leading experts across the areas of observational analysis, mathematical theory, and modeling to discuss these two issues. The outcome of the meeting is the 23 chapters in this book that review the state of the art in theoretical, observational and modeling research on internal, unforced and externally forced climate variability. The main conclusion of this research is that internal climate variability on decadal and longer time scales is so large that sidestepping it may lead to false estimates of the climate's sensitivity to anthropogenic forcing. Contents:Attribution of Climate Change in the Presence of Internal Variability (John M Wallace, Clara Deser, Brian V Smoliak, and Adam S Phillips)A Mathematical Theory of Climate Sensitivity or, How to Deal With Both Anthropogenic Forcing and Natural Variability? (Michael Ghil)Fluctuation-dissipation Theorem with Application to Climate Change Studies with Seasonal Impact (Xiaoming Wang)Parametrization of Cross-scale Interaction in Multiscale Systems (Jeroen Wouters and Valerio Lucarini)Dynamics of Nonlinear Error Growth and the "Spring Predictability Barrier" for El Ni ñ o Predictions (Wansuo Duan and Mu Mu)An Adaptive Approach for Nonlinear and Nonstationary Data Analysis (Norden E Huang)Internal Southern Ocean Centennial Variability: Dynamics, Impacts and Implications for Global Warming (Mojib Latif, Torge Martin, Wonsun Park, and Mohammad H Bordbar)Atlantic Meridional Overturning Circulation and Climate (Rong Zhang)North Atlantic Multi-Decadal Variability — Mechanisms and Predictability (Noel S Keenlyside, Jin Ba, Jennifer Mecking, Nour-Eddine Omrani, Mojib Latif, Rong Zhang, and Rym Msadek)A Review of the Dynamics of Pacific Interdecadal Climate Variability (Zhengyu Liu)Global-Scale Decadal Hyper Modes (Dietmar Dommenget)Evidence for a Recurrent Multi-Decadal Oscillation in Global Temperature and Possible Impacts on 21st Century Climate Projections (Ka-Kit Tung and Jiansong Zhou)Variability of Sea Ice Extent Over Decadal and Longer Timescales (John E Walsh and William L Chapman)Multi-year Prediction and Predictability (Timothy DelSole, Michael K Tippett, and Liwei Jia)Decadal Hydroclimate Variability Across the Americas (Richard Seager)The Interhemispheric Pattern and Long-Term Variations in the Tropical Climate over the 20th and 21st Centuries (John C H Chiang)Climate of China in the Holocene (Wang Shaowu, Wen Xinyu, and Huang Jianbin)North Atlantic Hurricane Activity: Past, Present and Future (Rym Msadek, Gabriel A Vecchi, and Thomas R Knutson)Observed Variations of Western North Pacific Tropical Cyclone Activity on Decadal Time Scales and Longer (Johnny C L Chan)Record-Breaking Increase of Tropical Cyclone Heavy Rainfall in Taiwan in the First Decade of 21st Century (Chih-Pei Chang, Hung-Chi Kuo, and Chung-Hsiung Sui)Multi-Decadal Variability in Indian Summer Monsoon Rainfall Using Proxy Data (Bhupendra N Goswami, Ramesh H Kripalani, Hemant P Borgaonkar, and Bhaskar Preethi)The South-Flood North-Drought Pattern Over Eastern China and the Drying of the Gangetic Plain (Sumant Nigam, Yongjing Zhao, Alfredo Ruiz-Barradas, and Tianjun Zhou)Impacts of Aerosols on the Asian Monsoon — An Interim Assessment (William K M Lau and Kyu-Myong Kim) Readership: Graduate students, academics and researchers in atmospheric sciences, oceanography, mathematics, and climate change. Keywords:Climate Change;Multidecadal Variability;Climate Variability Asia-Pacific Weather

This volume focuses on the area of the physics of complex systems and provides both an overview of the field and more detailed examination of those topics within the field that are currently of greatest interest to researchers. The properties of complex systems play an important role in a variety of different and overlapping areas in physics, chemistry, biology, mathematics and technology. The research field of complex systems is very broad, but this volume attempts to be comprehensive. This book is a useful reference work for researchers in this area, whether graduate students or advanced academics. Up-to-date reviews of cutting-edge topics are provided, compiled by leading authorities and designed to both broaden the reader's insight and encourage the exploration of new problems in related fields. An overview of the present status of the physics of complex systems is provided on the following general topics: (1) scaling behaviours; (2) supramolecular systems; (3) aggregation, aggregation kinetics and disorderly growth mechanisms; (4) granularly matter; (5) polymers, associating polymers, polyelectrolytes and gels; (6) amphiphiles, emulsions, colloids, membranes and interface phenomena; (7) molecular motors; (8) phase separation and out of equilibrium dynamics; (9) turbulence, chaos and chaotic dynamics; (10) glass transition, supercooled fluids and (11) geometrically constrained dynamics.

This book aims to provide a compact and unified introduction to the most important aspects in the physics of non-equilibrium systems. It first introduces stochastic processes and some modern tools and concepts that have proved their usefulness to deal with non-equilibrium systems from a purely probabilistic angle. The aim is to show the important role played by fluctuations in far-from-equilibrium situations, where noise can promote order and organization, switching among non-equilibrium states, etc. The second part adopts a more historical perspective,

retracing the first steps taken from the purely thermodynamic as well as from the kinetic points of view to depart (albeit slightly) from equilibrium. The third part revisits the path outlined in the first one, but now undertakes the mesoscopic description of extended systems, where new phenomena (patterns, long-range correlations, scaling far from equilibrium, etc.) are observed. This book is a revised and extended version of an earlier edition published in 1994. It includes topics of current research interest in far-from-equilibrium situations like noise-induced phenomena and free energy-like functionals, surface growth and roughening, etc. It can be used as an advanced textbook by graduate students in physics. It also covers topics of current interest in other disciplines and interdisciplinary approaches in engineering, biophysics, and economics, among others. The level of detail in the book is enough to capture the interest of the reader and facilitate the path to more learning by exploring the modern research literature provided. At the same time, the book is also complete enough to be self-contained for those readers who just need an overview of the subject.

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