Nonlinear Control Of Dynamic Networks Tengfei Liu

Unveiling the Power of Verbal Beauty: An Psychological Sojourn through **Nonlinear Control Of Dynamic Networks Tengfei Liu**

In some sort of inundated with displays and the cacophony of quick connection, the profound energy and emotional resonance of verbal artistry frequently fade in to obscurity, eclipsed by the continuous onslaught of noise and distractions. However, situated within the lyrical pages of **Nonlinear Control Of Dynamic Networks Tengfei Liu**, a interesting perform of fictional elegance that impulses with raw thoughts, lies an unforgettable journey waiting to be embarked upon. Penned with a virtuoso wordsmith, that enchanting opus manuals visitors on an emotional odyssey, softly exposing the latent potential and profound affect stuck within the elaborate web of language. Within the heart-wrenching expanse with this evocative examination, we shall embark upon an introspective exploration of the book is key subjects, dissect its interesting writing design, and immerse ourselves in the indelible impression it leaves upon the depths of readers souls.

Robust Adaptive Dynamic Programming Yu Jiang 2017-05-08 A comprehensive look at state-of-the-art ADP theory and real-world applications This book fills a gap in the literature by providing a theoretical framework for integrating techniques from adaptive dynamic programming (ADP) and modern nonlinear control to address data-driven optimal control design challenges arising from both parametric and dynamic uncertainties. Traditional model-based approaches leave much to be desired when addressing the challenges posed by the ever-increasing complexity of real-world engineering systems. An alternative which has received much interest in recent years are biologically-inspired approaches, primarily RADP. Despite their growing popularity worldwide, until now books on ADP have focused nearly exclusively on analysis and design, with scant consideration given to how it can be applied to address robustness issues, a new challenge arising from dynamic uncertainties encountered in common engineering problems. Robust Adaptive Dynamic Programming zeros in on the practical concerns of engineers. The authors develop RADP theory from linear systems to partially-linear, large-scale, and completely nonlinear systems. They provide in-depth coverage of state-of-the-art applications in power systems, supplemented with numerous real-world examples implemented in MATLAB. They also explore fascinating reverse engineering topics, such how ADP theory can be applied to the study of the human brain and cognition. In addition, the book: Covers the latest developments in RADP theory and applications for solving a range of systems' complexity problems Explores multiple real-world implementations in power systems with illustrative examples backed up by reusable MATLAB code and Simulink block sets Provides an overview of nonlinear control, machine learning, and dynamic control Features discussions of novel applications for RADP theory, including an entire chapter on how it can be used as a computational mechanism of human movement control Robust Adaptive Dynamic Programming is both a valuable working resource and an intriguing exploration of contemporary ADP theory and applications for practicing engineers and advanced students in systems theory, control engineering, computer science, and applied mathematics.
From Chaos to Order
Reinforcement Learning for Cyber-Physical Systems Chong Li 2019-02-22 Reinforcement Learning for Cyber-Physical Systems: with Cybersecurity Case Studies was inspired by recent developments in the fields of reinforcement learning (RL) and cyber-physical systems (CPSs). Rooted in behavioral psychology, RL is one of the primary strands of machine learning. Different from other machine learning algorithms, such as supervised learning and unsupervised learning, the key feature of RL is its unique learning paradigm, i.e., trial-and-error. Combined with the deep neural networks, deep RL become so powerful that many complicated systems can be automatically managed by AI agents at a superhuman level. On the other hand, CPSs are envisioned to revolutionize our society in the near future. Such examples include the emerging smart buildings, intelligent transportation, and electric grids. However, the conventional hand-programming controller in CPSs could neither handle the increasing complexity of the system, nor automatically adapt itself to new situations that it has never encountered before. The problem of how to apply the existing deep RL algorithms, or develop new RL algorithms to enable the real-time adaptive CPSs, remains open. This book aims to establish a linkage between the two domains by systematically introducing RL foundations and algorithms, each supported by one or a few state-of-the-art CPS examples to help readers understand the intuition and usefulness of RL techniques. Features Introduces reinforcement learning, including advanced topics in RL Applies reinforcement learning to cyber-physical systems and cybersecurity Contains state-of-the-art examples and exercises in each chapter Provides two cybersecurity case studies Reinforcement Learning for Cyber-Physical Systems with Cybersecurity Case Studies is an ideal text for graduate students or junior/senior undergraduates in the fields of science, engineering, computer science, or applied mathematics. It would also prove useful to researchers and engineers interested in cybersecurity, RL, and CPS. The only background knowledge required to appreciate the book is a basic knowledge of calculus and probability theory.
Stability and Stabilization of Nonlinear Systems Iasson Karafyllis 2011-04-02 Recently, the subject of nonlinear control systems analysis has grown rapidly and this book provides a simple and self-contained presentation of their stability and feedback stabilization which enables the reader to learn and understand major techniques used in mathematical control theory. In particular: the important techniques of proving global stability properties are presented closely linked with corresponding methods of nonlinear feedback stabilization; a general framework of methods for proving stability is given, thus allowing the study of a wide class of nonlinear systems, including finite-dimensional systems described by ordinary differential equations, discrete-time systems, systems with delays and sampled-data systems; approaches to the proof of classical global stability properties are extended to non-classical global stability properties such as non-uniform-in-time stability and input-to-output stability; and new tools for stability analysis and control design of a wide class of nonlinear systems are introduced. The presentational emphasis of Stability and Stabilization of Nonlinear Systems is theoretical but the theory's importance for concrete control problems is highlighted with a chapter specifically dedicated to applications and with numerous illustrative examples. Researchers working on nonlinear control theory will find this monograph of interest while graduate students of systems and control can also gain much insight and assistance from the methods and proofs detailed in this book.
Survival and Event History Analysis Odd Aalen 2008-09-16 The aim of this book is to bridge the gap between standard textbook models and a range of models where the dynamic structure of the data manifests itself fully. The common denominator of such models is stochastic processes. The authors show how counting processes, martingales, and stochastic integrals fit very nicely with censored data. Beginning with standard analyses such as Kaplan-Meier plots and Cox regression, the presentation progresses to the additive hazard model and recurrent event data. Stochastic processes are also used as natural models for individual frailty; they allow sensible interpretations of a number of surprising artifacts seen in population data. The stochastic process framework is naturally connected to causality. The authors show how dynamic path analyses can incorporate many modern causality ideas in a framework that takes the time aspect seriously. To make the material accessible to the reader, a large number of practical examples, mainly from medicine, are developed in detail. Stochastic processes are introduced in an intuitive and non-technical manner. The book is aimed at investigators who use event history methods and want a better understanding of the statistical concepts. It is suitable as a textbook for graduate courses in statistics and biostatistics.
Nanoscience and Technology
Triboelectric Nanogenerators Zhong Lin Wang 2016-08-17 This book introduces an innovative and high-efficiency technology for mechanical energy harvesting. The book covers the history and development of triboelectric nanogenerators, basic structures, working principles, performance characterization, and potential applications. It is divided into three parts: Part A illustrates the fundamental working modes of triboelectric nanogenerators with their prototype structures and theoretical analysis; Part B and Part C introduce two categories of

