

Modeling Human Behavior With Integrated Cognitive Architectures Comparison Evaluation And Validation Author Kevin A Gluck Aug 2005

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The Soar Cognitive Architecture - John E. Laird 2012-04-13

The definitive presentation of Soar, one AI's most enduring architectures, offering comprehensive descriptions of fundamental aspects and new components. In development for thirty years, Soar is a general cognitive architecture that integrates knowledge-intensive reasoning, reactive execution, hierarchical reasoning, planning, and learning from experience, with the goal of creating a general computational system that has the same cognitive abilities as humans. In contrast, most AI systems are designed to solve only one type of problem, such as playing chess, searching the Internet, or scheduling aircraft departures. Soar is both a software system for agent development and a theory of what computational structures are necessary to support human-level agents. Over the years, both software system and theory have evolved. This book offers the definitive presentation of Soar from theoretical and practical perspectives, providing comprehensive descriptions of fundamental aspects and new components. The current version of Soar features major extensions, adding reinforcement learning, semantic memory, episodic memory, mental imagery, and an appraisal-based model of emotion. This book describes details of Soar's component memories and processes and offers demonstrations of individual components, components working in combination, and real-world applications. Beyond these functional considerations, the book also proposes requirements for general cognitive architectures and explicitly evaluates how well Soar meets those requirements.

Integrated Models of Cognitive Systems - Wayne D. Gray 2007-04-19

The field of cognitive modeling has progressed beyond modeling cognition in the context of simple laboratory tasks and begun to attack the problem of modeling it in more complex, realistic environments, such as those studied by researchers in the field of human factors. The problems that the cognitive modeling community is tackling focus on modeling certain problems of communication and control that arise when integrating with the external environment factors such as implicit and explicit knowledge, emotion, cognition, and the cognitive system. These problems must be solved in order to produce integrated cognitive models of moderately complex tasks. Architectures of cognition in these tasks focus on the control of a central system, which includes control of the central processor itself, initiation of functional processes, such as visual search and memory retrieval, and harvesting the results of these functional processes. Because the control of the central system is conceptually different from the internal control required by individual functional processes, a complete architecture of cognition must incorporate two types of theories of control: Type 1 theories of the structure, functionality, and operation of the controller, and type 2 theories of the internal control of functional processes, including how and what they communicate to the controller. This book presents the current state of the art for both types of theories, as well as contrasts among current approaches to human-performance models. It will be an important resource for professional and student researchers in cognitive science, cognitive-engineering, and human-factors. Contributors: Kevin A. Gluck, Jerry T. Ball, Michael A. Krusmark, Richard W. Pew, Chris R. Sims, Vladislav D. Veksler, John R. Anderson, Ron Sun, Nicholas L. Cassimatis, Randy J. Brou, Andrew D. Egerton, Stephanie M. Doane, Christopher W. Myers, Hansjörg Neth, Jeremy M Wolfe, Marc Pomplun, Ronald A. Rensink, Hansjörg Neth, Chris R. Sims, Peter M. Todd, Lael J. Schooler, Wai-Tat Fu, Michael C. Mozer, Sachiko Kinoshita, Michael Shettel, Alex Kirlik, Vladislav D. Veksler, Michael J. Schoelles, Jerome R. Busemeyer, Eric Dimperio, Ryan K. Jessup, Jonathan Gratch, Stacy

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Smart Engineering System Design - Cihan H. Dagli 2005

The newest volume in this series presents refereed papers in the following categories and their applications in the engineering domain: Neural Networks; Complex Networks; Evolutionary Programming; Data Mining; Fuzzy Logic; Adaptive Control; Pattern Recognition; Smart Engineering System Design. These papers are intended to provide a forum for researchers in the field to exchange ideas on smart engineering system design.

Modeling Human Behavior With Integrated Cognitive Architectures - Kevin A. Gluck 2006-04-21

Modeling Human Behavior With Integrated Cognitive Architectures summarizes the results of four years of collaborative research within the Air Force Research Laboratory and the Office of Naval Research.

The British National Bibliography - Arthur James Wells 2006

Modeling Human Behavior with Integrated Cognitive Architectures - Kevin A. Gluck 2005

Accompanying CD-ROM contains ... "loadable/runnable versions of the D-OMAR ATC simulations and the human data that have been collected." -- p. 11.

