Introduction To Computational Models Of Argumentation

A Step-by-step Guide to Developing Innovative Computational Tools for Shallow Geothermal Systems Geothermal heat is a viable source of energy and its environmental impact in terms of CO2 emissions is significantly lower than conventional fossil fuels. Shallow geothermal systems are increasingly utilized for heating and cooling of buildings and greenhouses. However, their utilization is inconsistent with the enormous amount of energy available underneath the surface of the earth. Projects of this nature are not getting the public support they deserve because of the uncertainties associated with them, and this can primarily be attributed to the lack of appropriate computational tools necessary to carry out effective designs and analyses. For this energy field to have a better competitive position in the renewable energy market, it is vital that engineers acquire computational tools, which are accurate, versatile and efficient. This book aims at attaining such tools. This book addresses computational modeling of shallow geothermal systems in considerable detail, and provides researchers and developers in computational mechanics, geosciences, geology and geothermal engineering with the means to develop computational tools capable of modeling the complicated nature of heat flow in shallow geothermal systems in rather straightforward methodologies. Coupled conduction-convection models for heat flow in borehole heat exchangers and the surrounding soil mass are formulated and solved using analytical, semi-analytical and numerical methods. Background theories, enhanced by numerical examples, necessary for formulating the models and conducting the solutions are thoroughly addressed. The book emphasizes two main aspects: mathematical modeling and computational procedures. In geothermics, both aspects are considerably challenging because of the involved geometry and physical processes. However, they are highly stimulating and inspiring. A good combination of mathematical modeling and computational procedures can greatly reduce the computational efforts. This book thoroughly treats this issue and introduces step-by-step methodologies for developing innovative computational models, which are both rigorous and computationally efficient.

The entorhinal cortex of rat contains neurons, called "grid cells", that exhibit a very peculiar behavior. Discovered about a decade ago, the activity of these cells was found to correlate with the allocentric position of the animal by forming a regular, hexagonal lattice of firing fields across the entire environment. Due to this unusual behavior and the proximity of the entorhinal cortex to other brain regions that also contain cells with spatially correlated activity grid cells are commonly recognized as an important element of a neuronal system for navigation. Existing computational models of grid cells share this view and typically describe the behavior of grid cells as a path integration component of such a system. This work presents a new, complementary computational model of grid cells. In contrast to existing models it does not assume that grid cells are a specialized component of a navigational system. Instead, it assumes that the activity of grid cells reflects a general principle by which neurons in higher order parts of the cortex process information. The proposed model extends the growing neural gas approach by Bernd Fritzke into a recursive algorithm that describes the joint behavior of grid cells in a group as well as the processes within each individual cell. The work demonstrates that the chosen approach is able to model the characteristic behavior of grid cells and other cells, that also exhibit grid cell-like firing patterns but whose activity does not correlate with the animal's location in the environment.

Computational and mathematical models provide us with the opportunities to investigate the complexities of real world problems. They allow us to apply our best analytical methods to define problems in a clearly mathematical manner and exhaustively test our solutions before committing expensive resources. This is made possible by assuming parameter(s) in a bounded environment, allowing for controllable experimentation, not always possible in live scenarios. For example, simulation of computational models allows the testing of theories in a manner that is both fundamentally deductive and experimental in nature. The main ingredients for such research ideas come from multiple disciplines and the importance of interdisciplinary research is well recognized by the scientific community. This book provides a window to the novel endeavours of the research communities to present their works by highlighting the value of computational modelling as a research tool when investigating complex systems. We hope that the readers will have stimulating experiences to pursue research in these directions.

Computational aspects of discourse; Recognizing intentions from natural language utterances; Cooperative responses from a portable natural language database query system; Natural language generation as a computational problem: an introduction; Focusing in the comprehension of definite anaphora; So what can we talk about now?

