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System and Circuit Design for Biologically-Inspired Intelligent Learning

Frontiers Media SA
A survey of probabilistic approaches to modeling and understanding brain function. Neurophysiological, neuroanatomical, and brain imaging studies have helped to shed light on how the brain transforms raw sensory information into a form that is useful for goal-directed behavior. A fundamental question that is seldom addressed by these studies, however, is why the brain uses the types of representations it does and what evolutionary advantage, if any, these representations confer. It is difficult to address such questions directly via animal experiments. A promising alternative is to use probabilistic principles such as maximum likelihood and Bayesian inference to derive models of brain function. This book surveys some of the current probabilistic approaches to modeling and understanding brain function. Although most of the examples focus on vision, many of the models and techniques are applicable to other modalities as well. The book presents top-down computational models as well as bottom-up neurally motivated models of brain function. The topics covered include Bayesian and information-theoretic models of perception, probabilistic theories of neural coding and spike timing, computational models of lateral and cortico-cortical feedback connections, and the development of receptive field properties from natural signals.

Nutrition Diagnosis Springer Nature
The amount of data being produced by neuroscientists is increasing rapidly, driven by advances in neuroimaging and recording techniques spanning multiple scales of resolution. The availability of such data poses significant challenges for their processing and interpretation. To gain a deeper understanding of the surrounding issues, the Editors of this e-Book reached out to an interdisciplinary community, and formed the Cortical Networks Working Group, and the genesis of this e-Book thus began with the formation of this Working Group, which was supported by the National Institute for Mathematical and Biological Synthesis in the USA. The Group consisted of scientists from neuroscience, physics, psychology and computer science, and meetings were held in person. (A detailed list of the group members is presented in the Editorial that follows.) At the time we started, in 2010, the term “ big data ” was hardly in existence, though the volume of data we were handling would certainly have qualified. Furthermore, there was significant interest in harnessing the power of supercomputers to perform large scale neuronal simulations, and in creating specialized hardware to mimic neural function. We realized that the various disciplines represented in our Group could and should work together to accelerate progress in Neuroscience. We searched for common threads that could define the foundation for an integrated approach to solve important problems in the field. We adopted a network-centric perspective to address these challenges, as the data are derived from structures that are themselves network-like. We proposed three inter-twined threads, consisting of measurement of neural activity, analysis of network structures deduced from this activity, and modeling of network function, leading to theoretical insights. This approach formed the foundation of our initial call for papers. When we issued the call for papers, we were not sure how many papers would fall into each of these threads. We were pleased that we found significant interest in each thread, and the number of submissions exceeded our expectations. This is an indication that the field of neuroscience is ripe for the type of integration and interchange that we had anticipated. We first published a special topics issue after we received a sufficient number of submissions. This is now being converted to an e-book to strengthen the coherence of its contributions. One of the strong themes emerging in this e-book is that network-based measures capture better the dynamics of brain processes, and provide features with greater discriminative power than point-based measures. Another theme is the importance of network oscillations and synchrony. Current research is shedding light on the principles that govern the establishment and maintenance of network oscillation states. These principles could explain why there is impaired synchronization between different brain areas in schizophrenics and Parkinson ’ s patients. Such research could ultimately provide the foundation for an

understanding of other psychiatric and neurodegenerative conditions. The chapters in this book cover these three main threads related to cortical networks. Some authors have combined two or more threads within a single chapter. We expect the availability of related work appearing in a single e-book to help our readers see the connection between different research efforts, and spur further insights and research.
The Eugenic Mind Project Int. Rice Res. Inst.
Offering a balance of subject matter emphasis, clearly presented concepts and engaging examples, this book aims to help students gain a better understanding of ecology. Emphasis is placed on connections in nature, the importance of ecology to environmental health and services, and links to evolution.