Social-Behavioral Modeling for Complex Systems - Paul K. Davis 2019-04-09

This volume describes frontiers in social-behavioral modeling for contexts as diverse as national security, health, and on-line social gaming. Recent scientific and technological advances have created exciting opportunities for such improvements. However, the book also identifies crucial scientific, ethical, and cultural challenges to be met if social-behavioral modeling is to achieve its potential. Doing so will require new methods, data sources, and technology. The volume discusses these, including those needed to achieve and maintain high standards of ethics and privacy. The result should be a new generation of modeling that will advance science and, separately, aid decision-making on major social and security-related subjects despite the myriad uncertainties and complexities of social phenomena. Intended to be relatively comprehensive in scope, the volume balances theory-driven, data-driven, and hybrid approaches. The latter may be rapidly iterative, as when artificial-intelligence methods are coupled with theory-driven insights to build models that are sound, comprehensible and usable in new situations. With the intent of being a milestone document that sketches a research agenda for the next decade, the volume draws on the wisdom, ideas and suggestions of many noted researchers who draw in turn from anthropology, communications, complexity science, computer science, defense planning, economics, engineering, health systems, medicine, neuroscience, physics, political science, psychology, public policy and sociology. In brief, the volume discusses: Cutting-edge challenges and opportunities in modeling for social and behavioral science Special requirements for achieving high standards of privacy and ethics New approaches for developing theory while exploiting both empirical and computational data Issues of reproducibility,

communication, explanation, and validation Special requirements for models intended to inform decision making about complex social systems

The Soar Cognitive Architecture - John E. Laird 2019-08-20

The definitive presentation of Soar, one AI's most enduring architectures, offering comprehensive descriptions of fundamental aspects and new components. In development for thirty years, Soar is a general cognitive architecture that integrates knowledge-intensive reasoning, reactive execution, hierarchical reasoning, planning, and learning from experience, with the goal of creating a general computational system that has the same cognitive abilities as humans. In contrast, most AI systems are designed to solve only one type of problem, such as playing chess, searching the Internet, or scheduling aircraft departures. Soar is both a software system for agent development and a theory of what computational structures are necessary to support human-level agents. Over the years, both software system and theory have evolved. This book offers the definitive presentation of Soar from theoretical and practical perspectives, providing comprehensive descriptions of fundamental aspects and new components. The current version of Soar features major extensions, adding reinforcement learning, semantic memory, episodic memory, mental imagery, and an appraisal-based model of emotion. This book describes details of Soar's component memories and processes and offers demonstrations of individual components, components working in combination, and real-world applications. Beyond these functional considerations, the book also proposes requirements for general cognitive architectures and explicitly evaluates how well Soar meets those requirements.

Advances in Neural Computation, Machine Learning, and Cognitive Research II - Boris Kryzhanovsky 2018-10-06

This book describes new theories and applications of artificial neural networks, with a special focus on addressing problems in neuroscience, biology and biophysics and cognitive research. It covers a wide range of methods and technologies, including deep neural networks, large-scale neural models, brain-computer interface, signal processing methods, as well as models of perception, studies on emotion recognition, self-organization and many more. The book includes both selected and invited papers presented at the XX International Conference on Neuroinformatics, held in Moscow, Russia on October 8-12, 2018.

ACM Transactions on Computer-human Interaction - 2006

Sixth International Conference on Cognitive Modeling - ICCM - 2004 - Marsha C. Lovett 2004-08

The International Conference on Cognitive Modeling brings together researchers who develop computational models that explain and predict cognitive data. The 2004 conference encompassed an integration of diverse data through models of coherent phenomena;

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Intelligent Engineering Systems Through Artificial Neural Networks - 2003

Human Factors in Aviation and Aerospace - Joseph Keebler 2022-11-09

Human Factors in Aviation and Aerospace, Third Edition is written for the widespread aviation community, including students, engineers, scientists, pilots, managers, government personnel, etc. The book's editors offer essential breadth of experience on aviation human factors from multiple perspectives (i.e., scientific research, regulation, funding agencies, technology and implementation) as well as knowledge on the science. Beginning with more general topics, the book moves on to specific topics such as pilot performance, human factors in aircraft design, and vehicles and systems. Uses real-world case examples of dangers and solutions Includes a new chapter on cockpit resource management Examines future directions for aviation psychology and human factors in aviation in two new separate chapters Emphasizes the international perspective

