fluid concepts and creative analogies computer models of the fundamental mechanisms of thought

#fluid concepts AI #creative analogies computer models #mechanisms of thought AI #computational cognition #AI creativity modeling

Explore advanced computer models that delve into the fascinating interplay of fluid concepts and creative analogies. This research illuminates the fundamental mechanisms of thought, leveraging artificial intelligence to simulate and understand complex cognitive processes, offering groundbreaking insights into how intelligence, both human and artificial, truly functions.

Fluid Concepts And Creative Analogies

Hofstadter has developed a sophisticated vision of the mind in which perception, at an abstract level, is the key.

Fluid Concepts and Creative Analogies

Hosftadter and his colleagues at The Fluid Analogies Research Group have developed computer models that help describe and explain human discovery, creation and analogical thought. The key issue of perception is investigated through the exploration of playful anagrams, number puzzles, word play and fanciful alphabetical styles, and the result is a survey of cognitive processes. This text presents the results.

Fluid Concepts & Creative Analogies

Describes research projects in cognitive science over the past twenty years, and discusses arithmetical play, analogy, research evaluation, and creativity

Fluid Concepts and Creative Analogies

Om amerikanske forskeres arbejde med kognitiv videnskab og kunstig intelligens i forbindelse med udviklingen af nye computere

Fluid Concepts and Creative Analogies

Shows how analogy-making pervades human thought at all levels, influencing the choice of words and phrases in speech, providing guidance in unfamiliar situations, and giving rise to great acts of imagination.

Surfaces and Essences

The psychologist William James observed that "a native talent for perceiving analogies is ... the leading fact in genius of every order." The centrality and the ubiquity of analogy in creative thought have been noted again and again by scientists, artists, and writers, and understanding and modeling analogical thought have emerged as two of the most important challenges for cognitive science. Analogy-Making as Perception is based on the premise that analogy-making is fundamentally a high-level perceptual process in which the interaction of perception and concepts gives rise to "conceptual slippages" which allow analogies to be made. It describes Copycat - a computer model of analogymaking, developed by the author with Douglas Hofstadter, that models the complex, subconscious interaction between perception and concepts that underlies the creation of analogies. In Copycat, both concepts and high-level perception are emergent phenomena, arising from large numbers of low-level, parallel, non-deterministic activities. In the spectrum of cognitive modeling approaches, Copycat occupies a unique intermediate position between symbolic systems and connectionist systems a position that is at present the most useful one for understanding the fluidity of concepts and high-level perception. On one level the work described here is about analogy-making, but on another level it is about cognition in general. It explores such issues as the nature of concepts and perception and the emergence of highly flexible concepts from a lower-level "subcognitive" substrate. Melanie Mitchell, Assistant Professor in the Department of Electrical Engineering and Computer Science at the University of Michigan, is a Fellow of the Michigan Society of Fellows. She is also Director of the Adaptive Computation Program at the Santa Fe Institute.

Analogy-making as Perception

Is human creativity a wall that AI can never scale? Many people are happy to admit that experts in many domains can be matched by either knowledge-based or sub-symbolic systems, but even some AI researchers harbor the hope that when it comes to feats of sheer brilliance, mind over machine is an unalterable fact. In this book, the authors push AI toward a time when machines can autonomously write not just humdrum stories of the sort seen for years in AI, but first-rate fiction thought to be the province of human genius. It reports on five years of effort devoted to building a story generator--the BRUTUS.1 system. This book was written for three general reasons. The first theoretical reason for investing time, money, and talent in the quest for a truly creative machine is to work toward an answer to the question of whether we ourselves are machines. The second theoretical reason is to silence those who believe that logic is forever closed off from the emotional world of creativity. The practical rationale for this endeavor, and the third reason, is that machines able to work alongside humans in arenas calling for creativity will have incalculable worth.