Criticality in Neural Systems Springer Nature
This book shares important findings on the application of robotics in industry using advanced mechanisms, including software and hardware. It presents a collection of recent trends and research on various advanced computing paradigms such as soft computing, robotics, smart automation, power control, and uncertainty analysis. The book constitutes the proceedings of the 1st International Conference on Application of Robotics in Industry using Advanced Mechanisms (ARIAM2019), which offered a platform for sharing original research findings, presenting innovative ideas and applications, and comparing notes on various aspects of robotics. The contributions highlight the latest research and industrial applications of robotics, and discuss approaches to improving the smooth functioning of industries. Moreover, they focus on designing solutions for complex engineering problems and designing system components or processes to meet specific needs, with due considerations for public health and safety, including cultural, societal, and environmental considerations. Taken together, they offer a valuable resource for researchers, scientists, engineers, professionals and students alike.
Management of Chronic Kidney Disease Oxford University Press
Modern neural networks gave rise to major breakthroughs in several research areas. In neuroscience, we are witnessing a reappraisal of neural network theory and its relevance for understanding information processing in biological systems. The research presented in this book provides various perspectives on the use of artificial neural networks as models of neural information processing. We consider the biological plausibility of neural networks, performance improvements, spiking neural networks and the use of neural networks for understanding brain function.

Critical Developments and Applications of Swarm Intelligence Springer Nature
As technology spreads globally, researchers and scientists continue to develop and study the strategy behind creating artificial life. This research field is ever expanding, and it is essential to stay current in the contemporary trends in artificial life, artificial intelligence, and machine learning. This an important topic for researchers and scientists in the field as well as industry leaders who may adapt this technology. The Handbook of Research on New Investigations in Artificial Life, AI, and Machine Learning provides concepts, theories, systems, technologies, and procedures that exhibit properties, phenomena, or abilities of any living system or human. This major reference work includes the most up-to-date research on techniques and technologies supporting AI and machine learning. Covering topics such as behavior classification, quality control, and smart medical devices, it serves as an essential resource for graduate students, academicians, stakeholders, practitioners, and researchers and scientists studying artificial life, cognition, AI, biological inspiration, machine learning, and more.

Annual Conference Proceedings Springer Nature
This book constitutes the refereed proceedings of the First International Conference on Bioengineering and Biomedical Signal and Image Processing, BIOMESIP 2021, held in Meloneras, Gran Canaria, Spain, in July 2021. The 41 full and 5 short papers were carefully reviewed and selected from 121 submissions. The papers are grouped in topical issues on biomedical applications in molecular, structural, and functional imaging; biomedical computing; biomedical signal measurement, acquisition and processing; computerized medical imaging and graphics; disease control and diagnosis; neuroimaging; pattern recognition and machine learning for biosignal data; personalized medicine; and COVID-19.

Improving Health Management through Clinical Decision Support Systems

Frontiers Media SA
Integrates process and content of core areas of ecology using an engaging narrative, fascinating case studies, and stunning images throughout.
Cognitive hearing science: Investigating the relationship between selective attention and brain activity Cambridge University Press
Making use of digital technology for social care is a major responsibility of the computing domain. Social care services require attention for ease in social systems, e-farming, and automation, etc. Thus, the book focuses on suggesting software solutions for supporting social issues, such as health care, learning about and monitoring for disabilities, and providing technical solutions for better living. Technology is enabling people to have access to

advances so that they can have better health. To undergo the digital transformation, the current processes need to be completely re-engineered to make use of technologies like the Internet of Things (IoT), big data analytics, artificial intelligence, and others. Furthermore, it is also important to consider digital initiatives in tandem with their cloud strategy instead of treating them in isolation. At present, the world is going through another, possibly even stronger revolution: the use of recent computing models to perform complex cognitive tasks to solve social problems in ways that were previously either highly complicated or extremely resource intensive. This book not only focuses the computing technologies, basic theories, challenges, and implementation but also covers case studies. It focuses on core theories, architectures, and technologies necessary to develop and understand the computing models and their applications. The book also has a high potential to be used as a recommended textbook for research scholars and post-graduate programs. The book deals with a problem-solving approach using recent tools and technology for problems in health care, social care, etc. Interdisciplinary studies are emerging as both necessary and practical in universities. This book helps to improve computational thinking to "understand and change the world". It will be a link between computing and a variety of other fields. Case studies on social aspects of modern societies and smart cities add to the contents of the book to enhance book adoption potential. This book will be useful to undergraduates, postgraduates, researchers, and industry professionals. Every chapter covers one possible solution in detail, along with results.