With an emphasis on problem solving, this book introduces the basic principles and fundamental concepts of computational modeling. It emphasizes reasoning and conceptualizing problems, the elementary mathematical modeling, and the implementation using computing concepts and principles. Examples are included that demonstrate the computation and visu

This book provides an introduction, discussion, and formal-based modelling of trust theory and its applications in agent-based systems This book gives an accessible explanation of the importance of trust in human interaction and, in general, in autonomous cognitive agents including autonomous technologies. The authors explain the concepts of trust, and describe a principled, general theory of trust grounded on cognitive, cultural, institutional, technical, and normative solutions. This provides a strong base for the author’s discussion of role of trust in agent-based systems supporting human-computer interaction and distributed and virtual organizations or markets (multi-agent systems). Key Features: Provides an accessible introduction to trust, and its importance and applications in agent-based systems Proposes a principled, general theory of trust grounding on cognitive, cultural, institutional, technical, and normative solutions. Offers a clear, intuitive approach, and systematic integration of relevant issues Explains the dynamics of trust,

and the relationship between trust and security Offers operational definitions and models directly applicable both in technical and experimental domains Includes a critical examination of trust models in economics, philosophy, psychology, sociology, and AI This book will be a valuable reference for researchers and advanced students focused on information and communication technologies (computer science, artificial intelligence, organizational sciences, and knowledge management etc.), as well as Web-site and robotics designers, and for scholars working on human, social, and cultural aspects of technology. Professionals of ecommerce systems and peer-to-peer systems will also find this text of interest.

The book deals with development of comprehensive computational models for simulating underground coal gasification (UCG). It starts with an introduction to the UCG process and process modelling inputs in the form of reaction kinetics, flow patterns, spalling rate, and transport coefficient that are elaborated with methods to generate the same are described with illustrations. All the known process models are reviewed, and relative merits and limitations of the modeling approaches are highlighted and compared. The book describes all the necessary steps required to determine the techno-economic feasibility of UCG process for a given coal reserve, through modeling and simulation.

This book serves as an introduction to the myriad computational approaches to gene regulatory modeling and analysis, and is written specifically with experimental biologists in mind. Mathematical jargon is avoided and explanations are given in intuitive terms. In cases where equations are unavoidable, they are derived from first principles or, at the very least, an intuitive description is provided. Extensive examples and a large number of model descriptions are provided for use in both classroom exercises as well as self-guided exploration and learning. As such, the book is ideal for self-learning and also as the basis of a semester-long course for undergraduate and graduate students in molecular biology, bioengineering, genome sciences, or systems biology.

Emphasizing analytical skill development and problem solving, this book shows how to implement computational models using the flexible and easy-to-use Python programming language. It provides the foundation for more advanced work in scientific computing. The book uses the Python programming language interpreter and several packages from the huge

This book is intended for use in advanced graduate courses in statistics / machine learning, as well as for all experimental neuroscientists seeking to understand statistical methods at a deeper level, and theoretical neuroscientists with a limited background in statistics. It reviews almost all areas of applied statistics, from basic statistical estimation and test theory, linear and nonlinear approaches for regression and classification, to model selection and methods for dimensionality reduction, density estimation and unsupervised clustering. Its focus, however, is linear and nonlinear time series analysis from a dynamical systems perspective, based on which it aims to convey an understanding also of the dynamical mechanisms that could have generated observed time series. Further, it integrates computational modeling of behavioral and neural dynamics with statistical estimation and hypothesis testing. This way computational models in neuroscience are not only explanatory frameworks, but become powerful, quantitative data-analytical tools in themselves that enable researchers to look beyond the data surface and unravel underlying mechanisms. Interactive examples of most methods are provided through a package of MatLab routines, encouraging a playful approach to the subject, and providing readers with a better feel for the practical aspects of the methods covered. "Computational neuroscience is essential for integrating and providing a basis for understanding the myriads of remarkable laboratory data on nervous system functions. Daniel Durstewitz has excellently covered the breadth of computational neuroscience from statistical interpretations of data to biophysically based modeling of the neurobiological sources of those data. His presentation is clear, pedagogically sound, and readily useable by experts and beginners alike. It is a pleasure to recommend this very well crafted discussion to experimental neuroscientists as well as mathematically well versed Physicists. The book acts as a window to the issues, to the questions, and to the tools for finding the answers to interesting inquiries about brains and how they function." Henry D. I. Abarbanel Physics and Scripps Institution of Oceanography, University of California, San Diego “This book delivers a clear and thorough introduction to sophisticated analysis approaches useful in computational neuroscience. The models described and the examples provided will help readers develop critical intuitions into what the methods reveal about data. The overall approach of the book reflects the extensive experience Prof. Durstewitz has developed as a leading practitioner of computational neuroscience. “ Bruno B. Averbeck