Artificial Intelligence and Literary Creativity

Milieus of Creativity is the second volume in the book series Knowledge and Space. This book deals with spatial disparities of knowledge and the impact of environments, space and contexts on the production and application of knowledge. The contributions in this volume focus on the role of places, environments, and spatial contexts for the emergence and perpetuation of creativity. Is environment a social or a spatial phenomenon? Are only social factors relevant for the development of creativity or should one also include material artefacts and resources in its definition? How can we explain spatial disparities of creativity without falling victim to geodeterminism? This book offers insights from various disciplines such as environmental psychology, philosophy, and social geography. It presents the results of a research conference at Heidelberg University in September 2006, which was supported by the Klaus Tschira Foundation.

Milieus of Creativity

One of our greatest philosophers and scientists of the mind asks, where does the self come from -- and how our selves can exist in the minds of others. Can thought arise out of matter? Can self, soul, consciousness, "I" arise out of mere matter? If it cannot, then how can you or I be here? I Am a Strange Loop argues that the key to understanding selves and consciousness is the "strange loop"-a special kind of abstract feedback loop inhabiting our brains. The most central and complex symbol in your brain

is the one called "I." The "I" is the nexus in our brain, one of many symbols seeming to have free will and to have gained the paradoxical ability to push particles around, rather than the reverse. How can a mysterious abstraction be real-or is our "I" merely a convenient fiction? Does an "I" exert genuine power over the particles in our brain, or is it helplessly pushed around by the laws of physics? These are the mysteries tackled in I Am a Strange Loop, Douglas Hofstadter's first book-length journey into philosophy since Gödel, Escher, Bach. Compulsively readable and endlessly thought-provoking, this is a moving and profound inquiry into the nature of mind.

I Am a Strange Loop

“[Why Time Flies] captures us. Because it opens up a well of fascinating queries and gives us a glimpse of what has become an ever more deepening mystery for humans: the nature of time.” —The New York Times Book Review “Erudite and informative, a joy with many small treasures.” —Science “Time” is the most commonly used noun in the English language; it’s always on our minds and it advances through every living moment. But what is time, exactly? Do children experience it the same way adults do? Why does it seem to slow down when we’re bored and speed by as we get older? How and why does time fly? In this witty and meditative exploration, award-winning author and New Yorker staff writer Alan Burdick takes readers on a personal quest to understand how time gets in us and why we perceive it the way we do. In the company of scientists, he visits the most accurate clock in the world (which exists only on paper); discovers that “now” actually happened a split-second ago; finds a twenty-fifth hour in the day; lives in the Arctic to lose all sense of time; and, for one fleeting moment in a neuroscientist’s lab, even makes time go backward. Why Time Flies is an instant classic, a vivid and intimate examination of the clocks that tick inside us all.

Why Time Flies

'What is a self and how can a self come out of inanimate matter?' This is the riddle that drove Douglas Hofstadter to write this extraordinary book. In order to impart his original and personal view on the core mystery of human existence - our intangible sensation of 'I'-ness - Hofstadter defines the playful yet seemingly paradoxical notion of 'strange loop', and explicates this idea using analogies from many disciplines.

Gödel, Escher, Bach

This book gives the most comprehensive, in depth and contemporary assessment of this classic topic in artificial intelligence. It is the first to elaborate in such detail the numerous conflicting points of view on many aspects of this multifaceted, controversial subject. It offers new insights into Turing's own interpretation and is essential reading for research on the Turing test and for teaching undergraduate and graduate students in philosophy, computer science, and cognitive science.

The Turing Test

The philosophy professor behind Breaking the Spell and Consciousness Explained offers exercises and tools to stretch the mind, offering new ways to consider, discuss and argue positions on dangerous subject matter including evolution, the meaning of life and free will.

Intuition Pumps and Other Tools for Thinking

Modeling Creativity (doctoral thesis, 2013) explores how creativity can be represented using computational approaches. Our aim is to construct computer models that exhibit creativity in an artistic context, that is, that are capable of generating or evaluating an artwork (visual or linguistic), an interesting new idea, a subjective opinion. The research was conducted in 2008–2012 at the Computational Linguistics Research Group (CLiPS, University of Antwerp) under the supervision of Prof. Walter Daelemans. Prior research was also conducted at the Experimental Media Research Group (EMRG, St. Lucas University College of Art & Design Antwerp) under the supervision of Lucas Nijs. Modeling Creativity examines creativity in a number of different perspectives: from its origins in nature, which is essentially blind, to humans and machines, and from generating creative ideas to evaluating and learning their novelty and usefulness. We will use a hands-on approach with case studies and examples in the Python programming language.

