

Systems Biology: Mathematical Modeling and Model Analysis (Chapman & Hall/CRC Mathematical and Computational Biology)

By Andreas Kremling

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Drawing on the latest research in the field, **Systems Biology: Mathematical Modeling and Model Analysis** presents many methods for modeling and analyzing biological systems, in particular cellular systems. It shows how to use predictive mathematical models to acquire and analyze knowledge about cellular systems. It also explores how the models are systematically applied in biotechnology.

The first part of the book introduces biological basics, such as metabolism, signaling, gene expression, and control as well as mathematical modeling fundamentals, including deterministic models and thermodynamics. The text also discusses linear regression methods, explains the differences between linear and nonlinear regression, and illustrates how to determine input variables to improve estimation accuracy during experimental design.

The second part covers intracellular processes, including enzymatic reactions, polymerization processes, and signal transduction. The author highlights the process–function–behavior sequence in cells and shows how modeling and analysis of signal transduction units play a mediating role between process and function.

The third part presents theoretical methods that address the dynamics of subsystems and the behavior near a steady state. It covers techniques for determining different time scales, sensitivity analysis, structural kinetic modeling, and theoretical control engineering aspects, including a method for robust control. It also explores frequent patterns (motifs) in biochemical networks, such as the feed-forward loop in the transcriptional network of *E. coli*.

Moving on to models that describe a large number of individual reactions, the

last part looks at how these cellular models are used in biotechnology. The book also explains how graphs can illustrate the link between two components in large networks with several interactions.

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Editorial Review

Review

"**Systems Biology: Mathematical Modeling and Model Analysis** is a rich resource of mathematical methods and approaches that can be utilized to analyze and understand biological systems. It will be particularly attractive to engineers and mathematicians, who want to learn the basics of modern biology in a condensed fashion and then apply the tools of their trades to relevant biological questions.
Systems Biology presents key phenomena of molecular biology in a succinct, introductory manner while expecting the reader to have some prior knowledge of basic math, including probabilities, integrals, matrices, differential equations, and Laplace transforms. Building upon this knowledge, **Systems Biology** devotes a good portion of the material to state-of-the-art model diagnostics and engineering techniques, such as linear systems analysis and control theory, which so far are rarely found in systems biology texts and are therefore a welcome addition to the repertoire of textbook literature. For instance, important topics like identifiability, observability, and robust control are seldom encountered in introductory texts on systems biology but discussed here in some detail. Laudably, all topics are illustrated with step-by-step examples, and many of them are reinforced with exercises."
?Eberhard Voit, Georgia Institute of Technology

"Computational modeling of biological circuits, networks and pathways is one of the most exciting areas in biology today, and Andreas Kremling's **Systems Biology: Mathematical Modeling and Model Analysis** is a meticulous and far-reaching treatment of this critically important subject. This book clearly aims to be comprehensive without sacrificing depth, and the result is an exhaustive survey of modeling approaches. Each chapter is thoughtfully crafted to draw in novices to the field while still engaging to experts. Additionally, a number of well-designed exercises complement each chapter. I found the sections on model analysis and control theory particularly useful and relevant."
?Markus Covert, Stanford University

Users Review

From reader reviews:

Jessica Jackson:

Reading a reserve tends to be new life style within this era globalization. With reading you can get a lot of information that may give you benefit in your life. With book everyone in this world can easily share their idea. Books can also inspire a lot of people. A lot of author can inspire all their reader with their story as well as their experience. Not only the storyline that share in the guides. But also they write about the knowledge about something that you need illustration. How to get the good score toefl, or how to teach your kids, there are many kinds of book that you can get now. The authors on this planet always try to improve their expertise in writing, they also doing some study before they write to the book. One of them is this Systems Biology: Mathematical Modeling and Model Analysis (Chapman & Hall/CRC Mathematical and Computational Biology).

David Clark:

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Mary Peterson:

The book untitled Systems Biology: Mathematical Modeling and Model Analysis (Chapman & Hall/CRC Mathematical and Computational Biology) contain a lot of information on this. The writer explains the woman idea with easy technique. The language is very clear to see all the people, so do not necessarily worry, you can easy to read the item. The book was compiled by famous author. The author will bring you in the new age of literary works. You can read this book because you can keep reading your smart phone, or model, so you can read the book in anywhere and anytime. If you want to buy the e-book, you can open up their official web-site in addition to order it. Have a nice examine.

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