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KEY=DYNAMICS - ATKINSON JOVANY

Distributed Cooperative Control of Multi-agent Systems

John Wiley & Sons A detailed and systematic introduction to the distributed cooperative control of multi-agent systems from a theoretical, network perspective Features detailed analysis and discussions on the distributed cooperative control and dynamics of multi-agent systems Covers comprehensively first order, second order and higher order systems, swarming and flocking behaviors Provides a broad theoretical framework for understanding the fundamentals of distributed cooperative control

The Synchronized Dynamics of Complex Systems

Elsevier The origin of the word synchronization is a greek root, meaning "to share the common time". The original meaning of synchronization has been maintained up to now in the colloquial use of this word, as agreement or correlation in time of different processes. Historically, the analysis of synchronization phenomena in the evolution of dynamical systems has been a subject of active investigation since the earlier days of physics. Recently, the search for synchronization has moved to chaotic systems. In this latter framework, the appearance of collective (synchronized) dynamics is, in general, not trivial. Indeed, a dynamical system is called chaotic whenever its evolution sensitively depends on the initial conditions. The above said implies that two trajectories emerging from two different closeby initial conditions separate exponentially in the course of the time. As a result, chaotic systems intrinsically defy synchronization, because even two identical systems starting from slightly different initial conditions would evolve in time in a unsynchronized manner (the differences in the systems' states would grow exponentially). This is a relevant practical problem, insofar as experimental initial conditions are never known perfectly. The setting of some collective (synchronized) behavior in coupled chaotic systems has therefore a great importance and interest. The subject of the present book is to summarize the recent discoveries involving the study of synchronization in coupled chaotic systems. Not always the word synchronization is taken as having the same colloquial meaning, and one needs to specify what synchrony means in all particular contexts in which we will describe its emergence. The book describes the complete synchronization phenomenon, both for low and for high dimensional situations, and illustrates possible applications in the field of communicating with chaos. Furthermore, the book summarizes the concepts of phase synchronization, lag synchronization, imperfect phase synchronization, and generalized synchronization, describing a general transition scenario between a hierarchy of different types of synchronization for chaotic oscillators. These concepts are extended to the case of structurally different systems, of uncoupled systems subjected to a common external source, of space extended nonlinearly evolving fields, and of dynamical units networking via a complex wiring of connections, giving thus a summary of all possible situations that are encountered in real life and in technology. · Technical, but not specialistic language · About 100 illustrative Figures · Full overview on synchronization phenomena · Review of the main tools and techniques used in the field · Paradigmatic examples and experiments illustrating the basic concepts · Full Reference to the main publications existing in the literature on the subject

Synchronization in Complex Networks of Nonlinear Dynamical Systems

Applications of Chaos and Nonlinear Dynamics in Science and Engineering - Vol. 3

Springer Chaos and nonlinear dynamics initially developed as a new emergent field with its foundation in physics and applied mathematics. The highly generic, interdisciplinary quality of the insights gained in the last few decades has spawned myriad applications in almost all branches of science and technology—and even well beyond. Wherever quantitative modeling and analysis of complex, nonlinear phenomena is required, chaos theory and its methods can play a key role. This third volume concentrates on reviewing further relevant contemporary applications of chaotic nonlinear systems as they apply to the various cutting-edge branches of engineering. This encompasses, but is not limited to, topics such fluctuation relations and chaotic dynamics in physics, fractals and their applications in epileptic seizures, as well as chaos synchronization. Featuring contributions from active and leading research groups, this collection is ideal both as a reference and as a 'recipe book' full of tried and tested, successful engineering applications.