Modeling Creativity

National Book Award Finalist: “This man’s ideas may be the most influential, not to say controversial, of the second half of the twentieth century.”—Columbus Dispatch At the heart of this classic, seminal book is Julian Jaynes's still-controversial thesis that human consciousness did not begin far back in animal evolution but instead is a learned process that came about only three thousand years ago and is still developing. The implications of this revolutionary scientific paradigm extend into virtually every aspect of our psychology, our history and culture, our religion—and indeed our future. “Don’t be put off by the academic title of Julian Jaynes’s The Origin of Consciousness in the Breakdown of the Bicameral Mind. Its prose is always lucid and often lyrical…he unfolds his case with the utmost intellectual rigor.”—The New York Times “When Julian Jaynes . . . speculates that until late in the twentieth millennium BC men had no consciousness but were automatically obeying the voices of the gods, we are astounded but compelled to follow this remarkable thesis.”—John Updike, The New Yorker “He is as startling as Freud was in The Interpretation of Dreams, and Jaynes is equally as adept at forcing a new view of known human behavior.”—American Journal of Psychiatry

The Origin of Consciousness in the Breakdown of the Bicameral Mind

In this mind-expanding book, scientific pioneer Marvin Minsky continues his groundbreaking research, offering a fascinating new model for how our minds work. He argues persuasively that emotions, intuitions, and feelings are not distinct things, but different ways of thinking. By examining these different forms of mind activity, Minsky says, we can explain why our thought sometimes takes the form of carefully reasoned analysis and at other times turns to emotion. He shows how our minds progress from simple, instinctive kinds of thought to more complex forms, such as consciousness or self-awareness. And he argues that because we tend to see our thinking as fragmented, we fail to appreciate what powerful thinkers we really are. Indeed, says Minsky, if thinking can be understood as the step-by-step process that it is, then we can build machines -- artificial intelligences -- that not only can assist with our thinking by thinking as we do but have the potential to be as conscious as we are. Eloquently written, The Emotion Machine is an intriguing look into a future where more powerful artificial intelligences await.

The Emotion Machine

How is it possible to think new thoughts? What is creativity and can science explain it? And just how did Coleridge dream up the creatures of The Ancient Mariner? When The Creative Mind: Myths and Mechanisms was first published, Margaret A. Boden's bold and provocative exploration of creativity broke new ground. Boden uses examples such as jazz improvisation, chess, story writing, physics, and the music of Mozart, together with computing models from the field of artificial intelligence to uncover the nature of human creativity in the arts. The second edition of The Creative Mind has been updated to include recent developments in artificial intelligence, with a new preface, introduction and conclusion by the author. It is an essential work for anyone interested in the creativity of the human mind.

The Mind's I

Researchers in artificial intelligence and scholars in the humanities consider the past, present, and future of artificial intelligence from a multidisciplinary perspective.

The Creative Mind

This interdisciplinary volume introduces new theories and ideas on creativity from the perspectives of science and art. Featuring contributions from leading researchers, theorists and artists working in artificial intelligence, generative art, creative computing, music composition, and cybernetics, the book examines the relationship between computation and creativity from both analytic and practical perspectives. Each contributor describes innovative new ways creativity can be understood through, and inspired by, computers. The book tackles critical philosophical questions and discusses the major issues raised by computational creativity, including: whether a computer can exhibit creativity independently of its creator; what kinds of creativity are possible in light of our knowledge from computational simulation, artificial intelligence, evolutionary theory and information theory; and whether we can begin to automate the evaluation of aesthetics and creativity in silico. These important, often controversial questions are contextualised by current thinking in computational creative arts practice. Leading artistic practitioners discuss their approaches to working creatively with computational systems in a diverse array of media, including music, sound art, visual art, and interactivity. The volume also includes a comprehensive review of computational aesthetic evaluation and judgement research, alongside discussion

