Michele GIUGLIANO

Computational Neuroscience: A Beginner's Guide

A primer in Computational Neuroscience

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To Maura, who has kept walking with me,
and in memory of Professors Grattarola and
Tagliasco, who showed me the path.

Foreword

To be written by a person other than the author or editor of the book.

Preface

To be written.

Modena, *Michele GIUGLIANO*

Acknowledgements

Special thanks to Maura and Margherita for their unwavering support. I am also in debt to several generations of students I taught while in Antwerp (2008-2019), Trieste (2019-2023), and Modena (2024-), for their precious feedback.

Declarations

Competing Interests The Author has no conflicts of interest to declare that are relevant to the content of this book.

Ethics Approval Thos experimental traces, collected in the Author's lab and included here for illustrative purposes, were obtained in compliance with the EU Directive 2010/63, the Belgian Royal Decree of 29/5/2013, the Italian Decree 26 of 4/3/2014, and upon authorisation by institutional Ethical Committees and national regulatory authorities.

Contents

Acronyms

Lists of abbreviations, symbols and the like are easily formatted with the help of the Springer-enhanced `description` environment.

ABC Spelled-out abbreviation and definition
BABI Spelled-out abbreviation and definition
CABR Spelled-out abbreviation and definition

Part I
Elements of Computational Neurobiology

Use the template *part.tex* together with the document class SVMono (monograph-type books) or SVMult (edited books) to style your part title page and, if desired, a short introductory text (maximum one page) on its verso page.

Chapter 1
Electrical Phenomenology of Neurons

Chapter 2
Membranes and their Biophysics

Chapter 3
Excitability and How to Model It

Chapter 4
Synapses and their Plasticity

Chapter 5
Simulating or Modeling networks?

Chapter 6
Dynamical Systems

Appendix A
Chapter Heading

All's well that ends well

Use the template *appendix.tex* together with the Springer document class SVMono (monograph-type books) or SVMult (edited books) to style appendix of your book.

A.1 Section Heading

Instead of simply listing headings of different levels we recommend to let every heading be followed by at least a short passage of text. Furtheron please use the LaTeX automatism for all your cross-references and citations.

A.1.1 Subsection Heading

Instead of simply listing headings of different levels we recommend to let every heading be followed by at least a short passage of text. Furtheron please use the LaTeX automatism for all your cross-references and citations as has already been described in Sect. A.1.

For multiline equations we recommend to use the `eqnarray` environment.

$$\mathbf{a} \times \mathbf{b} = \mathbf{c}$$
$$\mathbf{a} \times \mathbf{b} = \mathbf{c} \tag{A.1}$$

A.1.1.1 Subsubsection Heading

Instead of simply listing headings of different levels we recommend to let every heading be followed by at least a short passage of text. Furtheron please use the LaTeX automatism for all your cross-references and citations as has already been described in Sect. A.1.1.

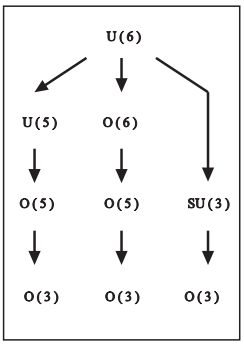

Fig. A.1 Please write your figure caption here

Please note that the first line of text that follows a heading is not indented, whereas the first lines of all subsequent paragraphs are.

Table A.1 Please write your table caption here

Classes	Subclass	Length	Action Mechanism
Translation	mRNA[a]	22 (19–25)	Translation repression, mRNA cleavage
Translation	mRNA cleavage	21	mRNA cleavage
Translation	mRNA	21–22	mRNA cleavage
Translation	mRNA	24–26	Histone and DNA Modification

[a] Table foot note (with superscript)

Part II
Networks of Spiking Neurons

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Solutions

Problems of Chapter ??

?? The solution is revealed here.

?? Problem Heading
(a) The solution of first part is revealed here.
(b) The solution of second part is revealed here.

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