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Modeling Biomolecular Networks in Cells

Structures and Dynamics

 Springer

Modeling Biomolecular Networks In Cells Structures And Dynamics

Mourad Elloumi, Albert Y. Zomaya



Modeling Biomolecular Networks In Cells Structures And Dynamics:

Modeling Biomolecular Networks in Cells Luonan Chen, Ruiqi Wang, Chunguang Li, Kazuyuki Aihara, 2010-07-05
Modeling Biomolecular Networks in Cells shows how the interaction between the molecular components of basic living organisms can be modelled mathematically and the models used to create artificial biological entities within cells. Such forward engineering is a difficult task but the nonlinear dynamical methods espoused in this book simplify the biology so that it can be successfully understood and the synthesis of simple biological oscillators and rhythm generators made feasible. Such simple units can then be coordinated using intercellular signal biomolecules. The formation of such man-made multicellular networks with a view to the production of biosensors, logic gates, new forms of integrated circuitry based on gene chips and even biological computers is an important step in the design of faster and more flexible electronics. The book also provides theoretical frameworks and tools with which to analyze the nonlinear dynamical phenomena which arise from the connection of building units in a biomolecular network. *Mathematical Approaches to Biological Systems* Toru Ohira, Tohru Uzawa, 2015-03-18
This book presents the most recent mathematical approaches to the growing research area of networks, oscillations and collective motions in the context of biological systems. Bringing together the results of multiple studies of different biological systems, this book sheds light on the relations among these research themes. Included in this book are the following topics: feedback systems with time delay and threshold; dead zone; robustness of biological networks from the point of view of dynamical systems; the hardware-oriented neuron modeling approach; a universal mechanism governing the entrainment limit under weak forcing; the robustness mechanism of open complex systems; situation-dependent switching of the cues primarily relied on by foraging ants and group chase and escape. Research on different biological systems is presented together, not separated by specializations or by model systems. Therefore, the book provides diverse perspectives at the forefront of current mathematical research on biological systems, especially focused on networks, oscillations and collective motions. This work is aimed at advanced undergraduate, graduate and postdoctoral students as well as scientists and engineers. It will also be of great use for professionals in industries and service sectors owing to the applicability of topics such as networks and synchronizations. **Modelling Methodology for Physiology and Medicine** Ewart Carson, Claudio Cobelli, 2013-12-05
Modelling Methodology for Physiology and Medicine, Second Edition, offers a unique approach and an unprecedented range of coverage of the state-of-the-art advanced modeling methodology that is widely applicable to physiology and medicine. The second edition, which is completely updated and expanded, opens with a clear and integrated treatment of advanced methodology for developing mathematical models of physiology and medical systems. Readers are then shown how to apply this methodology beneficially to real-world problems in physiology and medicine, such as circulation and respiration. The focus of Modelling Methodology for Physiology and Medicine, Second Edition, is the methodology that underpins good modeling practice. It builds upon the idea of an integrated methodology for the

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Bioinformatics and Biomedical Engineering Ignacio Rojas, Olga Valenzuela, Fernando Rojas, Francisco Ortuño, 2019-04-30 The two volume set LNBI 11465 and LNBI 11466 constitutes the proceedings of the 7th International Work Conference on Bioinformatics and Biomedical Engineering IWBBIO 2019 held in Granada Spain in May 2019 The total of 97 papers presented in the proceedings was carefully reviewed and selected from 301 submissions The papers are organized in topical sections as follows Part I High throughput genomics bioinformatics tools and medical applications omics data acquisition processing and analysis bioinformatics approaches for analyzing cancer sequencing data next generation sequencing and sequence analysis structural bioinformatics and function telemedicine for smart homes and remote monitoring clustering and analysis of biological sequences with optimization algorithms and computational approaches for drug repurposing and personalized medicine Part II Bioinformatics for healthcare and diseases computational genomics proteomics computational systems for modelling biological processes biomedical engineering biomedical image analysis and biomedicine and e health

