1. Record Nr. UNINA9910457264003321

Titolo	Methods and models in neurophysics [[electronic resource] =] : Methodes et modeles en neurophysique : Ecole d'Ete de Physique des Houches, Session LXXX, 28 July-29 August 2003, Nato Advanced Study Institute, Ecole Thematique du CNRS / / edited by C.C. Chow ... [et al.]
Pubbl/distr/stampa	Amsterdam ; ; San Diego, Calif., : Elsevier, 2005
ISBN	1-281-04744-9 9786611047443 0-08-053638-7
Edizione	[1st ed.]
Descrizione fisica	1 online resource (863 p.)
Collana	Les Houches
Altri autori (Persone)	ChowC. C (Carson C.)
Disciplina	573.8/01/13 573.850113
Soggetti	Neural networks (Neurobiology) - Computer simulation Nervous system - Computer simulation Computational neuroscience Electronic books.
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Description based upon print version of record.
Nota di bibliografia	Includes bibliographical references.
Nota di contenuto	Front Cover; Methods and Models in Neurophysics; Copyright Page; Contents; Course 1. Experimenting with theory; 1. Overcoming communication barriers; 2. Modeling with biological neurons-the dynamic clamp; 3. The traps inherent in building conductance-based models; 4. Theory can drive new experiments; 5. Conclusions; References; Course 2. Understanding neuronal dynamics by geometrical dissection of minimal models; 1. Introduction; 2. Revisiting the Hodgkin-Huxley equations; 3. Morris-Lecar model; 4. Bursting, cellular level 5. Bursting, network generated. Episodic rhythms in the developing spinal cord6. Chapter summary; References; Course 3. Geometric singular perturbation analysis of neuronal dynamics; 1. Introduction; 2. Introduction to dynamical systems; 3. Properties of a single neuron; 4. Two mutually coupled cells; 5. Excitatory-inhibitory networks; 6. Activity patterns in the basal ganglia; References; Course 4. Theory of

neural synchrony; 1. Introduction; 2. Weakly coupled oscillators; 3. Strongly coupled oscillators: mechanisms of synchrony; 4. Conclusion Appendix A. Hodgkin-Huxley and Wang-Buszaki models Appendix B. Measure of synchrony and variability in numerical simulations; Appendix C. Reduction of a conductance-based model to the QIF model; References; Course 5. Some useful numerical techniques for simulating integrate-and-fire networks; 1.Introduction; 2. The conductance-based I&F model; 3. Modified time-stepping schemes; 4. Synaptic interactions; 5. Simulating a V1 model; References; Course 6. Propagation of pulses in cortical networks: the single-spike approximation; 1. Introduction
2. Propagating pulses in networks of excitatory neurons 3. Propagating pulses in networks of excitatory and inhibitory neurons; 4. Discussion; Appendix A. Stability of the lower branch; References; Course 7. Activity-dependent transmission in neocortical synapses; 1. Introduction; 2. Phenomenological model of synaptic depression and facilitation; 3. Dynamic synaptic transmission on the population level; 4. Recurrent networks with synaptic depression; 5. Conclusion; References; Course 8. Theory of large recurrent networks: from spikes to behavior; 1. Introduction
2. From spikes to rates I: rates in asynchronous states 3. From spikes to rates II: dynamics and conductances; 4. Persistent activity and neural integration in the brain; 5. Feature selectivity in recurrent networks-the ring model; 6. Models of associative memory; 7. Concluding remarks; References; Course 9. Irregular activity in large networks of neurons; 1. Introduction; 2. A simple binary model; 3. A memory model; 4. A model of visual cortex hypercolumn; 5. Adding realism: integrate-and-fire network; 6. Discussion; References; Course 10. Network models of memory; 1. Introduction
2. Persistent neuronal activity during delayed response experiments

Sommario/riassunto

Neuroscience is an interdisciplinary field that strives to understand the functioning of neural systems at levels ranging from biomolecules and cells to behaviour and higher brain functions (perception, memory, cognition). Neurophysics has flourished over the past three decades, becoming an indelible part of neuroscience, and has arguably entered its maturity. It encompasses a vast array of approaches stemming from theoretical physics, computer science, and applied mathematics. This book provides a detailed review of this field from basic concepts to its most recent development.