applications, namely self-powered systems and self-powered active sensors. The book will be an ideal guide to scientists and engineers beginning to study triboelectric nanogenerators or wishing to deepen their knowledge of the field. Readers will be able to place the technical details about this technology in context, and acquire the necessary skills to reproduce the experimental setups for fabrication and measurement.

Distributed Control of Robotic Networks Francesco Bullo 2009-07-06 This self-contained introduction to the distributed control of robotic networks offers a distinctive blend of computer science and control theory. The book presents a broad set of tools for understanding coordination algorithms, determining their correctness, and assessing their complexity; and it analyzes various cooperative strategies for tasks such as consensus, rendezvous, connectivity maintenance, deployment, and boundary estimation. The unifying theme is a formal model for robotic networks that explicitly incorporates their communication, sensing, control, and processing capabilities--a model that in turn leads to a common formal language to describe and analyze coordination algorithms. Written for first- and second-year graduate students in control and robotics, the book will also be useful to researchers in control theory, robotics, distributed algorithms, and automata theory. The book provides explanations of the basic concepts and main results, as well as numerous examples and exercises. Self-contained exposition of graph-theoretic concepts, distributed algorithms, and complexity measures for processor networks with fixed interconnection topology and for robotic networks with position-dependent interconnection topology Detailed treatment of averaging and consensus algorithms interpreted as linear iterations on synchronous networks Introduction of geometric notions such as partitions, proximity graphs, and multicenter functions Detailed treatment of motion coordination algorithms for deployment, rendezvous, connectivity maintenance, and boundary estimation

Robust Event-Triggered Control of Nonlinear Systems Tengfei Liu 2020-06-25 This book presents a study on the novel concept of "event-triggered control of nonlinear systems subject to disturbances", discussing the theory and practical applications. Richly illustrated, it is a valuable resource for researchers, engineers and graduate students in automation engineering who wish to learn the theories, technologies, and applications of event-triggered control of nonlinear systems.

Learning-Based Control Zhong-Ping Jiang 2020-12-07 The recent success of Reinforcement Learning and related methods can be attributed to several key factors. First, it is driven by reward signals obtained through the interaction with the environment. Second, it is closely related to the human learning behavior. Third, it has a solid mathematical foundation. Nonetheless, conventional Reinforcement Learning theory exhibits some shortcomings particularly in a continuous environment or in considering the stability and robustness of the controlled process. In this monograph, the authors build on Reinforcement Learning to present a learning-based approach for controlling dynamical systems from real-time data and review some major developments in this relatively young field. In doing so the authors develop a framework for learning-based control theory that shows how to learn directly suboptimal controllers from input-output data. There are three main challenges on the development of learning-based control. First, there is a need to generalize existing recursive methods. Second, as a fundamental difference between learning-based control and Reinforcement Learning, stability and robustness are important issues that must be addressed for the safety-critical engineering systems such as self-driving cars. Third, data efficiency of Reinforcement Learning algorithms need be addressed for safety-critical engineering systems. This monograph provides the reader with an accessible primer on a new direction in control theory still in its infancy, namely Learning-Based Control Theory, that is closely tied to the literature of safe Reinforcement Learning and Adaptive Dynamic Programming.