Encyclopedia of the Sciences of Learning - Norbert M. Seel 2011-10-05

Over the past century, educational psychologists and researchers have posited many theories to explain how individuals learn, i.e. how they acquire, organize and deploy knowledge and skills. The 20th century can be considered the century of psychology on learning and related fields of interest (such as motivation, cognition, metacognition etc.) and it is fascinating to see the various mainstreams of learning, remembered and forgotten over the 20th century and note that basic assumptions of early theories survived several paradigm shifts of psychology and epistemology. Beyond folk psychology and its naïve theories of learning, psychological learning theories can be grouped into some basic categories, such as behaviorist learning theories, connectionist learning theories, cognitive learning theories, constructivist learning theories, and social learning theories. Learning theories are not limited to psychology and related fields of interest but rather we can find the topic of learning in various disciplines, such as philosophy and epistemology, education, information science, biology, and – as a result of the emergence of computer technologies – especially also in the field of computer sciences and artificial intelligence. As a consequence, machine learning struck a chord in the 1980s and became an important field of the learning sciences in general. As the learning sciences became more specialized and complex, the various fields of interest were widely spread and separated from each other; as a consequence, even presently, there is no comprehensive overview of the sciences of learning or the central theoretical concepts and vocabulary on which researchers rely. The *Encyclopedia of the Sciences of Learning* provides an up-to-date, broad and authoritative coverage of the specific terms mostly used in the sciences of learning and its related fields, including relevant areas of instruction, pedagogy, cognitive sciences, and especially machine learning and knowledge engineering. This modern compendium will be an indispensable source of information for scientists, educators, engineers, and technical staff active in all fields of learning. More specifically, the *Encyclopedia* provides fast access to the most relevant theoretical terms provides up-to-date, broad and authoritative coverage of the most important theories within the various fields of the learning sciences and adjacent sciences and communication technologies; supplies clear and precise explanations of the theoretical terms, cross-references to related entries and up-to-date references to important research and publications. The *Encyclopedia* also contains biographical entries of individuals who have substantially contributed to the sciences of learning; the entries are written by a distinguished panel of researchers in the various fields of the learning sciences.

Advanced Research on Biologically Inspired Cognitive Architectures - Vallverdú, Jordi 2017-01-25

There are many different approaches to understanding human consciousness. By conducting research to better understand various biological mechanisms, these can be redefined and utilized for technological purposes. *Advanced Research on Biologically Inspired Cognitive Architectures* is an essential reference source for the latest scholarly research on the biological elements of human cognition and examines the applications of consciousness within computing environments. Featuring exhaustive coverage on a broad range of innovative topics and perspectives, such as artificial intelligence, bi-robotics, and human-computer interaction, this publication is ideally designed for academics, researchers, professionals, graduate students, and practitioners seeking current research on the exploration of the intricacies of consciousness and different approaches of perception. [Behavioral Modeling and Simulation](#) - National Research Council 2008-07-04

Today's military missions have shifted away from fighting nation states using conventional weapons toward combating insurgents and terrorist networks in a battlespace in which the attitudes and behaviors of civilian noncombatants may be the primary effects of military actions. To support these new missions, the military services are increasingly interested in using models of the behavior of humans, as individuals and in groups of various kinds and sizes. *Behavioral Modeling and Simulation* reviews relevant individual, organizational, and societal (IOS) modeling research programs, evaluates the strengths and weaknesses of the programs and their methodologies, determines which have the greatest potential for military use, and provides guidance for the design of a research program to effectively foster the development of IOS models useful to the military. This book will be of interest to model developers, operational military users of the models and their managers, and government personnel making funding decisions regarding model development.

Human Performance Modeling in Aviation - David C. Foyle 2007-12-07

Based on the six-year NASA Aviation Safety and Security Program Human Performance Modeling project, a collaboration of five teams from industry and academia, *Human Performance Modeling in Aviation* chronicles the results of modeling NASA-supplied data on two aviation flight deck problems: pilot surface operations taxi errors, and approach and landing with synthetic vision systems. The book provides a deep understanding of the aviation problems and "what-if" system redesigns of flight deck technologies and procedures. Five modeling teams describe how they applied their models to these two problems and discuss the results in terms of the specific problems addressed, the modeling challenges faced, and the modeling solutions developed to address complex, real-world situations. The book then compares the five modeling tools used, shedding light on the unique approach that each brings to bear on two qualitatively different problems. It includes a "virtual roundtable discussion" that poses questions to each of the five teams and offers take-home lessons and insights into the modeling process and its complexities. The modeling teams also explore the issue of model validation and the approach that they adopted. Concluding with a summary of how modeling fits into the system design and evaluation process, the text covers state-of-the-art advances in human performance modeling for complex systems. Critical for modeling aviation-domain tasks, these modeling capabilities can also be applied to other complex-system domains such as process control, medical applications, surface transportation, and military command and control, which share similar human-system interaction issues.

