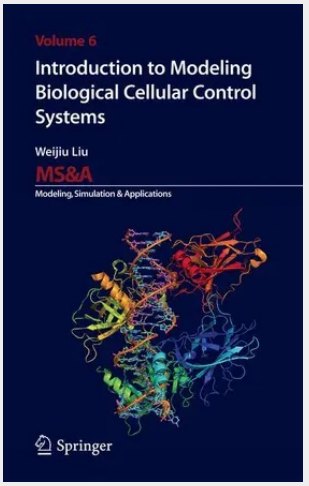
Liu

Introduction to Modeling Biological Cellular Control Systems



This textbook contains the essential knowledge in modeling, simulation, analysis, and applications in dealing with biological cellular control systems. In particular, the book shows how to use the law of mass balance and the law of mass action to derive an enzyme kinetic model - the Michaelis-Menten function or the Hill function, how to use a current-voltage relation, Nernst potential equilibrium equation, and Hodgkin and Huxley's models to model an ionic channel or pump, and how to use the law of mass balance to integrate these enzyme or channel models into a complete feedback control system. The book also illustrates how to use data to estimate parameters in a model, how to use MATLAB to solve a model numerically, how to do computer simulations, and how to provide model predictions. Furthermore, the book demonstrates how to conduct a stability and sensitivity analysis on a model.

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