Analysis and Control of Complex Dynamical Systems Kazuyuki Aihara, Jun-ichi Imura, Tetsushi Ueta, 2015-03-20 This book is the first to report on theoretical breakthroughs on control of complex dynamical systems developed by collaborative researchers in the two fields of dynamical systems theory and control theory As well its basic point of view is of three kinds of complexity bifurcation phenomena subject to model uncertainty complex behavior including periodic quasi periodic orbits as well as chaotic orbits and network complexity emerging from dynamical interactions between subsystems Analysis and Control of Complex Dynamical Systems offers a valuable resource for mathematicians physicists and biophysicists as well as for researchers in nonlinear science and control engineering allowing them to develop a better fundamental understanding of the analysis and control synthesis of such complex systems

Concepts and Techniques in OMICS and System Biology Asmat Farooq, Sajad Majeed Zargar, Parvaze Ahmad Sofi, Jebi Sudan, Uneeb Urwat, Khursheed Hussain, 2024-08-13 Concepts and Techniques in OMICS and Systems Biology provides a concise and lucid account on the technical aspects of omics system biology and their application in fields of different life science With a strong focus on the fundamental principles understanding of metabolomics ionomics and system biology the book also gives an updated account on technical aspects of omics and system biology Since both omics and systems biology fields are fast advancing filed of biological sciences its significance and applications need to be understood from the baseline

In 10 chapters Concepts and Techniques in OMICS and Systems Biology introduces the reader to both Proteomics Metabolomics and Ionomics and System Biology the technical applications describes both the software in for proteomics as metabolomic enumeration and preludes Omics technologies and their applications The chapters are designed in a well defined chronology such that readers will understand the concepts and techniques involved in omics and system biology This compilation will be ideal reading material for students researchers and people working in the industries related to biological sciences Provides an in depth explanation of fundamental principles regarding the understanding of metabolomics ionomics and system biology Gives updated account on technical aspects of omics and system biology Includes unique content in its theoretical background technical approaches and advancements made in omics and systems biology

Fundamentals of Complex Networks Guanrong Chen,Xiaofan Wang,Xiang Li,2015-06-29 Complex networks such as the Internet WWW transportation networks power grids biological neural networks and scientific cooperation networks of all kinds provide challenges for future technological development The first systematic presentation of dynamical evolving networks with many up to date applications and homework projects to enhance study The authors are all very active and well known in the rapidly evolving field of complex networks Complex networks are becoming an increasingly important area of research Presented in a logical constructive style from basic through to complex examining algorithms through to construct networks and research challenges of the future

Dynamic Systems Biology Modeling and Simulation Joseph DiStefano III,2015-01-10 Dynamic Systems Biology Modeling and Simulation consolidates and unifies classical and contemporary multiscale methodologies for mathematical modeling and computer simulation of dynamic biological systems from molecular cellular organ system on up to population levels The book pedagogy is developed as a well annotated systematic tutorial with clearly spelled out and unified nomenclature derived from the author s own modeling efforts publications and teaching over half a century Ambiguities in some concepts and tools are clarified and others are rendered more accessible and practical The latter include novel qualitative theory and methodologies for recognizing dynamical signatures in data using structural multicompartmental and network models and graph theory and analyzing structural and measurement data models for quantification feasibility The level is basic to intermediate with much emphasis on biomodeling from real biodata for use in real applications Introductory coverage of core mathematical concepts such as linear and nonlinear differential and difference equations Laplace transforms linear algebra probability statistics and stochastics topics The pertinent biology biochemistry biophysics or pharmacology for modeling are provided to support understanding the amalgam of math modeling with life sciences Strong emphasis on quantifying as well as building and analyzing biomodels includes methodology and computational tools for parameter identifiability and sensitivity analysis parameter estimation from real data model distinguishability and simplification and practical bioexperiment design and optimization Companion website provides solutions and program code for examples and exercises using Matlab Simulink VisSim SimBiology SAAMII AMIGO Copasi and SBML coded models A full

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Biomedical Index to PHS-supported Research: pt. A. Subject access A-H, 1992