Handbook of Driving Simulation for Engineering, Medicine, and Psychology - Donald L. Fisher 2011-04-25

Effective use of driving simulators requires considerable technical and methodological skill along with considerable background knowledge. Acquiring the requisite knowledge and skills can be extraordinarily time consuming, yet there has been no single convenient and comprehensive source of information on the driving simulation research being conducted around the world. A how-to-do-it resource for researchers and professionals, *Handbook of Driving Simulation for Engineering, Medicine, and Psychology* brings together discussions of technical issues in driving simulation with broad areas in which driving simulation is now playing a role. The chapters explore technical considerations, methodological issues, special and impaired populations, evaluation of in-vehicle and nomadic devices, and infrastructure evaluations. It examines hardware and software selection, visual database and scenario development, independent subject variables and dependent vehicle, environmental, and psychological variables, statistical and biostatistical analysis, different types of drivers, existing and future key-in vehicle

devises, and validation of research. A compilation of the research from more than 100 of the world's top thinkers and practitioners, the book covers basic and advanced technical topics and provides a comprehensive review of the issues related to driving simulation. It describes literally hundreds of different simulation scenarios, provides color photographs of those scenarios, and makes available select videos of the scenarios on an accompanying web site, all of which should prove essential for seasoned researchers and for individuals new to driving simulation.

[Biologically Inspired Cognitive Architectures 2010](#) - BICA Society. Annual Meeting 2010

"This book presents the proceedings of the First International Conference on Biologically Inspired Cognitive Architectures (BICA 2010), which is also the First Annual Meeting of the BICA Society. A cognitive architecture is a computational framework for the design of intelligent, even conscious, agents. It may draw inspiration from many sources, such as pure mathematics, physics or abstract theories of cognition. A biologically inspired cognitive architecture (BICA) is one which incorporates formal mechanisms from computational models of human and animal cognition, which currently provide the only physical examples with the robustness, flexibility, scalability and consciousness that artificial intelligence aspires to achieve. The BICA approach has several different goals: the broad aim of creating intelligent software systems without focusing on any one area of application; attempting to accurately simulate human behavior or gain an understanding of how the human mind works, either for purely scientific reasons or for applications in a variety of domains; understanding how the brain works at a neuronal and sub-neuronal level; or designing artificial systems which can perform the cognitive tasks important to practical applications in human society, and which at present only humans are capable of. The papers presented in this volume reflect the cross-disciplinary and integrative nature of the BICA approach and will be of interest to anyone developing their own approach to cognitive architectures. Many insights can be found here for inspiration or to import into one's own architecture, directly or in modified form."--Publisher description.

Human Factors in Aviation - Eduardo Salas 2010-01-30

This edited textbook is a fully updated and expanded version of the highly successful first edition of *Human Factors in Aviation*. Written for the widespread aviation community - students, engineers, scientists, pilots, managers, government personnel, etc., HFA offers a comprehensive overview of the topic, taking readers from the general to the specific, first covering broad issues, then the more specific topics of pilot performance, human factors in aircraft design, and vehicles and systems. The new editors offer essential breath of experience on aviation human factors from multiple perspectives (i.e. scientific research, regulation, funding agencies, technology, and implementation) as well as knowledge about the science. The contributors are experts in their fields. Topics carried over from the first edition are fully updated, several by new authors who are now at the fore of the field. New material - which represents 50% of the volume - focuses on the challenges facing aviation specialists today. One of the most significant developments in this decade has been NextGen, the Federal Aviation Administration's plan to modernize national airspace and to address the impact of air traffic growth by increasing airspace capacity and efficiency while simultaneously improving safety, environmental impacts and user access. NextGen issues are covered in full. Other new topics include: High Reliability Organizational Perspective, Situation Awareness & Workload in Aviation, Human Error Analysis, Human-System Risk Management, LOSA, NOSS and Unmanned Aircraft System. Comprehensive text with up-to-date synthesis of primary source material that does not need to be supplemented. New edition thoroughly updated with 50% new material and full coverage of NexGen and other modern issues. Instructor website with test bank and image collection makes this the only text offering ancillary support. Liberal use of case examples exposes readers to real-world examples of dangers and solutions.