Flow-Induced Vibrations Eduard Naudascher 2012-03-27 Despite their variety, the vibration phenomena from many different engineering fields can be classified into a relatively few basic excitation mechanisms. The classification enables engineers to identify all possible sources of excitation in a given system and to assess potential dangers. This graduate-level text presents a synthesis of research results and practical experience from disparate fields in the form of engineering guidelines. It is particularly geared toward assessing the possible sources of excitation in a flow system, in identifying the actual danger spots, and in finding appropriate remedial measures or cures. Flow-induced vibrations are presented in terms of their basic elements: body oscillators, fluid oscillators, and sources of excitation. By stressing these basic elements, the authors provide a basis for the transfer of knowledge from one system to another, as well as from one engineering field to another. In this manner, well-known theories on cylinders in cross-flow or well-executed solutions from the field of wind engineering--to name just two examples--may be useful in other systems or fields on which information is scarce. The unified approach is broad enough to permit treatment of the major excitation mechanism, yet simple enough to be of practical use.

Introduction To Percolation Theory Dietrich Stauffer 2018-12-10 This work dealing with percolation theory clustering, criticallity, diffusion, fractals and phase transitions takes a broad approach to the subject, covering basic theory and also specialized fields like disordered systems and renormalization groups.

Cooperative Control of Multi-Agent Systems Frank L. Lewis 2013-12-31 Cooperative Control of Multi-Agent Systems extends optimal control and adaptive control design methods to multi-agent systems on communication graphs. It develops Riccati design techniques for general linear dynamics for cooperative state feedback design, cooperative observer design, and cooperative dynamic output feedback design. Both continuous-time and discrete-time dynamical multi-agent systems are treated. Optimal cooperative control is introduced and neural adaptive design techniques for multi-agent nonlinear systems with unknown dynamics, which are rarely treated in literature are developed. Results spanning systems with first-, second- and on up to general high-order nonlinear dynamics are presented. Each control methodology proposed is developed by rigorous proofs. All algorithms are justified by simulation examples. The text is self-contained and will serve as an excellent comprehensive source of information for researchers and graduate students working with multi-agent systems.

Graph Representation Learning William L. Hamilton 2020-09-16 This book is a foundational guide to graph representation learning, including state-of-the art advances, and introduces the highly successful graph neural network (GNN) formalism. Graph-structured data is ubiquitous throughout the natural and social sciences, from telecommunication networks to quantum chemistry. Building relational inductive biases into deep learning architectures is crucial for creating systems that can learn, reason, and generalize from this kind of data. Recent years have seen a surge in research on graph representation learning, including techniques for deep graph embeddings, generalizations of convolutional neural networks to graph-structured data, and neural message-passing approaches inspired by belief propagation. These advances in graph representation learning have led to new state-of-the-art results in numerous domains, including chemical synthesis, 3D vision, recommender systems, question answering, and social network analysis. It begins with a discussion of the goals of graph representation learning as well as key methodological foundations in graph theory and network analysis. Following this, the book introduces and reviews methods for learning node embeddings, including random-walk-based methods and applications to knowledge graphs. It then provides a technical synthesis and introduction to the highly successful graph neural network (GNN) formalism, which has become a dominant and fast-growing paradigm for deep learning with graph data. The book concludes with a synthesis of recent advancements in deep generative models for graphs -- a nascent but quickly growing subset of graph representation learning.

Nonlinear Control of Dynamic Networks Tengfei Liu 2018-09-03 Significant progress has been made on nonlinear control systems in the past two decades. However, many of the existing nonlinear control methods cannot be readily used to cope with communication and networking issues without nontrivial modifications. For example, small quantization errors may cause the performance of a "well-designed" nonlinear control system to deteriorate. Motivated by the need for new tools to solve complex problems resulting from smart power grids, biological processes, distributed computing networks, transportation networks, robotic systems, and other cutting-edge control applications, Nonlinear Control of Dynamic Networks tackles newly arising theoretical and real-world challenges for stability analysis and control design, including nonlinearity, dimensionality, uncertainty, and information constraints as well as behaviors stemming from quantization, data-sampling, and impulses. Delivering a systematic review of the nonlinear small-gain theorems, the text: Supplies novel cyclic-small-gain theorems for large-scale nonlinear dynamic networks Offers a cyclic-small-gain framework for nonlinear control with static or dynamic quantization Contains a combination of cyclic-small-gain and set-valued map designs for robust control of nonlinear uncertain systems subject to sensor noise Presents a cyclic-small-gain result in directed graphs and distributed control of nonlinear multi-agent systems with fixed or dynamically

changing topology Based on the authors' recent research, Nonlinear Control of Dynamic Networks provides a unified framework for robust, quantized, and distributed control under information constraints. Suggesting avenues for further exploration, the book encourages readers to take into consideration more communication and networking issues in control designs to better handle the arising challenges.