and insights from pioneering artists working with computation as a creative medium over the last fifty years. A distinguishing feature of this volume is that it explains and grounds new theoretical ideas on creativity through practical applications and creative practice. Computers and Creativity will appeal to theorists, researchers in artificial intelligence, generative and evolutionary computing, practicing artists and musicians, students and any reader generally interested in understanding how computers can impact upon creativity. It bridges concepts from computer science, psychology, neuroscience, visual art, music and philosophy in an accessible way, illustrating how computers are fundamentally changing what we can imagine and create, and how we might shape the creativity of the future. Computers and Creativity will appeal to theorists, researchers in artificial intelligence, generative and evolutionary computing, practicing artists and musicians, students and any reader generally interested in understanding how computers can impact upon creativity. It bridges concepts from computer science, psychology, neuroscience, visual art, music and philosophy in an accessible way, illustrating how computers are fundamentally changing what we can imagine and create, and how we might shape the creativity of the future.

Mechanical Bodies, Computational Minds

Hofstadter's collection of quirky essays is unified by its primary concern: to examine the way people perceive and think.

Computers and Creativity

The novel organization of the program in terms of figure descriptions, which are analyzed to find transformation rules, and rule descriptions, which are analyzed to find 'common generalizations' of pairs of transformation rules, has implications for the design of problem-solving programs and for machine learning. These implications are discussed at some length and suggestions are made for work on pattern-recognition and learning techniques based on ideas developed in the course of the present investigation.

Metamagical Themas

Essays on computer art and its relation to more traditional art, by a pioneering practitioner and a philosopher of artificial intelligence. In From Fingers to Digits, a practicing artist and a philosopher examine computer art and how it has been both accepted and rejected by the mainstream art world. In a series of essays, Margaret Boden, a philosopher and expert in artificial intelligence, and Ernest Edmonds, a pioneering and internationally recognized computer artist, grapple with key questions about the aesthetics of computer art. Other modern technologies—photography and film—have been accepted by critics as ways of doing art. Does the use of computers compromise computer art's aesthetic credentials in ways that the use of cameras does not? Is writing a computer program equivalent to painting with a brush? Essays by Boden identify types of computer art, describe the study of creativity in AI, and explore links between computer art and traditional views in philosophical aesthetics. Essays by Edmonds offer a practitioner's perspective, considering, among other things, how the experience of creating computer art compares to that of traditional art making. Finally, the book presents interviews in which contemporary computer artists offer a wide range of comments on the issues raised in Boden's and Edmonds's essays.

A Program for the Solution of a Class of Geometric-analogy Intelligence-test Questions

How is it possible to think new thoughts? What is creativity and can science explain it? And just how did Coleridge dream up the creatures of The Ancient Mariner? When The Creative Mind: Myths and Mechanisms was first published, Margaret A. Boden's bold and provocative exploration of creativity broke new ground. Boden uses examples such as jazz improvisation, chess, story writing, physics, and the music of Mozart, together with computing models from the field of artificial intelligence to uncover the nature of human creativity in the arts. The second edition of The Creative Mind has been updated to include recent developments in artificial intelligence, with a new preface, introduction and conclusion by the author. It is an essential work for anyone interested in the creativity of the human mind.

From Fingers to Digits

Pulls back the curtain on creativity and language, using a wide range of examples to illustrate how we create new ways of saying things.

The Creative Mind

Knowledge Based Systems (KBS) are systems that use artificial intelligence techniques in the problem solving process. This text is designed to develop an appreciation of KBS and their architecture and to help users understand a broad variety of knowledge based techniques for decision support and planning. It assumes basic computer science skills and a math background that includes set theory, relations, elementary probability, and introductory concepts of artificial intelligence. Each of the 12 chapters are designed to be modular providing instructors with the flexibility to model the book to their own course needs. Exercises are incorporated throughout the text to highlight certain aspects of the material being presented and to stimulate thought and discussion.