Cellular Automata Alejandro Salcido, 2011-04-11 Cellular automata make up a class of completely discrete dynamical systems which have become a core subject in the sciences of complexity due to their conceptual simplicity easiness of implementation for computer simulation and their ability to exhibit a wide variety of amazingly complex behavior The feature of simplicity behind complexity of cellular automata has attracted the researchers attention from a wide range of divergent fields of study of science which extend from the exact disciplines of mathematical physics up to the social ones and beyond Numerous complex systems containing many discrete elements with local interactions have been and are being conveniently modelled as cellular automata In this book the versatility of cellular automata as models for a wide diversity of complex systems is underlined through the study of a number of outstanding problems using these innovative techniques for modelling and simulation

Understanding Protein Dynamics, Binding and Allostery for Drug Design Guang

Hu, Pemra Doruker, Hongchun Li, Ebru Demet Akten, 2021-06-08

Molecular Machines in Biology Joachim Frank, 2011-12-19 The concept of molecular machines in biology has transformed the medical field in a profound way Many essential processes that occur in the cell including transcription translation protein folding and protein degradation are all carried out by molecular machines This volume focuses on important molecular machines whose architecture is known and whose functional principles have been established by tools of biophysical imaging X ray crystallography and cryo electron microscopy and fluorescence probing single molecule FRET This edited volume includes contributions from prominent scientists and researchers who understand and have explored the structure and functions of these machines This book is essential for students and professionals in the medical field who want to learn more about molecular machines

Synthetic Biology, 2 Volumes Robert A. Meyers, 2015-06-08

Dieses zweibändige Nachschlagewerk ist das erste maßgebliche Referenzwerk zu diesem aufstrebenden Fachgebiet konzentriert sich auf die Forschung in der synthetischen Biologie und enthält Beiträge einer Reihe von Grundlagenvertretern der Fachrichtung

Comprehensive Biophysics, 2012-04-12 Biophysics is a rapidly evolving interdisciplinary science that applies theories and methods of the physical sciences to questions of biology Biophysics encompasses many disciplines including physics chemistry mathematics biology biochemistry medicine pharmacology physiology and neuroscience and it is essential that scientists working in these varied fields are able to

understand each other's research Comprehensive Biophysics Nine Volume Set will help bridge that communication gap Written by a team of researchers at the forefront of their respective fields under the guidance of Chief Editor Edward Egelman Comprehensive Biophysics Nine Volume Set provides definitive introductions to a broad array of topics uniting different areas of biophysics research from the physical techniques for studying macromolecular structure to protein folding muscle and molecular motors cell biophysics bioenergetics and more The result is this comprehensive scientific resource a valuable tool both for helping researchers come to grips quickly with material from related biophysics fields outside their areas of expertise and for reinforcing their existing knowledge Biophysical research today encompasses many areas of biology These studies do not necessarily share a unique identifying factor This work unites the different areas of research and allows users regardless of their background to navigate through the most essential concepts with ease saving them time and vastly improving their understanding The field of biophysics counts several journals that are directly and indirectly concerned with the field There is no reference work that encompasses the entire field and unites the different areas of research through deep foundational reviews Comprehensive Biophysics fills this vacuum being a definitive work on biophysics It will help users apply context to the diverse journal literature offering and aid them in identifying areas for further research Chief Editor Edward Egelman E I C Biophysical Journal has assembled an impressive world class team of Volume Editors and Contributing Authors Each chapter has been painstakingly reviewed and checked for consistent high quality The result is an authoritative overview which ties the literature together and provides the user with a reliable background information and citation resource

Systems Biology Aleš Prokop, Béla Csukás, 2013-08-28 Growth in the pharmaceutical market has slowed down almost to a standstill One reason is that governments and other payers are cutting costs in a faltering world economy But a more fundamental problem is the failure of major companies to discover develop and market new drugs Major drugs losing patent protection or being withdrawn from the market are simply not being replaced by new therapies the pharmaceutical market model is no longer functioning effectively and most pharmaceutical companies are failing to produce the innovation needed for success This multi authored new book looks at a vital strategy which can bring innovation to a market in need of new ideas and new products Systems Biology SB Modeling is a significant task of systems biology SB aims to develop and use efficient algorithms data structures visualization and communication tools to orchestrate the integration of large quantities of biological data with the goal of computer modeling It involves the use of computer simulations of biological systems such as the networks of metabolites comprise signal transduction pathways and gene regulatory networks to both analyze and visualize the complex connections of these cellular processes SB involves a series of operational protocols used for performing research namely a cycle composed of theoretical analytic or computational modeling to propose specific testable hypotheses about a biological system experimental validation and then using the newly acquired quantitative description of cells or cell processes to refine the computational model or theory