This textbook provides an introduction to the growing interdisciplinary field of computational science. It combines a foundational development of numerical methods with a variety of illustrative applications spread across numerous areas of science and engineering. The intended audience is the undergraduate who has completed introductory coursework in mathematics and computer science. Students gain computational acuity by authoring their own numerical routines and by practicing with numerical methods as they solve computational models. This education encourages students to learn the importance of answering: How expensive is a calculation, how trustworthy is a calculation, and how might we model a problem to apply a desired numerical method? The text is written in two parts. Part I provides a succinct, one-term inauguration into the primary routines on which a further study of computational science rests. The material is organized so that the transition to computational science from coursework in calculus, differential equations, and linear algebra is natural. Beyond the mathematical and computational content of Part I, students gain proficiency with elemental programming constructs and visualization, which are presented in MATLAB syntax. The focus of Part II is modeling, wherein students build computational models, compute solutions, and report their findings. The models purposely intersect numerous areas of science and engineering to demonstrate the pervasive role played by computational science.

Proceedings of the NATO Advanced Study Institute on Computational Models of Speech Pattern Processing, held in St. Helier, Jersey, UK, July 7-18, 1997

The investigation of computational models of argument is a rich and fascinating interdisciplinary research field with two ultimate aims: the theoretical goal of understanding argumentation as a cognitive phenomenon by modeling it in computer programs, and the practical goal of supporting the development of computer-based systems able to engage in argumentation-related activities with human users or among themselves. The biennial International Conferences on Computational Models of Argument (COMMA) provide a dedicated forum for the presentation and discussion of the latest advancements in the field, and cover both basic research and innovative applications. This book presents the proceedings of COMMA 2020. Due to the Covid-19

pandemic, COMMA 2020 was held as an online event on the originally scheduled dates of 8 -11 September 2020, organised by the University of Perugia, Italy. The book includes 28 full papers and 13 short papers selected from a total of 78 submissions, the abstracts of 3 invited talks and 13 demonstration abstracts. The interdisciplinary nature of the field is reflected, and contributions cover both theory and practice. Theoretical contributions include new formal models, the study of formal or computational properties of models, designs for implemented systems and experimental research. Practical papers include applications to medicine, law and criminal investigation, chatbots and online product reviews. The argument-mining trend from previous COMMA's is continued, while an emerging trend this year is the use of argumentation for explainable AI. The book provided an overview of the latest work on computational models of argument, and will be of interest to all those working in the field.

This book is a collection of articles by leading researchers working at the cutting edge of neuro-computational modelling of neurological and psychiatric disorders. Each article contains model validation techniques used in the context of the specific problem being studied. Validation is essential for neuro-inspired computational models to become useful tools in the understanding and treatment of disease conditions. Currently, the immense diversity in neuro-computational modelling approaches for investigating brain diseases has created the need for a structured and coordinated approach to benchmark and standardise validation methods and techniques in this field of research. This book serves as a step towards a systematic approach to validation of neuro-computational models used for studying brain diseases and should be useful for all neuro-computational modellers.

Mathematical modeling can be a useful tool for researchers in the biological scientists. Yet in biological modeling there is no one modeling technique that is suitable for all problems. Instead, different problems call for different approaches. Furthermore, it can be helpful to analyze the same system using a variety of approaches, to be able to exploit the advantages and drawbacks of each. In practice, it is often unclear which modeling approaches will be most suitable for a particular biological question, a problem which requires researchers to know a reasonable amount about a number of techniques, rather than become experts on a single one. "Introduction to Modeling for Biosciences" addresses this issue by presenting a broad overview of the most important techniques used to model biological systems. In addition to providing an introduction into the use of a wide range of software tools and modeling environments, this helpful text/reference describes the constraints and difficulties that each modeling technique presents in practice, enabling the researcher to quickly determine which software package would be most useful for their particular problem. Topics and features: introduces a basic array of techniques to formulate models of biological systems, and to solve them; intersperses the text with exercises throughout the book; includes practical introductions to the Maxima computer algebra system, the PRISM model checker, and the Repast Simphony agent modeling environment; discusses agent-based models, stochastic modeling techniques, differential equations and Gillespie's stochastic simulation algorithm; contains appendices on Repast batch running, rules of differentiation and integration, Maxima and PRISM notation, and some additional mathematical concepts; supplies source code for many of the example models discussed, at the associated website http://www.cs.kent.ac.uk/imb/. This unique and practical guide leads the novice modeler through realistic and concrete modeling projects, highlighting and commenting on the process of abstracting the real system into a model. Students and active researchers in the biosciences will also benefit from the discussions of the high-quality, tried-and-tested modeling tools described in the book. Dr. David J. Barnes is a lecturer in computer science at the University of Kent, UK, with a strong background in the teaching of programming. Dr. Dominique Chu is a lecturer in computer science at the University of Kent, UK. He is an internationally recognized expert in agent-based modeling, and has also in-depth research experience in stochastic and differential equation based modeling.