Atom Probe Tomography Williams Lefebvre 2016-05-30 Atom Probe Tomography is aimed at beginners and researchers interested in expanding their expertise in this area. It provides the theoretical background and practical information necessary to investigate how materials work using atom probe microscopy techniques, and includes detailed explanations of the fundamentals, the instrumentation, contemporary specimen preparation techniques, and experimental details, as well as an overview of the results that can be obtained. The book emphasizes processes for assessing data quality and the proper implementation of advanced data mining algorithms. For those more experienced in the technique, this book will serve as a single comprehensive source of indispensable reference information, tables, and techniques. Both beginner and expert will value the way the book is set out in the context of materials science and engineering. In addition, its references to key research outcomes based upon the training program held at the University of Rouen-one of the leading scientific research centers exploring the various aspects of the instrument-will further enhance understanding and the learning process. Provides an introduction to the capabilities and limitations of atom probe tomography when analyzing materials Written for both experienced researchers and new users Includes exercises, along with corrections, for users to practice the techniques discussed Contains coverage of more advanced and less widespread techniques, such as correlative APT and STEM microscopy

Analysis and Design of Nonlinear Control Systems Alessandro Astolfi 2007-11-13 This book is a tribute to Prof. Alberto Isidori on the occasion of his 65th birthday. Prof. Isidori's proli?c, pioneering and high-impact research activity has spanned over 35 years. Throughout his career, Prof. Isidori has developed ground-breaking results, has initiated researchdirections and has contributed towardsthe foundationofnonlinear controltheory.In addition,his dedication to explain intricate issues and di?cult concepts in a simple and rigorous way and to motivate young researchers has been instrumental to the intellectual growth of the nonlinear control community worldwide. The volume collects 27 contributions written by a total of 52 researchers. The principal author of each contribution has been selected among the -searchers who have worked with Prof. Isidori, have in?uenced his research activity, or have had the privilege and honour of being his PhD students. The contributions address a signi?cant number of control topics, including th- retical issues, advanced applications, emerging control directions and tutorial works. The diversity of the areas covered, the number of contributors and their international standing provide evidence of the impact of Prof. Isidori in the control and systems theory communities. The book has been divided into six parts: System Analysis, Optimization Methods, Feedback Design, Regulation, Geometric Methods and Asymptotic Analysis, re?ecting important control areas which have been strongly in- enced and, in some cases, pioneered by Prof. Isidori.

Recent Advances and Applications of Hybrid Simulation Wei Song 2021-01-13

Methods of Qualitative Theory in Nonlinear Dynamics L. P. Shil'nikov 2001 Bifurcation and chaos has dominated research in nonlinear dynamics for over two decades, and numerous introductory and advanced books have been published on this subject. There remains, however, a dire need for a textbook which provides a pedagogically appealing yet rigorous mathematical bridge between these two disparate levels of exposition. This book has been written to serve that unfulfilled need. Following the footsteps of Poincar(r), and the renowned Andronov school of nonlinear oscillations, this book focuses on the qualitative study of high-dimensional nonlinear dynamical systems. Many of the qualitative methods and tools presented in the book have been developed only recently and have not yet appeared in textbook form. In keeping with the self-contained nature of the book, all the topics are developed with introductory background and complete mathematical rigor. Generously illustrated and written at a high level of exposition, this invaluable book will appeal to both the beginner and the advanced student of nonlinear dynamics interested in learning a rigorous mathematical foundation of this fascinating subject. Sample Chapter(s). Introduction to Part II (124 KB). Chapter 7.1: Rough systems on a plane. Andronov-Pontryagin theorem (218 KB). Chapter 7.2: The set of center motions (158 KB). Chapter 7.3: General classification of center motions (155 KB). Chapter 7.4: Remarks on roughness of high-order dynamical systems (136 KB). Chapter 7.5: Morse-Smale systems (435 KB). Chapter 7.6: Some properties of Morse-Smale systems (211 KB). Contents: Structurally Stable Systems; Bifurcations of Dynamical Systems; The Behavior of Dynamical Systems on Stability Boundaries of Equilibrium States; The Behavior of Dynamical Systems on Stability Boundaries of Periodic Trajectories; Local Bifurcations on the Route Over Stability Boundaries; Global Bifurcations at the Disappearance of a Saddle-Node Equilibrium States and Periodic Orbits; Bifurcations of Homoclinic Loops of Saddle Equilibrium States; Safe and Dangerous Boundaries. Readership: Engineers, students, mathematicians and researchers in nonlinear dynamics and dynamical systems.