[Cognitive Systems Engineering](#) - Michael D. McNeese 2017-07-12

This book provides a framework for integrating complex systems that are problem-centric, human-centered, and provides an interdisciplinary, multi-methodological purview of multiple perspectives surrounding the human factors/human actors within living ecosystems. This book will provide useful theoretical and practical information to human factors, human-computer interaction, cognitive systems engineering personnel who are currently engaged in human-centered design or other applied aspects of modeling, simulation, and design that requires joint understanding of theory and practice.

Biologically Inspired Cognitive Architectures 2012 - Antonio Chella
2012-09-29

The challenge of creating a real-life computational equivalent of the human mind requires that we better understand at a computational level how natural intelligent systems develop their cognitive and learning functions. In recent years, biologically inspired cognitive architectures have emerged as a powerful new approach toward gaining this kind of understanding (here "biologically inspired" is understood broadly as "brain-mind inspired"). Still, despite impressive successes and growing interest in BICA, wide gaps separate different approaches from each other and from solutions found in biology. Modern scientific societies pursue related yet separate goals, while the mission of the BICA Society consists in the integration of many efforts in addressing the above challenge. Therefore, the BICA Society shall bring together researchers from disjointed fields and communities who devote their efforts to solving the same challenge, despite that they may "speak different languages". This will be achieved by promoting and facilitating the transdisciplinary study of cognitive architectures, and in the long-term perspective - creating one unifying widespread framework for the human-level cognitive architectures and their implementations. This book is a proceedings of the Third Annual Meeting of the BICA Society, which was held in Palermo-Italy from October 31 to November 2, 2012. The book describes recent advances and new challenges around the theme of understanding how to create general-purpose humanlike artificial intelligence using inspirations from studies of the brain and the mind.

Integrating Cognitive Architectures into Virtual Character Design
- Turner, Jeremy Owen 2016-06-06

Cognitive architectures represent an umbrella term to describe ways in which the flow of thought can be engineered towards cerebral and behavioral outcomes. Cognitive Architectures are meant to provide top-down guidance, a knowledge base, interactive heuristics and concrete or fuzzy policies for which the virtual character can utilize for intelligent interaction with his/her/its situated virtual environment. Integrating Cognitive Architectures into Virtual Character Design presents emerging research on virtual character artificial intelligence systems and procedures and the integration of cognitive architectures. Emphasizing innovative methodologies for intelligent virtual character integration and design, this publication is an ideal reference source for graduate-level students, researchers, and professionals in the fields of artificial intelligence, gaming, and computer science.

Human Error, Safety and Systems Development - Philippe Palanque
2010-02-12

th HESSD 2009 was the 7 IFIP WG 13.5 Working Conference in the series on Human Error, Safety and Systems Development which looks at integration of usability, human factors and human-computer interaction within system development. This edition was jointly organized with the 8 TAMODIA event on Tasks, Models and Diagrams for User Interface Development. There is an obvious synergy between the two previously separated events, as a rigorous, engineering approach to user interface development can help in the prevention of human error and the maintenance of safety in critical interactive systems. Following the tradition of HESSD events, the papers in these proceedings address the problem of developing systems that support human interaction with complex, safety-critical applications. The last 30 years have seen a significant reduction in the accident rates across many different industries. Given these achievements, why do we need further research in this area? Recent accidents in a range of industries have increased concern over the design, management and control of safety-critical systems. Therefore, any system that involves human lives in its functioning is subject to safety-critical aspects. Contributions such as the one by Holloway and Johnson (2004) report that over 80% of accidents in aeronautics are attributed to human error.

Enabling Technologies for Simulation Science IX - Dawn A. Trevisani
2005

Proceedings of SPIE present the original research papers presented at SPIE conferences and other high-quality conferences in the broad-ranging fields of optics and photonics. These books provide prompt access to the latest innovations in research and technology in their respective fields. Proceedings of SPIE are among the most cited references in patent literature.