Mathematical Analysis and Applications

MAA 2020, Jamshedpur, India, November 2–4

Springer Nature This book collects original peer-reviewed contributions presented at the "International Conference on Mathematical Analysis and Applications (MAA 2020)" organized by the Department of Mathematics, National Institute of Technology Jamshedpur, India, from 2–4 November 2020. This book presents peer-reviewed research and survey papers in mathematical analysis that cover a broad range of areas including approximation theory, operator theory, fixed-point theory, function spaces, complex analysis, geometric and univalent function theory, control theory, fractional calculus, special functions, operation research, theory of inequalities, equilibrium problem, Fourier and wavelet analysis, mathematical physics, graph theory, stochastic orders and numerical analysis. Some chapters of the book discuss the applications to real-life situations. This book will be of value to researchers and students associated with the field of pure and applied mathematics.

Digital Communications Using Chaos and Nonlinear Dynamics

Springer Science & Business Media This book provides a summary of the research conducted at UCLA, Stanford University, and UCSD over the last ?ve years in the area of nonlinear dyn- ics and chaos as applied to digital communications. At ?rst blush, the term "chaotic communications" seems like an oxymoron; how could something as precise and deterministic as digital communications be chaotic? But as this book will demonstrate, the application of chaos and nonlinear dynamicstocommunicationsprovidesmanypromisingnewdirectionsinareas of coding, nonlinear optical communications, and ultra-wideband commu- cations. The eleven chapters of the book summarize many of the promising new approaches that have been developed, and point the way to new research directions in this ?eld. Digital communications techniques have been continuously developed and re?ned for the past ?fty years to the point where today they form the heart of a multi-hundred billion dollar per year industry employing hundreds of thousands of people on a worldwide basis. There is a continuing need for transmission and reception of digital signals at higher and higher data rates. There are a variety of physical limits that place an upper limit on these data rates, and so the question naturally arises: are there alternative communi- tion techniques that can overcome some of these limitations? Most digital communications today is carried out using electronic devices that are essentially "linear," and linear system theory has been used to c- tinually re?ne their performance. In many cases, inherently nonlinear devices are linearized in order to achieve a certain level of linear system performance.

Handbook of Research on Modeling, Analysis, and Control of Complex Systems

IGI Global The current literature on dynamic systems is quite comprehensive, and system theory's mathematical jargon can remain quite complicated. Thus, there is a need for a compendium of accessible research that involves the broad range of fields that dynamic systems can cover, including engineering, life sciences, and the environment, and which can connect researchers in these fields. The Handbook of Research on Modeling, Analysis, and Control of Complex Systems is a comprehensive reference book that describes the recent developments in a wide range of areas including the modeling, analysis, and control of dynamic systems, as well as explores related applications. The book acts as a forum for researchers seeking to understand the latest theory findings and software problem experiments. Covering topics that include chaotic maps, predictive modeling, random bit generation, and software bug prediction, this book is ideal for professionals, academicians, researchers, and students in the fields of electrical engineering, computer science, control engineering, robotics, power systems, and biomedical engineering.

Applications of Chaos and Nonlinear Dynamics in Science and Engineering - Vol. 2

Springer Chaos and nonlinear dynamics initially developed as a new emergent field with its foundation in physics and applied mathematics. The highly generic, interdisciplinary quality of the insights gained in the last few decades has spawned myriad applications in almost all branches of science and technology—and even well beyond. Wherever the quantitative modeling and analysis of complex, nonlinear phenomena are required, chaos theory and its methods can play a key role. This second volume concentrates on reviewing further relevant, contemporary applications of chaotic nonlinear systems as they apply to the various cutting-edge branches of engineering. This encompasses, but is not limited to, topics such as the spread of epidemics; electronic circuits; chaos control in mechanical devices; secure communication; and digital watermarking. Featuring contributions from active and leading research groups, this collection is ideal both as a reference work and as a 'recipe book' full of tried and tested, successful engineering applications.