Animal Biotechnology Ashish S. Verma, Anchal Singh, 2013-11-04 Animal Biotechnology introduces applications of animal biotechnology and implications for human health and welfare It begins with an introduction to animal cell cultures and genome sequencing analysis and provides readers with a review of available cell and molecular tools Topics here include the use of transgenic animal models tissue engineering nanobiotechnology and proteomics The book then delivers in depth examples of applications in human health and prospects for the future including cytogenetics and molecular genetics xenografts and treatment of HIV and cancers All this is complemented by a discussion of the ethical and safety considerations in the field Animal biotechnology is a broad field encompassing the polarities of fundamental and applied research including molecular modeling gene manipulation development of diagnostics and vaccines and manipulation of tissue Given the tools that are currently available and the translational potential for these studies animal biotechnology has become one of the most essential subjects for those studying life sciences Highlights the latest biomedical applications of genetically modified and cloned animals with a focus on cancer and infectious diseases Provides firsthand accounts of the use of biotechnology tools including molecular markers stem cells and tissue engineering Cellular Mechanics and Biophysics Claudia Tanja Mierke, 2020-10-30 This book focuses on the mechanical properties of cells discussing the basic concepts and processes in the fields of immunology biology and biochemistry It introduces and explains state of the art biophysical methods and examines the role of mechanical properties in the cell protein interaction with the connective tissue microenvironment The book presents a unique perspective on cellular mechanics and biophysics by combining the mechanical biological physical biochemical medical and immunological views highlighting the importance of the mechanical properties of cells and biophysical measurement methods The book guides readers through the complex and growing field of cellular mechanics and biophysics connecting and discussing research findings from different fields such as biology cell biology immunology physics and medicine Featuring suggestions for further reading throughout and addressing a wide selection of biophysical topics this book is an indispensable guide for graduate and advanced undergraduate students in the fields of cellular mechanics and biophysics *Biological Knowledge Discovery Handbook* Mourad Elloumi, Albert Y. Zomaya, 2015-02-04 The first comprehensive overview of preprocessing mining and postprocessing of biological data Molecular biology is undergoing exponential growth in both the volume and complexity of biological data and knowledge discovery offers the capacity to automate complex search and data analysis tasks This book presents a vast overview of the most recent developments on techniques and approaches in the field of biological knowledge discovery and data mining KDD providing in depth fundamental and technical field information on the most important topics encountered Written by top experts Biological Knowledge Discovery Handbook Preprocessing Mining and Postprocessing of Biological Data covers the three main phases of knowledge discovery data preprocessing data processing also known as data mining and data postprocessing and analyzes both verification systems and discovery systems BIOLOGICAL DATA PREPROCESSING Part A

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Research Awards Index, 1989 Protein Interactions as Targets in Drug Discovery Rossen Donev, 2020-04-18 Protein Interactions as Targets in Drug Discovery Volume 121 is dedicated to the design of therapeutics both experimental and computational that target protein interactions Chapters in this new release include Trends in structure based drug design with protein targets From fragment to peptide protein interaction addressing the structural basis of binding using Supervised Molecular Dynamics SuMD Protein protein and protein ligand interactions identification of potential inhibitors through computational analysis Aromatic aromatic interactions in protein drug and protein protein interactions Role of protein protein interaction in allosteric drug design within the human methyltransferome and much more Integrates experimental and computational methods for studying protein interactions and their modulation by potential therapeutics Contains timely chapters written by well renowned authorities in their field Covers information that is well supported by a number of high quality illustrations figures and tables Targets a very wide audience of specialists researchers and students

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