Advances in Human Factors in Simulation and Modeling - Daniel N. Cassenti 2018-06-26

This book focuses on computational modeling and simulation research that advances the current state-of-the-art regarding human factors in this

area. It reports on cutting-edge simulators such as virtual and augmented reality, on multisensory environments, and on modeling and simulation methods used in various applications, including surgery, military operations, occupational safety, sports training, education, transportation and robotics. Based on the AHFE 2018 International Conference on Human Factors in Simulation and Modeling, held on July 21-25, 2018, in Orlando, Florida, USA, the book serves as a timely reference guide for researchers and practitioners developing new modeling and simulation tools for analyzing or improving human performance. It also offers a unique resource for modelers seeking insights into human factors research and more feasible and reliable computational tools to foster advances in this exciting research field.

How to Build a Brain - Chris Eliasmith 2013-04-16

How to Build a Brain provides a detailed exploration of a new cognitive architecture - the Semantic Pointer Architecture - that takes biological detail seriously, while addressing cognitive phenomena. Topics ranging from semantics and syntax, to neural coding and spike-timing-dependent plasticity are integrated to develop the world's largest functional brain model.

The Cambridge Handbook of Computational Psychology - Ron Sun
2008-04-28

A cutting-edge reference source for the interdisciplinary field of computational cognitive modeling.

Principles of Synthetic Intelligence - Joscha Bach 2009-04-06

From the Foreword: "In this book Joscha Bach introduces Dietrich Dörner's PSI architecture and Joscha's implementation of the MicroPSI architecture. These architectures and their implementation have several lessons for other architectures and models. Most notably, the PSI architecture includes drives and thus directly addresses questions of emotional behavior. An architecture including drives helps clarify how emotions could arise. It also changes the way that the architecture works on a fundamental level, providing an architecture more suited for behaving autonomously in a simulated world. PSI includes three types of drives, physiological (e.g., hunger), social (i.e., affiliation needs), and cognitive (i.e., reduction of uncertainty and expression of competency). These drives routinely influence goal formation and knowledge selection and application. The resulting architecture generates new kinds of behaviors, including context dependent memories, socially motivated behavior, and internally motivated task switching. This architecture illustrates how emotions and physical drives can be included in an embodied cognitive architecture. The PSI architecture, while including perceptual, motor, learning, and cognitive processing components, also includes several novel knowledge representations: temporal structures, spatial memories, and several new information processing mechanisms and behaviors, including progress through types of knowledge sources when problem solving (the Rasmussen ladder), and knowledge-based hierarchical active vision. These mechanisms and representations suggest ways for making other architectures more realistic, more accurate, and easier to use. The architecture is demonstrated in the Island simulated environment. While it may look like a simple game, it was carefully designed to allow multiple tasks to be pursued and provides ways to satisfy the multiple drives. It would be useful in its own right for developing other architectures interested in multi-tasking, long-term learning, social interaction, embodied architectures, and related aspects of behavior that arise in a complex but tractable real-time environment. The resulting models are not presented as validated cognitive models, but as theoretical explorations in the space of architectures for generating behavior. The sweep of the architecture can thus be larger-it presents a new cognitive architecture attempting to provide a unified theory of cognition. It attempts to cover perhaps the largest number of phenomena to date. This is not a typical cognitive modeling work, but one that I believe that we can learn much from." -- Frank E. Ritter, Series Editor Although computational models of cognition have become very popular, these models are relatively limited in their coverage of cognition-- they usually only emphasize problem solving and reasoning, or treat perception and motivation as isolated modules. The first architecture to cover cognition more broadly is PSI theory, developed by Dietrich Dörner. By integrating motivation and emotion with perception and reasoning, and including grounded neuro-symbolic representations, PSI contributes significantly to an integrated understanding of the mind. It provides a conceptual framework that highlights the relationships between perception and memory, language and mental representation, reasoning and motivation, emotion and cognition, autonomy and social behavior. It is, however, unfortunate that PSI's origin in psychology, its methodology, and its lack of

documentation have limited its impact. The proposed book adapts Psi theory to cognitive science and artificial intelligence, by elucidating both its theoretical and technical frameworks, and clarifying its contribution to how we have come to understand cognition.

