

1. Record Nr.	UNINA9910337843703321
Titolo	Automated Reasoning for Systems Biology and Medicine // edited by Pietro Liò, Paolo Zuliani
Pubbl/distr/stampa	Cham : , : Springer International Publishing : , : Imprint : Springer, , 2019
ISBN	3-030-17297-X
Edizione	[1st ed. 2019.]
Descrizione fisica	1 online resource (471 pages)
Collana	Computational Biology, , 1568-2684 ; ; 30
Disciplina	570.285
Soggetti	Bioinformatics Systems biology Artificial intelligence Health informatics Pattern recognition Computational Biology/Bioinformatics Systems Biology Artificial Intelligence Health Informatics Pattern Recognition
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di contenuto	Part I: Model Checking -- Chapter 1. Model Checking Approach to the Analysis of Biological Systems -- Chapter2. Automated Reasoning for the Synthesis and Analysis of Biological Programs -- Chapter 3. Statistical Model Checking based Analysis Techniques of Biological Networks -- Chapter 4. Models, Devices, Properties and Verification for the Artificial Pancreas -- Chapter 5. Using State Space Exploration to Determine How Gene Regulatory Networks Constrain Mutation Order in Cancer Evolution -- Part II: Formal Methods and Logic -- Chapter 6. Set-based Analysis for Biological Modelling -- Chapter 7. Logic and Linear Programs to Understand Cancer Response -- Chapter 8. Logic-Based Formalization of System Requirements for Integrated Clinical Environments -- Chapter 9. Balancing prescriptions with Constraint Solvers -- Chapter 10. Metastable Regimes and Tipping Points of

Biochemical Networks with Potential Applications in Precision Medicine -- Part III: Stochastic Modelling and Analysis.-Chapter 11. Stochastic Spatial Modelling of the Remyelination Process in Multiple Sclerosis Lesions -- Chapter 12. Approximation Techniques for Stochastic Analysis of Biological Systems -- Chapter 13. A Graphical Approach for the Hybrid Modelling of Intracellular Calcium Dynamics Based on Coloured Hybrid Petri Nets -- Chapter 14. Methods for Personalised Delivery Rate Computation for IV Administered Anesthetic Propofol -- Part IV: Machine Learning and Artificial Intelligence -- Chapter 15. Towards the Integration of Metabolic Network Modelling and Machine Learning for the Routine Analysis of High-Throughput Patient Data -- Chapter 16. Opportunities and Challenges in Applying Artificial Intelligence to Bioengineering -- Chapter 17. Deep Learning with Convolutional Neural Networks for Histopathology Image Analysis.

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## Sommario/riassunto

This book presents outstanding contributions in an exciting, new and multidisciplinary research area: the application of formal, automated reasoning techniques to analyse complex models in systems biology and systems medicine. Automated reasoning is a field of computer science devoted to the development of algorithms that yield trustworthy answers, providing a basis of sound logical reasoning. For example, in the semiconductor industry formal verification is instrumental to ensuring that chip designs are free of defects (or “bugs”). Over the past 15 years, systems biology and systems medicine have been introduced in an attempt to understand the enormous complexity of life from a computational point of view. This has generated a wealth of new knowledge in the form of computational models, whose staggering complexity makes manual analysis methods infeasible. Sound, trusted, and automated means of analysing the models are thus required in order to be able to trust their conclusions. Above all, this is crucial to engineering safe biomedical devices and to reducing our reliance on wet-lab experiments and clinical trials, which will in turn produce lower economic and societal costs. Some examples of the questions addressed here include: Can we automatically adjust medications for patients with multiple chronic conditions? Can we verify that an artificial pancreas system delivers insulin in a way that ensures Type 1 diabetic patients never suffer from hyperglycaemia or hypoglycaemia? And lastly, can we predict what kind of mutations a cancer cell is likely to undergo? This book brings together leading researchers from a number of highly interdisciplinary areas, including: · Parameter inference from time series · Model selection · Network structure identification · Machine learning · Systems medicine · Hypothesis generation from experimental data · Systems biology, systems medicine, and digital pathology · Verification of biomedical devices “This book presents a comprehensive spectrum of model-focused analysis techniques for biological systems ...an essential resource for tracking the developments of a fast moving field that promises to revolutionize biology and medicine by the automated analysis of models and data.” Prof Luca Cardelli FRS, University of Oxford.

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