Recent Advances in Nonlinear Dynamics and Synchronization

With Selected Applications in Electrical Engineering, Neurocomputing, and Transportation

Springer This book focuses on modelling and simulation, control and optimization, signal processing, and forecasting in selected nonlinear dynamical systems, presenting both literature reviews and novel concepts. It develops analytical or numerical approaches, which are simple to use, robust, stable, flexible and universally applicable to the analysis of complex nonlinear dynamical systems. As such it addresses key challenges are addressed, e.g. efficient handling of time-varying dynamics, efficient design, faster numerical computations, robustness, stability and convergence of algorithms. The book provides a series of contributions discussing either the design or analysis of complex systems in sciences and engineering, and the concepts developed involve nonlinear dynamics, synchronization, optimization, machine learning, and forecasting. Both theoretical and practical aspects of diverse areas are investigated, specifically neurocomputing, transportation engineering, theoretical electrical engineering, signal processing, communications engineering, and computational intelligence. It is a valuable resource for students and researchers interested in nonlinear dynamics and synchronization with applications in selected areas.

Advances in System Dynamics and Control

IGI Global Complex systems are pervasive in many areas of science. With the increasing requirement for high levels of system performance, complex systems has become an important area of research due to its role in many industries. Advances in System Dynamics and Control provides emerging research on the applications in the field of control and analysis for complex systems, with a special emphasis on how to solve various control design and observer design problems, nonlinear systems, interconnected systems, and singular systems. Featuring coverage on a broad range of topics, such as adaptive control, artificial neural network, and synchronization, this book is an important resource for engineers, professionals, and researchers interested in applying new computational and mathematical tools for solving the complicated problems of mathematical modeling, simulation, and control.

Chaos, Synchronization and Structures in Dynamics of Systems with Cylindrical Phase Space

Springer Nature This book develops analytical methods for studying the dynamical chaos, synchronization, and dynamics of structures in various models of coupled rotators. Rotators and their systems are defined in a cylindrical phase space, and, unlike oscillators, which are defined in Rn, they have a wider "range" of motion: There are vibrational and rotational types for cyclic variables, as well as their combinations (rotational-vibrational) if the number of cyclic variables is more than one. The specificity of rotator phase space poses serious challenges in terms of selecting methods for studying the dynamics of related systems. The book chiefly focuses on developing a modified form of the method of averaging, which can be used to study the dynamics of rotators. In general, the book uses the "language" of the qualitative theory of differential equations, point mappings, and the theory of bifurcations, which helps authors to obtain new results on dynamical chaos in systems with few degrees of freedom. In addition, a special section is devoted to the study and classification of dynamic structures that can occur in systems with a large number of interconnected objects, i.e. in lattices of rotators and/or oscillators. Given its scope and format, the book can be used both in lectures and courses on nonlinear dynamics, and in specialized courses on the development and operation of relevant systems that can be represented by a large number of various practical systems: interconnected grids of various mechanical systems, various types of networks including not only mechanical but also biological systems, etc.

Collective Behavior in Complex Networked Systems under Imperfect Communication

Springer Nature This book aims to explain how collective behavior is formed via local interactions under imperfect communication in complex networked systems. It also presents some new distributed protocols or algorithms for complex networked systems to comply with bandwidth limitation and tolerate communication delays. This book will be of particular interest to the readers due to the benefits: 1) it studies the effect of time delay and quantization on the collective behavior by non-smooth analytical technique and algebraic graph theory; 2) it introduces the event-based consensus method under delayed information transmission; In the meantime, it presents some novel approaches to handle the communication constraints in networked systems; 3) it gives some synchronization and control strategies for complex networked systems with limited communication abilities. Furthermore, it provides a consensus recovery approach for multi-agent systems with node failure. Also, it presents interesting results about bipartite consensus and fixed-time/finite-time bipartite consensus of networks with cooperative and antagonistic interactions.

Controlling Synchronization Patterns in Complex Networks

Springer This research aims to achieve a fundamental understanding of synchronization and its interplay with the topology of complex networks. Synchronization is a ubiquitous phenomenon observed in different contexts in physics, chemistry, biology, medicine and engineering. Most prominently, synchronization takes place in the brain, where it is associated with several cognitive capacities but is - in abundance - a characteristic of neurological diseases. Besides zero-lag synchrony, group and cluster states are considered, enabling a description and study of complex synchronization patterns within the presented theory. Adaptive control methods are developed, which allow the control of synchronization in scenarios where parameters drift or are unknown. These methods are, therefore, of particular interest for experimental setups or technological applications. The theoretical framework is demonstrated on generic models, coupled chemical oscillators and several detailed examples of neural networks.