Artificial Cognitive Systems - David Vernon 2014-10-17

A concise introduction to a complex field, bringing together recent work in cognitive science and cognitive robotics to offer a solid grounding on key issues. This book offers a concise and accessible introduction to the emerging field of artificial cognitive systems. Cognition, both natural and artificial, is about anticipating the need for action and developing the capacity to predict the outcome of those actions. Drawing on artificial intelligence, developmental psychology, and cognitive neuroscience, the field of artificial cognitive systems has as its ultimate goal the creation of computer-based systems that can interact with humans and serve society in a variety of ways. This primer brings together recent work in cognitive science and cognitive robotics to offer readers a solid grounding on key issues. The book first develops a working definition of cognitive systems—broad enough to encompass multiple views of the subject and deep enough to help in the formulation of theories and models. It surveys the cognitivist, emergent, and hybrid paradigms of cognitive science and discusses cognitive architectures derived from them. It then turns to the key issues, with chapters devoted to autonomy, embodiment, learning and development, memory and prospection, knowledge and representation, and social cognition. Ideas are introduced in an intuitive, natural order, with an emphasis on the relationships among ideas and building to an overview of the field. The main text is straightforward and succinct; sidenotes drill deeper on specific topics and provide contextual links to further reading.

Modeling Human and Organizational Behavior - Panel on Modeling Human Behavior and Command Decision Making: Representations for Military Simulations 1998-08-14

Simulations are widely used in the military for training personnel, analyzing proposed equipment, and rehearsing missions, and these simulations need realistic models of human behavior. This book draws together a wide variety of theoretical and applied research in human behavior modeling that can be considered for use in those simulations. It covers behavior at the individual, unit, and command level. At the individual soldier level, the topics covered include attention, learning, memory, decisionmaking, perception, situation awareness, and planning. At the unit level, the focus is on command and control. The book provides short-, medium-, and long-term goals for research and development of more realistic models of human behavior.

An Introduction to Model-Based Cognitive Neuroscience - Birte U. Forstmann 2015-04-20

Two recent innovations, the emergence of formal cognitive models and the addition of cognitive neuroscience data to the traditional behavioral data, have resulted in the birth of a new, interdisciplinary field of study: model-based cognitive neuroscience. Despite the increasing scientific interest in model-based cognitive neuroscience, few active researchers and even fewer students have a good knowledge of the two constituent disciplines. The main goal of this edited collection is to promote the integration of cognitive modeling and cognitive neuroscience. Experts in the field will provide tutorial-style chapters that explain particular techniques and highlight their usefulness through concrete examples and numerous case studies. The book will also include a thorough list of references pointing the reader towards additional literature and online resources.

Geocomputation - Chris Brunsdon 2015-01-22

Geocomputation is the use of software and computing power to solve complex spatial problems. It is gaining increasing importance in the era of the 'big data' revolution, of 'smart cities', of crowdsourced data, and of associated applications for viewing and managing data geographically - like Google Maps. This student focused book: Provides a selection of practical examples of geocomputational techniques and 'hot topics' written by world leading practitioners. Integrates supporting materials in each chapter, such as code and data, enabling readers to work through the examples themselves. Chapters provide highly applied and practical discussions of: Visualisation and exploratory spatial data analysis Space time modelling Spatial algorithms Spatial regression and statistics Enabling interactions through the use of neogeography All chapters are uniform in design and each includes an introduction, case studies, conclusions - drawing together the generalities of the introduction and specific findings from the case study application - and guidance for further reading. This accessible text has been specifically designed for those readers who are new to Geocomputation as an area of research,

showing how complex real-world problems can be solved through the integration of technology, data, and geocomputational methods. This is the applied primer for Geocomputation in the social sciences.

Computational Cognitive Modeling and Linguistic Theory - Adrian Brasoveanu 2020-01-01

This open access book introduces a general framework that allows natural language researchers to enhance existing competence theories with fully specified performance and processing components. Gradually developing increasingly complex and cognitively realistic competence-performance models, it provides running code for these models and shows how to fit them to real-time experimental data. This computational cognitive modeling approach opens up exciting new directions for research in formal semantics, and linguistics more generally, and offers new ways of (re)connecting semantics and the broader field of cognitive science. The approach of this book is novel in more ways than one. Assuming the mental architecture and procedural modalities of Anderson's ACT-R framework, it presents fine-grained computational models of human language processing tasks which make detailed quantitative predictions that can be checked against the results of self-paced reading and other psycho-linguistic experiments. All models are presented as computer programs that readers can run on their own computer and on inputs of their choice, thereby learning to design, program and run their own models. But even for readers who won't do all that, the book will show how such detailed, quantitatively predicting modeling of linguistic processes is possible. A methodological breakthrough and a must for anyone concerned about the future of linguistics! (Hans Kamp) This book constitutes a major step forward in linguistics and psycholinguistics. It constitutes a unique synthesis of several different research traditions: computational models of psycholinguistic processes, and formal models of semantics and discourse processing. The work also introduces a sophisticated python-based software environment for modeling linguistic processes. This book has the potential to revolutionize not only formal models of linguistics, but also models of language processing more generally. (Shravan Vasishth) .