De novo Molecular Design John Wiley & Sons
Systematically examining current methods and strategies, this ready reference covers a wide range of molecular structures, from organic-chemical drugs to peptides, Proteins and nucleic acids, in line with emerging new drug classes derived from biomacromolecules. A leader in the field and one of the pioneers of this young discipline has assembled here the most prominent experts from across the world to provide first-hand knowledge. While most of their methods and examples come from the area of pharmaceutical discovery and development, the approaches are equally applicable for chemical probes and diagnostics, pesticides, and any other molecule designed to interact with a biological system. Numerous images and screenshots illustrate the many examples and method descriptions. With its broad and balanced coverage, this will be the firststop resource not only for medicinal chemists, biochemists and biotechnologists, but equally for bioinformaticians and molecular designers for many years to come. From the content: * Reaction-driven de novo design * Adaptive methods in molecular design * Design of ligands against multitarget profiles * Free energy methods in ligand design * Fragment-based de novo design * Automated design of focused and target family-oriented compound libraries * Molecular de novo design by nature-inspired computing * 3D QSAR approaches to de novo drug design * Bioisosteres in de novo design * De novo design of peptides, proteins and nucleic acid structures, including RNA aptamers and many more.

Multidisciplinary Journal of Research Development MIT Press
This book highlights recent research on intelligent systems and nature-inspired computing. It presents 132 selected papers from the 21st International Conference on Intelligent Systems Design and Applications (ISDA 2021), which was held online. The ISDA is a premier conference in the field of computational intelligence, and the latest installment brought together researchers, engineers and practitioners whose work involves intelligent systems and their applications in industry. Including contributions by authors from 34 countries, the book offers a valuable reference guide for all researchers, students and practitioners in the fields of Computer Science and Engineering.

Imaging in the Visual System Disorders Frontiers Media SA
In bringing together a global community of philosophers, Global Epistemologies and Philosophies of Science develops novel perspectives on epistemology and philosophy of science by demonstrating how frameworks from academic philosophy (e.g. standpoint theory, social epistemology, feminist philosophy of science) and related fields (e.g. decolonial studies, transdisciplinarity, global history of science) can contribute to critical engagement with global dimensions of knowledge and science. Global challenges such as climate change, food production, and infectious diseases raise complex questions about scientific knowledge production and its interactions with local knowledge systems and social realities. As academic philosophy provides relatively little reflection on global negotiations of knowledge, many pressing scientific and societal issues remain disconnected from core debates in epistemology and philosophy of science. This book is an invitation to broaden agendas of academic philosophy by presenting epistemology and philosophy of science as globally engaged fields that address heterogeneous forms of knowledge production and their interactions with local livelihoods, practices, and worldviews. This integrative ambition makes the book equally relevant for philosophers and interdisciplinary scholars who are concerned with methodological and political challenges at the intersection of science and society.

Industrial Research Laboratories of the United States Cambridge University Press

A focused, accessible introduction to this key aspect of cancerbiology. It covers the individual cell signalling pathways that are known to be involved in cancer development, and, most important, includes the cross- interactions between the pathways together with the current therapeutic approaches. This is a ‘must-have’ for advanced undergraduate and postgraduate students studying and researching within the field of cancerbiology.

Bioengineering and Biomedical Signal and Image Processing John Wiley & Sons

Although verbal learning offers a powerful tool, Mayer explores ways of going beyond the purely verbal. Recent advances in graphics technology and information technology have prompted new efforts to understand the potential of multimedia learning as a means of promoting human understanding. In this second edition, Mayer includes double the number of experimental comparisons, 6 new principles - signalling, segmenting, pertaining, personalization, voice and image principles. The 12 principles of multimedia instructional design have been reorganized into three sections - reducing extraneous processing, managing essential processing and fostering generative processing. Finally an indication of the maturity of the field is that the second edition highlights boundary conditions for each principle research-based constraints on when a principle is likely or not likely to apply. The boundary conditions are interpreted in terms of the cognitive theory of multimedia learning, and help to enrich theories of multimedia learning.