Classical and Quantum Dynamics in Condensed Phase Simulations Bruce J Berne 1998-06-17 The school held at Villa Marigola, Lerici, Italy, in July 1997 was very much an educational experiment aimed not just at teaching a new generation of students the latest developments in computer simulation methods and theory, but also at bringing together researchers from the condensed matter computer simulation community, the biophysical chemistry community and the quantum dynamics community to confront the shared problem: the development of methods to treat the dynamics of quantum condensed phase systems. This volume collects the lectures delivered there. Due to the focus of the school, the contributions divide along natural lines into two broad groups: (1) the most sophisticated forms of the art of computer simulation, including biased phase space sampling schemes, methods which address the multiplicity of time scales in condensed phase problems, and static equilibrium methods for treating quantum systems; (2) the contributions on quantum dynamics, including methods for mixing quantum and classical dynamics in condensed phase simulations and methods capable of treating all degrees of freedom quantum-mechanically. Contents:Barrier Crossing: Classical Theory of Rare but Important Events (D Chandler)Monte Carlo Simulations (D Frenkel)Molecular Dynamics Methods for the Enhanced Sampling of Phase Space (B J Berne)Constrained and Nonequilibrium Molecular Dynamics (G Ciccotti & M Ferrario)From Erying to Kramers: Computation of Diffusive Barrier Crossing Rates (M J Ruiz-Montero)Monte Carlo Methods for Sampling of Rare Event States (W Janke)Proton Transfer in Ice (D Marx)Nudged Elastic Band Method for Finding Minimum Energy Paths of Transitions (H Jónsson et al.)RAW Quantum Transition State Theory (G Mills et al.)Dynamics of Peptide Folding (R Elber et al.)Theoretical Studies of Activated Processes in Biological Ion Channels (B Roux & S Crouzy)The Semiclassical Initial Value Representation for Including Quantum Effects in Molecular Dynamics Simulations (W H Miller)Tunneling in the Condensed Phase: Barrier Crossing and Dynamical Control (N Makri)Feynman Path Centroid Methods for Condensed Phase Quantum Dynamics (G A Voth)Quantum Molecular Dynamics Using Wigner Representation (V S Filinov et al.)Nonadiabatic Molecular Dynamics Methods for Diffusion (D Laria et al.)and other papers Readership: Computational and statistical physicists. Keywords:Quantum;Molecular Dynamics;DynamicsReviews: "… this volume is a useful introduction to currently popular, and widely-used techniques in chemical and statistical physics. The authors are well-respected researchers in the field and the level is appropriate to graduate students and researchers." Journal of Statistical Physics

Nonlinear Control of Wheeled Mobile Robots Warren E. Dixon 2007-12-13 This book examines the control problem for wheeled mobile robots. Several novel control strategies are developed and the stability of each controller is examined utilizing Lyapunov techniques. The performance of each controller is either illustrated through simulation results or experimental results. The final chapter describes how the control techniques developed for wheeled mobile robots can be applied to solve other problems with similar governing differential equations (e.g., twin rotor helicopters, surface vessels). Several appendices are included to provide the reader with the mathematical background utilized in the control development and stability analysis. Two appendices are also included that provide specific details with regard to the modifications that were done to commercially available mobile robots (e.g., a K2A manufactured by Cybermotion Inc. and a Pioneer II manufactured by Activemedia) to experimentally demonstrate the performance of the torque input controllers.

Microwave Photonics Jianping Yao 2027-08-25 This book is the first authored in the area of microwave photonics. It presents an overview of techniques developed in the last 30 years in microwave photonics. The topics covered include: photonics generation of microwave signals,

photonics processing of microwave signals, photonics distribution of microwave signals, photonic generation and distribution of UWB signals, photonics generation and processing of arbitrary microwave signals, photonic true time delay beamforming for phased array antennas, photonics-assisted instantaneous microwave frequency measurement, and photonic analog-to-digital conversion. Existing books are edited collections of articles.

Advances in Computer Science for Engineering and Education III Zhengbing Hu 2020-08-05 This book comprises high-quality refereed research papers presented at the Third International Conference on Computer Science, Engineering and Education Applications (ICCSEEA2020), held in Kyiv, Ukraine, on 21–22 January 2020, organized jointly by National Technical University of Ukraine “Igor Sikorsky Kyiv Polytechnic Institute”, National Aviation University, and the International Research Association of Modern Education and Computer Science. The topics discussed in the book include state-of-the-art papers in computer science, artificial intelligence, engineering techniques, genetic coding systems, deep learning with its medical applications, and knowledge representation with its applications in education. It is an excellent source of references for researchers, graduate students, engineers, management practitioners, and undergraduate students interested in computer science and their applications in engineering and education.

Doubly Fed Induction Generators Edgar N. Sanchez 2016-08-05 Doubly Fed Induction Generators: Control for Wind Energy provides a detailed source of information on the modeling and design of controllers for the doubly fed induction generator (DFIG) used in wind energy applications. Focusing on the use of nonlinear control techniques, this book: Discusses the main features and advantages of the DFIG Describes key theoretical fundamentals and the DFIG mathematical model Develops controllers using inverse optimal control, sliding modes, and neural networks Devises an improvement to add robustness in the presence of parametric variations Details the results of real-time implementations All controllers presented in the book are tested in a laboratory prototype. Comparisons between the controllers are made by analyzing statistical measures applied to the control objectives.