Introduction to Computational Modeling Using C and Open-Source Tools presents the fundamental principles of computational models from a computer science perspective. It explains how to implement these models using the C programming language. The software tools used in the book include the Gnu Scientific Library (GSL), which is a free software libra

Introduction to Computational Modeling Using C and Open-Source ToolsCRC Press

"For the neuroscientist or psychologist who cringes at the sight of mathematical formulae and whose eyes glaze over at terms like differential equations, linear algebra, vectors, matrices, Bayes' rule, and Boolean logic, this book just might be the therapy needed." - Anjan Chatterjee, Professor of Neurology, University of Pennsylvania "Anderson provides a gentle introduction to computational aspects of psychological science, managing to respect the reader's intelligence while also being completely unintimidating. Using carefully-selected computational demonstrations, he guides students through a wide array of important approaches and tools, with little in the way of prerequisites...I recommend it with enthusiasm." - Asohan Amarasingham, The City University of New York This unique, self-contained and accessible textbook provides an introduction to computational modelling neuroscience accessible to readers with little or no background in computing or mathematics. Organized into thematic sections, the book spans from modelling integrate and firing neurons to playing the game Rock, Paper, Scissors in ACT-R. This non-technical guide shows how basic knowledge and modern computers can be combined for interesting simulations, progressing from early exercises utilizing spreadsheets, to simple programs in Python. Key Features include: Interleaved chapters that show how traditional computing constructs are simply disguised versions of the spread sheet methods. Mathematical facts and notation needed to understand the modelling methods are presented at their most basic and are interleaved with biographical and historical notes for contex. Numerous worked examples to demonstrate the themes and procedures of cognitive modelling. An excellent text for postgraduate students taking courses in research methods, computational neuroscience, computational modelling, cognitive science and neuroscience. It will be especially valuable to psychology students.

With an emphasis on problem solving, this book introduces the basic principles and fundamental concepts of computational modeling. It emphasizes reasoning and conceptualizing problems, the elementary mathematical modeling, and the implementation using computing concepts and principles. Examples are included that demonstrate the computation and visualization of the implemented models. The author provides case studies, along with an overview of computational models and their development. The first part of the text presents the basic concepts of models and techniques for designing and implementing problem solutions. It applies standard pseudo-code constructs and flowcharts for designing models. The second part covers model implementation with basic programming constructs using MATLAB®, Octave, and FreeMat. Aimed at beginning students in computer science, mathematics, statistics, and engineering, Introduction to Elementary Computational Modeling: Essential Concepts, Principles, and Problem Solving focuses on fundamentals, helping the next generation of scientists and engineers

hone their problem solving skills.

Introduction to Computational Modeling Using C and Open-Source Tools presents the fundamental principles of computational models from a computer science perspective. It explains how to implement these models using the C programming language. The software tools used in the book include the Gnu Scientific Library (GSL), which is a free software library of C functions, and the versatile, open-source GnuPlot for visualizing the data. All source files, shell scripts, and additional notes are located at science.kennesaw.edu/~jgarrido/comp_models The book first presents an overview of problem solving and the introductory concepts, principles, and development of computational models before covering the programming principles of the C programming language. The author then applies programming principles and basic numerical techniques, such as polynomial evaluation, regression, and other numerical methods, to implement computational models. He also discusses more advanced concepts needed for modeling dynamical systems and explains how to generate numerical solutions. The book concludes with the modeling of linear optimization problems. Emphasizing analytical skill development and problem solving, this book helps you understand how to reason about and conceptualize the problems, generate mathematical formulations, and computationally visualize and solve the problems. It provides you with the foundation to understand more advanced scientific computing, including parallel computing using MPI, grid computing, and other techniques in high-performance computing.