Fractional Order Control and Synchronization of Chaotic Systems

Springer The book reports on the latest advances in and applications of fractional order control and synchronization of chaotic systems, explaining the concepts involved in a clear, matter-of-fact style. It consists of 30 original contributions written by eminent scientists and active researchers in the field that address theories, methods and applications in a number of research areas related to fractional order control and synchronization of chaotic systems, such as: fractional chaotic systems, hyperchaotic systems, complex systems, fractional order discrete chaotic systems, chaos control, chaos synchronization, jerk circuits, fractional chaotic systems with hidden attractors, neural network, fuzzy logic controllers, behavioral modeling, robust and adaptive control, sliding mode control, different types of synchronization, circuit realization of chaotic systems, etc. In addition to providing readers extensive information on chaos fundamentals, fractional calculus, fractional differential equations, fractional control and stability, the book also discusses key applications of fractional order chaotic systems, as well as multidisciplinary solutions developed via control modeling. As such, it offers the perfect reference guide for graduate students, researchers and practitioners in the areas of fractional order control systems and fractional order chaotic systems.

Nonlinear Structural Dynamics and Damping

Springer This book compiles recent research in the field of nonlinear dynamics, vibrations and damping applied to engineering structures. It addresses the modeling of nonlinear vibrations in beams, frames and complex mechanical systems, as well as the modeling of damping systems and viscoelastic materials applied to structural dynamics. The book includes several chapters related to solution techniques and signal analysis techniques. Last but not least, it deals with the identification of nonlinear responses applied to condition monitoring systems.

Chimera States in Complex Networks

Frontiers Media SA

Sensors and Biosensors, MEMS Technologies and its Applications

Lulu.com

Chaotic Systems

BoD – Books on Demand This book presents a collection of major developments in chaos systems covering aspects on chaotic behavioral modeling and simulation, control and synchronization of chaos systems, and applications like secure communications. It is a good source to acquire recent knowledge and ideas for future research on chaos systems and to develop experiments applied to real life problems. That way, this book is very interesting for students, academia and industry since the collected chapters provide a rich cocktail while balancing theory and applications.

Regularity and Stochasticity of Nonlinear Dynamical Systems

Springer This book presents recent developments in nonlinear dynamics and physics with an emphasis on complex systems. The contributors provide recent theoretic developments and new techniques to solve nonlinear dynamical systems and help readers understand complexity, stochasticity, and regularity in nonlinear dynamical systems. This book covers integro-differential equation solvability, Poincare recurrences in ergodic systems, orientable horseshoe structure, analytical routes of periodic motions to chaos, grazing on impulsive differential equations, from chaos to order in coupled oscillators, and differential-invariant solutions for automorphic systems, inequality under uncertainty.

Complex Dynamics in Physiological Systems: From Heart to Brain

Springer Science & Business Media Nonlinear dynamics has become an important field of research in recent years in many areas of the natural sciences. In particular, it has potential applications in biology and medicine; nonlinear data analysis has helped to detect the progress of cardiac disease, physiological disorders, for example episodes of epilepsy, and others. This book focuses on the current trends of research concerning the prediction of sudden cardiac death and the onset of epileptic seizures, using the nonlinear analysis based on ECG and EEG data. Topics covered include the analysis of cardiac models and neural models. The book is a collection of recent research papers by leading physicists, mathematicians, cardiologists and neurobiologists who are actively involved in using the concepts of nonlinear dynamics to explore the functional behaviours of heart and brain under normal and pathological conditions. This collection is intended for students in physics, mathematics and medical sciences, and researchers in interdisciplinary areas of physics and biology.