Exploding The Creativity Myth

Analogy has been the focus of extensive research in cognitive science over the past two decades. Through analogy, novel situations and problems can be understood in terms of familiar ones. Indeed, a case can be made for analogical processing as the very core of cognition. This is the first book to span the full range of disciplines concerned with analogy. Its contributors represent cognitive, developmental, and comparative psychology; neuroscience; artificial intelligence; linguistics; and philosophy. The book is divided into three parts. The first part describes computational models of analogy as well as their relation to computational models of other cognitive processes. The second part addresses the role of analogy in a wide range of cognitive tasks, such as forming complex cognitive structures, conveying emotion, making decisions, and solving problems. The third part looks at the development of analogy in children and the possible use of analogy in nonhuman primates. Contributors Miriam Bassok, Consuelo B. Boronat, Brian Bowdle, Fintan Costello, Kevin Dunbar, Gilles Fauconnier, Kenneth D. Forbus, Dedre Gentner, Usha Goswami, Brett Gray, Graeme S. Halford, Douglas Hofstadter, Keith J. Holyoak, John E. Hummel, Mark T. Keane, Boicho N. Kokinov, Arthur B. Markman, C. Page Moreau, David L. Oden, Alexander A. Petrov, Steven Phillips, David Premack, Cameron Shelley, Paul Thagard, Roger K.R. Thompson, William H. Wilson, Phillip Wolff

Knowledge-Based Systems

An argument that we must read code for more than what it does—we must consider what it means. Computer source code has become part of popular discourse. Code is read not only by programmers but by lawyers, artists, pundits, reporters, political activists, and literary scholars; it is used in political debate, works of art, popular entertainment, and historical accounts. In this book, Mark Marino argues that code means more than merely what it does; we must also consider what it means. We need to learn to read code critically. Marino presents a series of case studies—ranging from the Climategate scandal to a hactivist art project on the US-Mexico border—as lessons in critical code reading. Marino shows how, in the process of its circulation, the meaning of code changes beyond its functional role to include connotations and implications, opening it up to interpretation and inference—and misinterpretation and reappropriation. The Climategate controversy, for example, stemmed from a misreading of a bit of placeholder code as a “smoking gun” that supposedly proved fabrication of climate data. A poetry generator created by Nick Montfort was remixed and reimagined by other poets, and subject to literary interpretation. Each case study begins by presenting a small and self-contained passage of code—by coders as disparate as programming pioneer Grace Hopper and philosopher Friedrich Kittler—and an accessible explanation of its context and functioning. Marino then explores its extra-functional significance, demonstrating a variety of interpretive approaches.

The Analogical Mind

A witty and addictively readable day-by-day literary companion. At once a love letter to literature and a charming guide to the books most worth reading, A Reader's Book of Days features bite-size accounts of events in the lives of great authors for every day of the year. Here is Marcel Proust starting In Search of Lost Time and Virginia Woolf scribbling in the margin of her own writing, "Is it nonsense, or is it brilliance?" Fictional events that take place within beloved books are also included: the birth of Harry Potter’s enemy Draco Malfoy, the blood-soaked prom in Stephen King’s Carrie. A Reader's Book of Days is filled with memorable and surprising tales from the lives and works of Martin Amis, Jane Austen, James Baldwin, Roberto Bolano, the Brontë sisters, Junot Díaz, Philip K. Dick, Charles Dickens, Joan Didion, F. Scott Fitzgerald, John Keats, Hilary Mantel, Haruki Murakami, Flannery O’Connor, Orhan Pamuk, George Plimpton, Marilynne Robinson, W. G. Sebald, Dr. Seuss, Zadie Smith, Susan Sontag, Hunter S. Thompson, Leo Tolstoy, David Foster Wallace, and many more. The book also notes the days on which famous authors were born and died; it includes lists of recommended reading for every

month of the year as well as snippets from book reviews as they appeared across literary history; and throughout there are wry illustrations by acclaimed artist Joanna Neborsky. Brimming with nearly 2,000 stories, A Reader's Book of Days will have readers of every stripe reaching for their favorite books and discovering new ones.