Memory and Action Selection in Human-Machine Interaction - Munéo Kitajima 2016-01-05

The first goal of this book is to extend Two Minds originating from behavioral economics to the domain of interaction, where the time dimension has to be dealt with rigorously; in human-machine interaction, it is of crucial importance how synchronization between conscious processes and unconscious processes is established for a sense of smoothness, and how memory processes and action selection processes are coordinated. The first half this book describes the theory in detail. The book begins by outlining the whole view of the theory consisting of action selection processes and memorization processes, and their interactions. Then, a detailed description for action selection processes theorized as a nonlinear dynamic human behavior model with real-time constraints is provided, followed by a description for memorization processes. Also, implications of the theory to human-machine interactions are discussed. The second goal of this book is to provide a methodology to study how Two Minds works in practice when people use interactive systems. The latter half of this book describes theory practices in detail. A new methodology called Cognitive Chrono-Ethnography (CCE) is introduced, which adds the time dimension to Hutchins' Cognitive Ethnography, in order to practice "know the users" systematically by designing user studies based on a simulation of users' mental operations controlled by Two Minds. The author then shows how CCE has been applied to understanding the ways in which people navigate in real physical environments by walking and by car, respectively, and explores the possibility of applying CCE to predict people's future needs. This is not for understanding how people use interfaces at present but to predict how people want to use the interfaces in the future given they are currently using them in a certain way Finally, the book concludes by describing implications of human-machine interactions that are carried out while using modern artefacts for people's cognitive development from birth, on the basis of the theories of action selection and memorization.

Strengthening the User-centered Product Design Paradigm with Cognitive Modeling - Melih Gunal 2006

How Can the Human Mind Occur in the Physical Universe? - John R. Anderson 2009-08-28

"The question for me is how can the human mind occur in the physical universe. We now know that the world is governed by physics. We now

understand the way biology nestles comfortably within that. The issue is how will the mind do that as well."--Allen Newell, December 4, 1991, Carnegie Mellon University The argument John Anderson gives in this book was inspired by the passage above, from the last lecture by one of the pioneers of cognitive science. Newell describes what, for him, is the pivotal question of scientific inquiry, and Anderson gives an answer that is emerging from the study of brain and behavior. Humans share the same basic cognitive architecture with all primates, but they have evolved abilities to exercise abstract control over cognition and process more complex relational patterns. The human cognitive architecture consists of a set of largely independent modules associated with different brain regions. In this book, Anderson discusses in detail how these various modules can combine to produce behaviors as varied as driving a car and solving an algebraic equation, but focuses principally on two of the modules: the declarative and procedural. The declarative module involves a memory system that, moment by moment, attempts to give each person the most appropriate possible window into his or her past. The procedural module involves a central system that strives to develop a set of productions that will enable the most adaptive response from any state of the modules. Newell argued that the answer to his question must take the form of a cognitive architecture, and Anderson organizes his

answer around the ACT-R architecture, but broadens it by bringing in research from all areas of cognitive science, including how recent work in brain imaging maps onto the cognitive architecture.

Agent-based Modeling and Simulation - S. Taylor 2014-08-27
Operational Research (OR) deals with the use of advanced analytical methods to support better decision-making. It is multidisciplinary with strong links to management science, decision science, computer science and many application areas such as engineering, manufacturing, commerce and healthcare. In the study of emergent behaviour in complex adaptive systems, Agent-based Modelling & Simulation (ABMS) is being used in many different domains such as healthcare, energy, evacuation, commerce, manufacturing and defense. This collection of articles presents a convenient introduction to ABMS with papers ranging from contemporary views to representative case studies. The OR Essentials series presents a unique cross-section of high quality research work fundamental to understanding contemporary issues and research across a range of Operational Research (OR) topics. It brings together some of the best research papers from the esteemed Operational Research Society and its associated journals, also published by Palgrave Macmillan.