IEEE Transactions on Circuits and Systems

A Publication of the IEEE Circuits and Systems Society. Regular papers. I

Optical Communication with Chaotic Lasers

Applications of Nonlinear Dynamics and Synchronization

John Wiley & Sons Starting with an introduction to the fundamental physics in chaotic instabilities in laser systems, this comprehensive and unified reference goes on to present the techniques and technology of synchronization of chaos in coupled lasers, as well as the many applications to lasers and optics, communications, security and information technology. Throughout, it presents the current state of knowledge, including encoding/decoding techniques, performance of chaotic communication systems, random number generation, and novel communication technologies.

The New Frontier of Network Physiology: From Temporal Dynamics to the Synchronization and Principles of Integration in Networks of Physiological Systems

Frontiers Media SA

Proceedings of 2016 Chinese Intelligent Systems Conference

Volume II

Springer These proceedings present selected research papers from CISC'16, held in Xiamen, China. The topics include Multi-agent system, Evolutionary Computation, Artificial Intelligence, Complex systems, Computation intelligence and soft computing, Intelligent control, Advanced control technology, Robotics and applications, Intelligent information processing, Iterative learning control, Machine Learning, and etc. Engineers and researchers from academia, industry, and government can get an insight view of the solutions combining ideas from multiple disciplines in the field of intelligent systems.

Advances in Chaos Theory and Intelligent Control

Springer The book reports on the latest advances in and applications of chaos theory and intelligent control. Written by eminent scientists and active researchers and using a clear, matter-of-fact style, it covers advanced theories, methods, and applications in a variety of research areas, and explains key concepts in modeling, analysis, and control of chaotic and hyperchaotic systems. Topics include fractional chaotic systems, chaos control, chaos synchronization, memristors, jerk circuits, chaotic systems with hidden attractors, mechanical and biological chaos, and circuit realization of chaotic systems. The book further covers fuzzy logic controllers, evolutionary algorithms, swarm intelligence, and petri nets among other topics. Not only does it provide the readers with chaos fundamentals and intelligent control-based algorithms; it also discusses key applications of chaos as well as multidisciplinary solutions developed via intelligent control. The book is a timely and comprehensive reference guide for graduate students, researchers, and practitioners in the areas of chaos theory and intelligent control.

Nonautonomous Dynamical Systems in the Life Sciences

Springer Nonautonomous dynamics describes the qualitative behavior of evolutionary differential and difference equations, whose right-hand side is explicitly time dependent. Over recent years, the theory of such systems has developed into a highly active field related to, yet recognizably distinct from that of classical autonomous dynamical systems. This development was motivated by problems of applied mathematics, in particular in the life sciences where genuinely nonautonomous systems abound. The purpose of this monograph is to indicate through selected, representative examples how often nonautonomous systems occur in the life sciences and to outline the new concepts and tools from the theory of nonautonomous dynamical systems that are now available for their investigation.

Robust Adaptive Dynamic Programming

John Wiley & Sons 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.

Proceedings of the International Conference on Advanced Intelligent Systems and Informatics 2018

Springer This book presents the proceedings of the 4th International Conference on Advanced Intelligent Systems and Informatics 2018 (AISI2018), which took place in Cairo, Egypt from September 1 to 3, 2018. This international and interdisciplinary conference, which highlighted essential research and developments in the field of informatics and intelligent systems, was organized by the Scientific Research Group in Egypt (SRGE). The book is divided into several main sections: Intelligent Systems; Robot Modeling and Control Systems; Intelligent Robotics Systems; Machine Learning Methodology and Applications; Sentiment Analysis and Arabic Text Mining; Swarm Optimizations and Applications; Deep Learning and Cloud Computing; Information Security, Hiding, and Biometric Recognition; and Data Mining, Visualization and E-learning.