Advanced Material Engineering Yongchang Liu 2015-09-08 This book represents a collection of papers presented at the 2015 International Conference on Advanced Material Engineering (AME 2015), held in Guangzhou, China. With the rapid development of industry and information technology, researchers across all fields began to discuss new ideas related to materials science and manufacturing technology. This proceedings provide a valuable insight from researchers and scientists who exchanged their ideas in the conference. Contents:Material Physics and Chemistry:Composites MaterialsNanomaterials and NanocompositesIron and SteelCeramic, Films and GlassesSemiconductors MaterialChemical MaterialBiomaterialsOptical, Electronic, Magnetic MaterialsNew Energy Materials and Environmental Friendly MaterialsNew Functional MaterialsMaterials Process Engineering:Thermal Engineering Theory and ApplicationsPolymer Materials ProcessingMetallurgy Technology and ApplicationSurface Engineering/CoatingsMaterials FormingWelding & JoiningLaser ProcessingSevere Plastic DeformationTribology in Manufacturing ProcessesCasting and solidificationEmerging Areas of Materials Science:Atomic Molecular and Laser PhysicsSpintronicsSolid State Ionics (Materials and Devices)Plasma PhysicsNanobiomaterials / Drug Delivery Readership: Graduate students and research professionals in materials engineering keeping up with the latest advancements in the field. Keywords:Composites;Nanomaterials;Biomaterials;Energy Materials;Functional Materials;Semiconductors;Metallurgy;Semiconductors;Solid State Ionics;Optical Materials;Magnetic Materials;Electronic MaterialsKey Features:Latest Research results on Material EngineeringCross-disciplinary ResearchResearch results come from all over the worldSome famous professors give the keynote speech on the conference

Deep Learning on Graphs Yao Ma 2021-09-23 A comprehensive text on foundations and techniques of graph neural networks with applications in NLP, data mining, vision and healthcare.

Stability of Stationary Sets in Control Systems with Discontinuous Nonlinearities Vladimir Andreevich I?A?kubovich 2004 This book presents a development of the frequency-domain approach to the stability study of stationary sets of systems with discontinuous nonlinearities. The treatment is based on the theory of differential inclusions and the second Lyapunov method. Various versions of the KalmanOCoYakubovich lemma on solvability of matrix inequalities are presented and discussed in detail. It is shown how the tools developed can be applied to stability investigations of relay control systems, gyroscopic systems, mechanical systems with a Coulomb friction, nonlinear electrical circuits, cellular neural networks, phase-locked loops, and synchronous machines. Sample Chapter(s). Chapter 1: Foundations of Theory of Differential Equations with Discontinuous Right-Hand Sides (455 KB). Contents: Foundations of Theory of Differential Equations with Discontinuous Right-Hand Sides; Auxiliary Algebraic Statements on Solutions of Matrix Inequalities of a Special Type; Dichotomy and Stability of Nonlinear Systems with Multiple Equilibria; Stability of Equilibria Sets of Pendulum-Like Systems. Readership: Upper level undergraduates, graduate students, academics, researchers and engineers involved with mechanics, electrical science and power systems."

Basic Theory of Fractional Differential Equations Yong Zhou 2016-10-20 This invaluable monograph is devoted to a rapidly developing area on the research of qualitative theory of fractional ordinary and partial differential equations. It provides the readers the necessary background material required to go further into the subject and explore the rich research literature. The tools used include many classical and modern nonlinear analysis methods such as fixed point theory, measure of noncompactness method, topological degree method, the technique of Picard operators, critical point theory and semigroup theory. Based on the research work carried out by the authors and other experts during the past seven years, the contents are very recent and comprehensive. In this edition, two new topics have been added, that is, fractional impulsive differential equations, and fractional partial differential equations including fractional Navier–Stokes equations and fractional diffusion equations. Contents:Preliminaries:IntroductionSome Notations, Concepts and LemmasFractional CalculusSome Results from Nonlinear AnalysisSemigroupsFractional Functional Differential Equations:IntroductionNeutral Equations with Bounded Delayp-Type Neutral EquationsNeutral Equations with Infinite DelayIterative Functional Differential EquationsNotes and RemarksFractional Ordinary Differential Equations in Banach Spaces:IntroductionCauchy Problems via Measure of Noncompactness MethodCauchy Problems via Topological Degree MethodCauchy Problems via Picard Operators TechniqueNotes and RemarksFractional Abstract Evolution Equations:IntroductionEvolution Equations with Riemann–Liouville DerivativeEvolution Equations with Caputo DerivativeNonlocal Problems for Evolution EquationsAbstract Cauchy Problems with Almost Sectorial OperatorsNotes and RemarksFractional Impulsive Differential Equations:IntroductionImpulsive Initial Value ProblemsImpulsive Boundary Value ProblemsImpulsive Langevin EquationsImpulsive Evolution EquationsNotes and RemarksFractional Boundary Value Problems:IntroductionSolution for BVP with Left and Right Fractional IntegralsMultiple Solutions for BVP with ParametersInfinite Solutions for BVP with Left and Right Fractional IntegralsSolutions for BVP with Left and Right Fractional DerivativesNotes and RemarksFractional Partial Differential Equations:IntroductionFractional Navier–Stokes EquationsFractional Euler–Lagrange EquationsFractional Diffusion EquationsFractional Schrödinger EquationsNotes and Remarks Readership: Researchers and graduate or PhD students dealing with fractional calculus and applied analysis, differential equations and related areas of research.

Nonlinear Oscillations, Dynamical Systems, and Bifurcations of Vector Fields John Guckenheimer 2002-02-08 An application of the techniques of dynamical systems and bifurcation theories to the study of nonlinear oscillations. Taking their cue from Poincare, the authors stress the geometrical and topological properties of solutions of differential equations and iterated maps. Numerous exercises, some of which require nontrivial algebraic manipulations and computer work, convey the important analytical underpinnings of problems in dynamical systems and help readers develop an intuitive feel for the properties involved.