Biology and Conservation of the River Dolphins MIT Press
Leading authorities in the field review current experimental and theoretical knowledge on criticality and brain function. The book begins by summarizing experimental evidence for criticality and self-organized criticality in the brain. Subsequently, important breakthroughs in modeling of critical neuronal circuits and how to establish self-organized criticality in the brain are described. A milestone publication, defining upcoming directions of research in this new field and set to become the primary source of information on the brain and criticality.

Laboratory Manual for Physiological Studies of Rice Routledge

Affective computing refers to computing that relates to, arises from, or influences emotions. The goal of affective computing is to bridge the gap between humans and machines and ultimately endow machines with emotional intelligence for improving natural human-machine interaction. In the context of human-robot interaction (HRI), it is hoped that robots can be endowed with human-like capabilities of observation, interpretation, and emotional expression. The research on affective computing has recently achieved extensive progress with many fields contributing including neuroscience, psychology, education, medicine, behavior, sociology, and computer science. Current research in affective computing concentrates on estimating human emotions through different forms of signals such as speech, face, text, EEG, fMRI, and many others. In neuroscience, the neural mechanisms of emotion are explored by combining neuroscience with the psychological study of personality, emotion, and mood. In psychology and philosophy, emotion typically includes a subjective, conscious experience characterized primarily by psychophysiological expressions, biological reactions, and mental states. The multi-disciplinary features of understanding “emotion” result in the fact that inferring the emotion of humans is definitely difficult. As a result, a multi-disciplinary approach is required to facilitate the development of affective computing. One of the challenging problems in affective computing is the affective gap, i.e., the inconsistency between the extracted feature representations and subjective emotions. To bridge the affective gap, various hand-crafted features have been widely employed to characterize subjective emotions. However, these hand-crafted features are usually low-level, and they may hence not be discriminative enough to depict subjective emotions. To address this issue, the recently-emerged deep learning (also called deep neural networks) techniques provide a possible solution. Due to the used multi-layer network structure, deep learning techniques are capable of learning high-level contributing features from a large dataset and have exhibited excellent performance in multiple application domains such as computer vision, signal processing, natural language processing, human-computer interaction, and so on. The goal of this Research Topic is to gather novel contributions on deep learning techniques applied to affective computing across the diverse fields of psychology, machine learning, neuroscience, education, behavior, sociology, and computer science to converge with those active in other research areas, such as speech emotion recognition, facial expression recognition, Electroencephalogram (EEG) based emotion estimation, human physiological signal (heart rate) estimation, affective human-robot interaction, multimodal affective computing, etc. We welcome researchers to contribute their original papers as well as review articles to provide works regarding the neural approach from computation to affective computing systems. This Research Topic aims to bring together research including, but not limited to: • Deep learning architectures and algorithms for affective computing tasks such as emotion recognition from speech, face, text, EEG, fMRI, and many others. • Explainability of deep Learning algorithms for affective computing. • Multi-task learning techniques for

emotion, personality and depression detection, etc. • Novel datasets for affective computing • Applications of affective computing in robots, such as emotion-aware human-robot interaction and social robots, etc.
Applications of Robotics in Industry Using Advanced Mechanisms Wiley-VCH
A detailed overview of current research in kernel methods and their application to computational biology.
Ecology in Action Frontiers Media SA
In an effort to combat human error in the medical field, medical professionals continue to seek the best practices and technology applications for the diagnosis, treatment, and overall care of their patients. Improving Health Management through Clinical Decision Support Systems brings together a series of chapters focused on the technology, funding, and future plans for improved organization and decision-making through medical informatics. Featuring timely, research-based chapters on topics including, but not limited to, data management, information security, and the benefits of technology-based medicine, this publication is an essential reference source for clinicians, scientists, health economists, policymakers, academicians, researchers, advanced level students, and government officials interested in health information technology.
Handbook of Research on New Investigations in Artificial Life, AI, and Machine Learning Sinauer Associates, Incorporated
Identifies non-government facilities active in commercial research, including development of products and processes. Arrangement is alphabetic, geographic, and by concept classification.
Deep Learning Techniques Applied to Affective Computing MIT Press
In order to focus on principles, each chapter in this work is brief, organized around 1-3 wiring diagrams of the key circuits, with several pages of text that distil the functional significance of each microcircuit