Critical Code Studies

Analogical thinking lies at the core of human cognition, pervading from the most mundane to the most extraordinary forms of creativity. By connecting poorly understood phenomena to learned situations whose structure is well articulated, it allows reasoners to expand the boundaries of their knowledge. The first part of the book begins by fleshing out the debate around whether our cognitive system is well-suited for creative analogizing, and ends by reviewing a series of studies that were designed to decide between the experimental and the naturalistic accounts. The studies confirm the psychological reality of the surface bias revealed by most experimental studies, thus claiming for realistic solutions to the problem of inert knowledge. The second part of the book delves into cognitive interventions, while maintaining an emphasis on the interplay between psychological modeling and instructional applications. It begins by reviewing the first generation of instructional interventions aimed at improving the later retrievability of educational contents by highlighting their abstract structure. Subsequent chapters discuss the most realistic avenues for devising easily-executable and widely-applicable ways of enhancing access to stored knowledge that would otherwise remain inert. The authors review results from studies from both others and their own lab that speak of the promise of these approaches.

Wired Bodies. New Perspectives on the Machine-organism Analogy

The development of cognitive science is one of the most remarkable and fascinating intellectual achievements of the modern era. It brings together psychology, neuroscience, artificial intelligence, computing, philosophy, linguistics, and anthropology in the project of understanding the mind by modelling its workings. Oxford University Press now presents a masterful history of cognitive science, told by one of its most eminent practitioners.

A Reader's Book of Days: True Tales from the Lives and Works of Writers for Every Day of the Year

Analogical reasoning is known as a powerful mode for drawing plausible conclusions and solving problems. It has been the topic of a huge number of works by philosophers, anthropologists, linguists, psychologists, and computer scientists. As such, it has been early studied in artificial intelligence, with a particular renewal of interest in the last decade. The present volume provides a structured view of current research trends on computational approaches to analogical reasoning. It starts with an overview of the field, with an extensive bibliography. The 14 collected contributions cover a large scope of issues. First, the use of analogical proportions and analogies is explained and discussed in various natural language processing problems, as well as in automated deduction. Then, different formal frameworks for handling analogies are presented, dealing with case-based reasoning, heuristic-driven theory projection, commonsense reasoning about incomplete rule bases, logical proportions induced by similarity and dissimilarity indicators, and analogical proportions in lattice structures. Lastly, the volume reports case studies and discussions about the use of similarity judgments and the process of analogy making, at work in IQ tests, creativity or other cognitive tasks. This volume gathers fully revised and expanded versions of papers presented at an international workshop, as well as invited contributions. All chapters have benefited of a thorough peer review process.

Distant Connections: The Memory Basis of Creative Analogy

This book discusses how scientific and other types of cognition make use of models, abduction, and explanatory reasoning in order to produce important or creative changes in theories and concepts. It includes revised contributions presented during the international conference on Model-Based Reasoning (MBR’015), held on June 25-27 in Sestri Levante, Italy. The book is divided into three main parts, the first of which focuses on models, reasoning and representation. It highlights key theoretical concepts from an applied perspective, addressing issues concerning information visualization, experimental methods and design. The second part goes a step further, examining abduction, problem solving and reasoning. The respective contributions analyze different types of reasoning, discussing various concepts of inference and creativity and their relationship with experimental data. In turn, the third part reports on a number of historical, epistemological and technological issues. By analyzing possible contradictions in modern research and describing representative case studies in experimental research, this part

aims at fostering new discussions and stimulating new ideas. All in all, the book provides researchers and graduate students in the field of applied philosophy, epistemology, cognitive science and artificial intelligence alike with an authoritative snapshot of current theories and applications of model-based reasoning.

Mind as Machine

The chapters contained in the book present a new and exciting set of conceptual tools that will not only allow us to think about transfer in more productive ways, but will also enable the development of educational and measurement tools that will greatly facilitate our ability to educate the children in our schools. This volume is eclectic in bringing together researchers from psychology and science education (especially physics)—who would not normally present their ideas under the same forum—to share their views and perspectives on transfer. What we believe has emerged is a fresh look at transfer issues from a multidisciplinary perspective.

