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Computational Systems Neurobiology

- Covers the whole spectrum of computational modeling of neuronal systems, from the molecule to the organ
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Computational neurosciences and systems biology are among the main domains of life science research where mathematical modeling made a difference. This book introduces the many different types of computational studies one can develop to study neuronal systems. It is aimed at undergraduate students starting their research in computational neurobiology or more senior researchers who would like, or need, to move towards computational approaches. Based on their specific project, the readers would then move to one of the more specialized excellent textbooks available in the field. The first part of the book deals with molecular systems biology. Functional genomics is introduced through examples of transcriptomics and proteomics studies of neurobiological interest. Quantitative modelling of biochemical systems is presented in homogeneous compartments and using spatial descriptions. A second part deals with the various approaches to model single neuron physiology, and naturally moves to neuronal networks. A division is focused on the development of neurons and neuronal systems and the book closes on a series of methodological chapters. From the molecules to the organ, thinking at the level of systems is transforming biology and its impact on society. This book will help the reader to hop on the train directly in the tank engine.

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