Introduction to Hybrid Intelligent Networks

Modeling, Communication, and Control

Springer This book covers the fundamental principles, new theories and methodologies, and potential applications of hybrid intelligent networks. Chapters focus on hybrid neural networks and networked multi-agent networks, including their communication, control and optimization synthesis. This text also provides a succinct but useful guideline for designing neural network-based hybrid artificial intelligence for brain-inspired computation systems and applications in the Internet of Things. Artificial Intelligence has developed into a deep research field targeting robots with more brain-inspired perception, learning, decision-making abilities, etc. This text devoted to a tutorial on hybrid intelligent networks that have been identified in nature and engineering, especially in the brain, modeled by hybrid dynamical systems and complex networks, and have shown potential application to brain-inspired intelligence. Included in this text are impulsive neural networks, neurodynamics, multiagent networks, hybrid dynamics analysis, collective dynamics, as well as hybrid communication, control and optimization methods. Graduate students who are interested in artificial intelligence and hybrid intelligence, as well as professors and graduate students who are interested in neural networks and multiagent networks will find this

textbook a valuable resource. AI engineers and consultants who are working in wireless communications and networking will want to buy this book. Also, professional and academic institutions in universities and Mobile vehicle companies and engineers and managers who concern humans in the loop of IoT will also be interested in this book.

The IEEE 2000 Adaptive Systems for Signal Processing, Communications, and Control Symposium

AS-SPCC, October 1-4, 2000, Chateau Lake Louise, Lake Louise, Alberta, Canada

Institute of Electrical & Electronics Engineers(IEEE) The proceedings of the Symposium on Adaptive Systems for Signal Processing, Communications, and Control, 2000. It addresses fundamentals of adaptive and learning systems; signal processing; radar/sonar; wireless communications; pattern recognition; chaos; and more.

Advances in Future Computer and Control Systems

Volume 2

Springer Science & Business Media FCCS2012 is an integrated conference concentrating its focus on Future Computer and Control Systems. “Advances in Future Computer and Control Systems” presents the proceedings of the 2012 International Conference on Future Computer and Control Systems(FCCS2012) held April 21-22,2012, in Changsha, China including recent research results on Future Computer and Control Systems of researchers from all around the world.

Chimera Patterns in Networks

Interplay between Dynamics, Structure, Noise, and Delay

Springer Nature This is the first book devoted to chimera states - peculiar partial synchronization patterns in networks. Providing an overview of the state of the art in research on this topic, it explores how these hybrid states, which are composed of spatially separated domains of synchronized and desynchronized behavior, arise surprisingly in networks of identical units and symmetric coupling topologies. The book not only describes various types of chimeras, but also discusses the role of time delay, stochasticity, and network topology for these synchronization-desynchronization patterns. Moreover, it addresses the question of robustness and control of chimera states, which have various applications in physics, biology, chemistry, and engineering. This book is intended for researchers with a background in physics, applied mathematics, or engineering. Of great interest to specialists working on related problems, it is also a valuable resource for newcomers to the field and other scientists working on the control of spatio-temporal patterns.

Advances in Nonlinear Dynamics

Proceedings of the Second International Nonlinear Dynamics Conference (NODYCON 2021), Volume 2

Springer Nature

Advances in Neural Networks – ISNN 2015

12th International Symposium on Neural Networks, ISNN 2015, Jeju, South Korea, October 15-18, 2015, Proceedings

Springer The volume LNCS 9377 constitutes the refereed proceedings of the 12th International Symposium on Neural Networks, ISNN 2015, held in Jeju, South Korea in October 2015. The 55 revised full papers presented were carefully reviewed and selected from 97 submissions. These papers cover many topics of neural network-related research including intelligent control, neurodynamic analysis, memristive neurodynamics, computer vision, signal processing, machine learning, and optimization.

13th Chaotic Modeling and Simulation International Conference

Springer Nature Gathering the proceedings of the 13th CHAOS2020 International Conference, this book highlights recent developments in nonlinear, dynamical and complex systems. The conference was intended to provide an essential forum for Scientists and Engineers to exchange ideas, methods, and techniques in the field of Nonlinear Dynamics, Chaos, Fractals and their applications in General Science and the Engineering Sciences. The respective chapters address key methods, empirical data and computer techniques, as well as major theoretical advances in the applied nonlinear field. Beyond showcasing the state of the art, the book will help academic and industrial researchers alike apply chaotic theory in their studies. .