Computational Approaches to Analogical Reasoning: Current Trends

The International Conference on ICT Innovations was held in September 2016, in Ohrid, Macedonia, with the main topic “Cognitive Functions and Next Generation ICT Systems”. We live in the era where technologies are intimately woven into virtually all aspects of daily life and are becoming almost invisible. While these technologies have considerable benefits, they also have a number of shortcomings and unforeseen consequences. For example, on the one hand, bodily sensors that track physical activity, physiological parameters and sleep patterns can help promote healthy habits and can enable early detection of problems. On the other hand, attention spans are becoming shorter and shorter due to constant interruptions by notifications, emails, and instant messages being delivered to cell phones or watches, and similar disturbances. Moreover, the privacy issues involved in storing and manipulation of these data must not be neglected. The technological convergence of sciences that were considered separate in the past, like information and communication technologies, cognitive sciences, nanotechnologies and biotechnologies, determines not only our society, health and economy, but also our education and culture. The conference gathered academics, professionals and practitioners involved in developing solutions and systems in the industrial and business arena, especially innovative commercial implementations, to discuss novel applications of these next-generation, emerging technologies in the context of human cognitive functions.

Model-Based Reasoning in Science and Technology

Scientists have used models for hundreds of years as a means of describing phenomena and as a basis for further analogy. In Scientific Models in Philosophy of Science, Daniela Bailer-Jones assembles an original and comprehensive philosophical analysis of how models have been used and interpreted in both historical and contemporary contexts. Bailer-Jones delineates the many forms models can take (ranging from equations to animals; from physical objects to theoretical constructs), and how they are put to use. She examines early mechanical models employed by nineteenth-century physicists such as Kelvin and Maxwell, describes their roots in the mathematical principles of Newton and others, and compares them to contemporary mechanistic approaches. Bailer-Jones then views the use of analogy in the late nineteenth century as a means of understanding models and to link different branches of science. She reveals how analogies can also be models themselves, or can help to create them. The first half of the twentieth century saw little mention of models in the literature of logical empiricism. Focusing primarily on theory, logical empiricists believed that models were of temporary importance, flawed, and awaiting correction. The later contesting of logical empiricism, particularly the hypothetico-deductive account of theories, by philosophers such as Mary Hesse, sparked a renewed interest in the importance of models during the 1950s that continues to this day. Bailer-Jones analyzes subsequent propositions of: models as metaphors; Kuhn's concept of a paradigm; the Semantic View of theories; and the case study approaches of Cartwright and Morrison, among others. She then engages current debates on topics such as phenomena versus data, the distinctions between models and theories, the concepts of representation and realism, and the discerning of falsities in models.

Artificial Intelligence

This book bridges the gap between models of human behavior that are based on cognitive task analysis and those based on neural networks. The author argues that these approaches are incomplete and not properly related to each other. His synthesis reconciles the very different conceptualizations of

human memory assumed by these two approaches by assuming that 'what the brain remembers' is not a collection of symbols or neurons or even networks of either of these, but rather how to coordinate behavior in time, relating different modalities of conception and movement. A second premise is that behavior sequences are categorized, with perceptual categorizations (sounds, images) comprising the first order of categorization and conceptual categorizations of perceptions and actions in time comprising the second order. The conceptual categorizations are themselves sequenced and categorized, corresponding to the familiar classification hierarchies in cognitive models. Inspired by Bartlett's work, the author seeks to develop a theory of "process memory"--memory for experience in time. Following the methodology of situated cognition, he finds clues in the particulars of human activity, such as typing errors, how a computer interface is used, how a child learns to play in a swimming pool, odd limitations in language comprehension, and so on. Throughout, he examines existing (and often famous) cognitive and neural models with respect to these phenomena. In each case, he attempts to show that the experienced behavior can be understood as sequences of categories being reactivated, substituted, and composed. Ultimately, this analysis is shown to be the link that may lead to improvement of both symbolic and neurally based models of memory and behavior, with concomitant implications for cognitive psychology, artificial intelligence, and cognitive science as a whole.

Transfer of Learning from a Modern Multidisciplinary Perspective

ICT Innovations 2016