Deep Learning for Medical Image Analysis S. Kevin Zhou 2017-01-18 Deep learning is providing exciting solutions for medical image analysis problems and is seen as a key method for future applications. This book gives a clear understanding of the principles and methods of neural network and deep learning concepts, showing how the algorithms that integrate deep learning as a core component have been applied to medical image detection, segmentation and registration, and computer-aided analysis, using a wide variety of application areas. Deep Learning for Medical Image Analysis is a great learning resource for academic and industry researchers in medical imaging analysis, and for graduate students taking courses on machine learning and deep learning for computer vision and medical image computing and analysis. Covers

common research problems in medical image analysis and their challenges Describes deep learning methods and the theories behind approaches for medical image analysis Teaches how algorithms are applied to a broad range of application areas, including Chest X-ray, breast CAD, lung and chest, microscopy and pathology, etc. Includes a Foreword written by Nicholas Ayache

Intelligent Computing, Networked Control, and Their Engineering Applications Dong Yue 2017-09-01 The three-volume set CCIS 761, CCIS 762, and CCIS 763 constitutes the thoroughly refereed proceedings of the International Conference on Life System Modeling and Simulation, LSMS 2017, and of the International Conference on Intelligent Computing for Sustainable Energy and Environment, ICSEE 2017, held in Nanjing, China, in September 2017. The 208 revised full papers presented were carefully reviewed and selected from over 625 submissions. The papers of this volume are organized in topical sections on: Biomedical Signal Processing; Computational Methods in Organism Modeling; Medical Apparatus and Clinical Applications; Bionics Control Methods, Algorithms and Apparatus; Modeling and Simulation of Life Systems; Data Driven Analysis; Image and Video Processing; Advanced Fuzzy and Neural Network Theory and Algorithms; Advanced Evolutionary Methods and Applications; Advanced Machine Learning Methods and Applications; Intelligent Modeling, Monitoring, and Control of Complex Nonlinear Systems; Advanced Methods for Networked Systems; Control and Analysis of Transportation Systems; Advanced Sliding Mode Control and Applications; Advanced Analysis of New Materials and Devices; Computational Intelligence in Utilization of Clean and Renewable Energy Resources; Intelligent Methods for Energy Saving and Pollution Reduction; Intelligent Methods in Developing Electric Vehicles, Engines and Equipment; Intelligent Computing and Control in Power Systems; Modeling, Simulation and Control in Smart Grid and Microgrid; Optimization Methods; Computational Methods for Sustainable Environment.

9th International Symposium on High-Temperature Metallurgical Processing Jiann-Yang Hwang 2018-01-16 In recent years, global metallurgical industries have experienced fast and prosperous growth. High-temperature metallurgical technology is the backbone to support the technical, environmental, and economical needs for the growth. This collection features contributions covering the advancements and developments of new high-temperature metallurgical technologies and their applications to the areas of processing of minerals; extraction of metals; preparation of metallic, refractory and ceramic materials; treatment and recycling of slag and wastes; and saving of energy and protection of environment.The volume will have a broad impact on the academics and professionals serving the metallurgical industries around the world.

Linear Control System Analysis and Design with MATLAB®, Sixth Edition Constantine H. Houpis 2013-10-30 Thoroughly classroom-tested and proven to be a valuable self-study companion, Linear Control System Analysis and Design: Sixth Edition provides an intensive overview of modern control theory and conventional control system design using in-depth explanations, diagrams, calculations, and tables. Keeping mathematics to a minimum, the book is designed with the undergraduate in mind, first building a foundation, then bridging the gap between control theory and its real-world application. Computer-aided design accuracy checks (CADAC) are used throughout the text to enhance computer literacy. Each CADAC uses fundamental concepts to ensure the viability of a computer solution. Completely updated and packed with student-friendly features, the sixth edition presents a range of updated examples using MATLAB®, as well as an appendix listing MATLAB functions for optimizing control system analysis and design. Over 75 percent of the problems presented in the previous edition have been revised or replaced.

Materials for Sustainable Energy Vincent Dusastre 2011 The search for cleaner, cheaper, smaller and more efficient energy technologies has to a large extent been motivated by the development of new materials. The aim of this collection of articles is therefore to focus on what materials-based solutions can offer and show how the rationale design and improvement of their physical and chemical properties can lead to energy-production alternatives that have the potential to compete with existing technologies. In terms of alternative means to generate electricity that utilize renewable energy sources, the most dramatic breakthroughs for both mobile (i.e., transportation) and stationary applications are taking place in the fields of solar and fuel cells. And from an energy-storage perspective, exciting developments can be seen emerging from the fields of rechargeable batteries and hydrogen storage.