Research Anthology on Artificial Neural Network Applications

IGI Global Artificial neural networks (ANNs) present many benefits in analyzing complex data in a proficient manner. As an effective and efficient problem-solving method, ANNs are incredibly useful in many different fields. From education to medicine and banking to engineering, artificial neural networks are a growing phenomenon as more realize the plethora of uses and benefits they provide. Due to their complexity, it is vital for researchers to understand ANN capabilities in various fields. The Research Anthology on Artificial Neural Network Applications covers critical topics related to artificial neural networks and their multitude of applications in a number of diverse areas including medicine, finance, operations research, business, social media, security, and more. Covering everything from the applications and uses of artificial neural networks to deep learning and non-linear problems, this book is ideal for computer scientists, IT specialists, data scientists, technologists, business owners, engineers, government agencies, researchers, academicians, and students, as well as anyone who is interested in learning more about how artificial neural networks can be used across a wide range of fields.

Temporal Network Theory

Springer Nature This book focuses on the theoretical side of temporal network research and gives an overview of the state of the art in the field. Curated by two pioneers in the field who have helped to shape it, the book contains contributions from many leading researchers. Temporal networks fill the border area between network science and time-series analysis and are relevant for the modeling of epidemics, optimization of transportation and logistics, as well as understanding biological phenomena. Network theory has proven, over the past 20 years to be one of the most powerful tools for the study and analysis of complex systems. Temporal network theory is perhaps the most recent significant development in the field in recent years, with direct applications to many of the "big data" sets. This monograph will appeal to students, researchers and professionals alike interested in theory and temporal networks, a field that has grown tremendously over the last decade.

Perspectives in Mathematical Sciences

World Scientific Gun Shy

Dynamics of Complex Autonomous Boolean Networks

Springer This thesis focuses on the dynamics of autonomous Boolean networks, on the basis of Boolean logic functions in continuous time without external clocking. These networks are realized with integrated circuits on an electronic chip as a field programmable gate array (FPGA) with roughly 100,000 logic gates, offering an extremely flexible model system. It allows fast and cheap design cycles and large networks with arbitrary topologies and coupling delays. The author presents pioneering results on theoretical modeling, experimental realization, and selected applications. In this regard, three classes of novel dynamic behavior are investigated: (i) Chaotic Boolean networks are proposed as high-speed physical random number generators with high bit rates. (ii) Networks of periodic Boolean oscillators are home to long-living transient chimera states, i.e., novel patterns of coexisting domains of spatially coherent (synchronized) and incoherent (desynchronized) dynamics. (iii) Excitable networks exhibit cluster synchronization and can be used as fast artificial Boolean neurons whose spiking patterns can be controlled. This work presents the first experimental platform for large complex networks, which will facilitate exciting future developments.

Distributed Filtering, Control and Synchronization

Local Performance Analysis Methods

Springer Nature This book establishes a unified framework for dealing with typical engineering complications arising in modern, complex, large-scale networks such as parameter uncertainties, missing measurement and cyber-attack. Distributed Filtering, Control and Synchronization is a timely reflection on methods designed to handle a series of control and signal-processing issues in modern industrial engineering practice in areas like power grids and environmental monitoring. It exploits the latest techniques to handle the emerging mathematical and computational challenges arising from, among other things, the dynamic topologies of distributed systems and in the context of sensor networks and multi-agent systems. These techniques include recursive linear matrix inequalities, local-performance and stochastic analyses and techniques based on matrix theory. Readers interested in the theory and application of control and signal processing will find much to interest them in the new models and methods presented in this book. Academic researchers can find ideas for developing their own research, graduate and advanced undergraduate students will be made aware of the state of the art, and practicing engineers will find methods for addressing practical difficulties besetting modern networked systems