



Advances in neuromorphic memristor science and applications /

Kozma, Robert
Pino, Robinson E.
Pazienza, Giovanni E.

Springer,
2012

Internet Resources

Monografía

Posited by Professor Leon Chua at UC Berkeley more than 40 years ago, memristors, a nonlinear element in electrical circuitry, are set to revolutionize computing technology. Finally discovered by scientists at Hewlett-Packard in 2008, memristors generate huge interest because they can facilitate nanoscale, real-time computer learning, as well as due to their potential of serving as instant memories. . This edited volume bottles some of the excitement about memristors, providing a state-of-the-art overview of neuromorphic memristor theory, as well as its technological and practical aspects. Based on work presented to specialist memristor seminars organized by the editors, the volume takes readers from a general introduction the fundamental concepts involved, to specialized analysis of computational modeling, hardware, and applications. The latter include the ground-breaking potential of memristors in facilitating hybrid wetware-hardware technologies for in-vitro experiments. The book evinces, and devotes space to the discussion of, the socially transformative potential of memristors, which could be as pervasive as was the invention of the silicon chip: machines that learn in the style of brains, are a computational Holy Grail. With contributions from key players in a fast-moving field, this edited volume is the first to cover memristors in the depth needed to trigger the further advances that surely lie around the corner

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Título: Advances in neuromorphic memristor science and applications Robert Kozma, Robinson E. Pino, Giovanni E. Pazienza, editors

Editorial: Dordrecht New York Springer 2012

Descripción física: 1 online resource

Tipo Audiovisual: Medicine Neurosciences Artificial intelligence Biomedicine Nanoscale Science and Technology Mathematical Models of Cognitive Processes and Neural Networks

Mención de serie: Springer series in cognitive and neural systems v. 4

Bibliografía: Includes bibliographical references and index

Contenido: Part 1.) Fundamental Concepts of Memristors and Neuromorphic Systems -- Prolog: Memristor Minds Greg Snider. -- Are Memristors the Future of AI? A Review of Recent Progress and Future Perspectives Robert Kozma, Robinson E. Pino and Giovanni E. Pazienza. -- Biologically-Inspired Electronics with Memory Circuit Elements Massimiliano Di Ventra and Yuriy V. Pershin. -- Persuading Computers to Act More Like Brains Heather Ames, Massimiliano Versace, Anatoli Gorchetchnikov, Benjamin Chandler and Gennady Livitz, et al. -- Memristors for More Than Just Memory: How to Use Learning to Expand Applications Paul J. Werbos -- Part 2.) Computational Models of Memristors -- Computational Intelligence and Neuromorphic Computing Architectures Robinson E. Pino. -- Reconfigurable Memristor Fabrics for Heterogeneous Computing Dhireesha Kudithipudi and Cory E. Merkel. -- Statistical Memristor Model and Its Applications in Neuromorphic Computing Hai Helen Li, Miao Hu and Robinson E. Pino. -- Adaptive Resonance Theory Design in Mixed Memristive-Fuzzy Hardware Max Versace, Robert T. Kozma and Donald C. Wunsch. -- Phase Change Memory and Chalcogenide Materials for Neuromorphic Applications: Emphasis on Synaptic Plasticity Manan Suri and Barbara DeSalvo. -- Energy-Efficient Memristive Analog and Digital Electronics Sung Mo Steve Kang and Sangho Shin. -- Memristor SPICE Modeling Chris Yakopcic, Tarek M. Taha, Guru Subramanyam and Robinson E. Pino. -- Memristor Models for Pattern Recognition Systems Fernando Corinto, Alon Ascoli and Marco Gilli. -- A Columnar V1/V2 Visual Cortex Model and Emulation Robinson E. Pino and Michael Moore. -- Polymer and Nanoparticle-Composite Bistable Devices: Physics of Operation and Initial Applications Robert A. Nawrocki, Richard M. Voyles and Sean E. Shaheen

Lengua: English

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ISBN: 9789400744912 electronic bk.) 9400744919 electronic bk.) 9400744900 9789400744905 9789400744905 1280994185 9781280994180

Materia: Memristors Nanoelectronics Neuromorphics Neural networks (Computer science) Physical sciences Pattern recognition systems Life sciences Artificial intelligence Neurosciences Neural Networks, Computer Information Science Disciplines and Occupations Natural Science Disciplines Pattern Recognition, Automated Biological Science Disciplines Computing Methodologies Mathematical Concepts Phenomena and Processes Artificial Intelligence Neurosciences Memristances Nanoélectronique Ingénierie neuromorphique Réseaux neuronaux (Informatique) Sciences physiques Reconnaissance des formes (Informatique) Sciences de la vie Intelligence artificielle Neurosciences physical sciences. biological sciences. artificial intelligence. TECHNOLOGY & ENGINEERING- Electronics- Circuits- General. TECHNOLOGY & ENGINEERING- Electronics- Circuits- Integrated. Physical sciences. Pattern recognition systems. Neurosciences. Life sciences. Artificial intelligence. Memristors. Nanoelectronics. Neural networks (Computer science) Neuromorphics.

Autores: Kozma, Robert Pino, Robinson E. Pazienza, Giovanni E.

Enlace a formato físico adicional: Print version Advances in neuromorphic memristor science and applications. Dordrecht ; New York : Springer, 2012 (DLC) 2012941404

Punto acceso adicional serie-Título: Springer series in cognitive and neural systems v. 4

Baratz Innovación Documental

- Gran Vía, 59 28013 Madrid
- (+34) 91 456 03 60
- informa@baratz.es