Dynamic Mode Decomposition J. Nathan Kutz 2016-11-23 Data-driven dynamical systems is a burgeoning field?it connects how measurements of nonlinear dynamical systems and/or complex systems can be used with well-established methods in dynamical systems theory. This is a critically important new direction because the governing equations of many problems under consideration by practitioners in various scientific fields are not typically known. Thus, using data alone to help derive, in an optimal sense, the best dynamical system representation of a given application allows for important new insights. The recently developed dynamic mode decomposition (DMD) is an innovative tool for integrating data with dynamical systems theory. The DMD has deep connections with traditional dynamical systems theory and many recent innovations in compressed sensing and machine learning. Dynamic Mode Decomposition: Data-Driven Modeling of Complex Systems, the first book to address the DMD algorithm, presents a pedagogical and comprehensive approach to all aspects of DMD currently developed or under development; blends theoretical development, example codes, and applications to showcase the theory and its many innovations and uses; highlights the numerous innovations around the DMD algorithm and demonstrates its efficacy using example problems from engineering and the physical and biological sciences; and provides extensive MATLAB code, data for intuitive examples of key methods, and graphical presentations.

Modeling and Control for Micro/Nano Devices and Systems Ning Xi 2017-12-19 Micro/nano-scale engineering—especially the design and implementation of ultra-fast and ultra-scale energy devices, sensors, and cellular and molecular systems—remains a daunting challenge. Modeling and control has played an essential role in many technological breakthroughs throughout the course of history. Therefore, the need for a practical guide to modeling and control for micro/nano-scale devices and systems has emerged. The first edited volume to address this rapidly growing field, Modeling and Control for Micro/Nano Devices and Systems gives control engineers, lab managers, high-tech researchers, and graduate students easy access to the expert contributors' cutting-edge knowledge of micro/nanotechnology, energy, and bio-systems. The editors offer an integrated view from theory to practice, covering diverse topics ranging from micro/nano-scale sensors to energy devices and control of biology systems in cellular and molecular levels. The book also features numerous case studies for modeling of micro/nano devices and systems, and explains how the models can be used for control and optimization purposes. Readers benefit from learning the latest modeling techniques for micro/nano-scale devices and systems, and then applying those techniques to their own research and development efforts.

Representation Learning for Natural Language Processing Zhiyuan Liu 2020-07-03 This open access book provides an overview of the recent advances in representation learning theory, algorithms and applications for natural language processing (NLP). It is divided into three parts. Part I presents the representation learning techniques for multiple language entries, including words, phrases, sentences and documents. Part II then introduces the representation techniques for those objects that are closely related to NLP, including entity-based world knowledge, sememe-based linguistic knowledge, networks, and cross-modal entries. Lastly, Part III provides open resource tools for representation learning techniques, and discusses the remaining challenges and future research directions. The theories and algorithms of representation learning presented can also benefit other related domains such as machine learning, social network analysis, semantic Web, information retrieval, data mining and computational biology. This book is intended for advanced undergraduate and graduate students, post-doctoral fellows, researchers, lecturers, and industrial engineers, as well as anyone interested in representation learning and natural language processing.

2020 59th Annual Conference of the Society of Instrument and Control Engineers of Japan (SICE) IEEE Staff 2020-09-23 The scope includes research in the area of Measurement, Control Theory and Applications, Mechatronics, Industrial Automation, Transportation, Biological and Medical Systems, Artificial Intelligence, Cyber Physical Systems, Smart Grids, Educational and Social Contributions

Nonlinear Dynamics and Entropy of Complex Systems with Hidden and Self-excited Attractors Christos Volos 2019-05-03 In recent years, entropy has been used as a measure of the degree of chaos in dynamical systems. Thus, it is important to study entropy in nonlinear systems. Moreover, there has been increasing interest in the last few years regarding the novel classification of nonlinear dynamical systems including two kinds of attractors: self-excited attractors and hidden

attractors. The localization of self-excited attractors by applying a standard computational procedure is straightforward. In systems with hidden attractors, however, a specific computational procedure must be developed, since equilibrium points do not help in the localization of hidden attractors. Some examples of this kind of system are chaotic dynamical systems with no equilibrium points; with only stable equilibria, curves of equilibria, and surfaces of equilibria; and with non-hyperbolic equilibria. There is evidence that hidden attractors play a vital role in various fields ranging from phase-locked loops, oscillators, describing convective fluid motion, drilling systems, information theory, cryptography, and multilevel DC/DC converters. This Special Issue is a collection of the latest scientific trends on the advanced topics of dynamics, entropy, fractional order calculus, and applications in complex systems with self-excited attractors and hidden attractors.

Networked Control Systems Alberto Bemporad 2010-10-14 This book nds its origin in the WIDE PhD School on Networked Control Systems, which we organized in July 2009 in Siena, Italy. Having gathered experts on all the aspects of networked control systems, it was a small step to go from the summer school to the book, certainly given the enthusiasm of the lecturers at the school. We felt that a book collecting overviewson the important developmentsand open pr- lems in the eld of networked control systems could stimulate and support future research in this appealing area. Given the tremendouscurrentinterests in distributed control exploiting wired and wireless communication networks, the time seemed to be right for the book that lies now in front of you. The goal of the book is to set out the core techniques and tools that are ava- able for the modeling, analysis and design of networked control systems. Roughly speaking, the book consists of three parts. The rst part presents architectures for distributed control systems and models of wired and wireless communication n- works. In particular, in the rst chapter important technological and architectural aspects on distributed control systems are discussed. The second chapter provides insight in the behavior of communication channels in terms of delays, packet loss and information constraints leading to suitable modeling paradigms for commu- cation networks.

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