In this introduction to computational modelling the authors provide a concise description of computational methods, including dynamic simulation, knowledge-based models and machine learning, as a single broad class of research tools.

"Argumentation has evolved from its original study primarily by philosophers to emerge in the last ten years as an important sub-discipline of Artificial Intelligence. There have been significant contributions resulting from this, including approaches to modelling and analysis of defeasible reasoning, formal bases for negotiation and dialogue processes in multiagent systems, and the use of argumentation theory in AI applications whose nature is not best described through traditional logics, e.g. legal reasoning, evaluation of conflicting beliefs, etc. The process of interpreting and exploiting classical treatments of Argumentation Theory in effective computational terms has led to a rich interchange of ideas among researchers from disciplines such as Philosophy, Linguistics, AI and Economics. While work over recent years has done much to consolidate diverse contributions to the field, many new concerns have been identified and form the basis of current research. The papers in this volume, presented as part of the 1st International Conference on Computational Model of Arguments (COMMA) in September 2006, give a valuable overview of on-going research issues and concerns within this field."

Since first described, multiple properties of classical conditioning have been discovered, establishing the need for mathematical models to help explain the defining features. The mathematical complexity of the models puts our understanding of their workings beyond the ability of our intuitive thinking and makes computer simulations irreplaceable. The complexity of the models frequently results in function redundancy, a natural property of biologically evolved systems that is much desired in technologically designed products. Experts provide the latest advancements in the field and present detailed descriptions of how the models simulate conditioned behaviour and its physiological bases. It offers advanced students and researchers examples of how the models are used to analyse existing experimental results and design future experiments. This volume is of great interest to psychologists and neuroscientists, as well as computer scientists and engineers searching for ideas applicable to the design of robots that mimic animal behaviour.

Parallel Computational Models and Algorithms introduce parallel computational models based on which the parallel algorithms can be designed and analyzed, including performance models for tuning parallel programs. This book focuses on both the theoretical and practical aspects on the parallel computing, namely the main features of parallelism and the pragmatic techniques. Based on kernels (e.g., matrix multiplication), readers can understand and use the model by the example kernels. This valuable reference provides a deeper introduction to modern parallel computational models. The author presents the models in a new classification, which give readers a whole new view to parallel computational models. Focuses on both the theoretical and practical aspects on the parallel computing, namely the main features of parallelism and the pragmatic techniques Provides a whole view to modern parallel computational models Presents the algorithms of each problem, and techniques of algorithm design

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provide models that could be used by do-it-yourselfers and also can be used toprovideunderstandingofthebackgroundissuessothatonecandoabetter job of working with the (proprietary) algorithms of the software vendors. In this book we strive to provide models that capture many of the - tails faced by ?rms operating in a modern supply chain, but we stop short of proposing models for economic analysis of the entire multi-player chain. In other words, we produce models that are useful for planning within a supply chain rather than models for planning the supply chain. The usefulness of the models is enhanced greatly by the fact that they have been implemented - ing computer modeling languages. Implementations are shown in Chapter 7, which allows solutions to be found using a computer. A reasonable question is: why write the book now? It is a combination of opportunities that have recently become available. The availability of mod- inglanguagesandcomputersthatprovidestheopportunitytomakepractical use of the models that we develop. Meanwhile, software companies are p- viding software for optimized production planning in a supply chain. The opportunity to make use of such software gives rise to a need to understand some of the issues in computational models for optimized planning. This is best done by considering simple models and examples.

A Concise Introduction to Computation Models and Computability Theory provides an introduction to the essential concepts in computability, using several models of computation, from the standard Turing Machines and Recursive Functions, to the modern computation models inspired by quantum physics. An in-depth analysis of the basic concepts underlying each model of computation is provided. Divided into two parts, the first highlights the traditional computation models used in the first studies on computability: - Automata and Turing Machines; - Recursive functions and the Lambda-Calculus; - Logic-based computation models. and the second part covers object-oriented and interaction-based models. There is also a chapter on concurrency, and a final chapter on emergent computation models inspired by quantum mechanics. At the end of each chapter there is a discussion on the use of computation models in the design of programming languages.

This book provides the first clear, comprehensive, and accessible account of complex adaptive social systems, by two of the field's leading authorities. Such systems--whether political parties, stock markets, or ant colonies--present some of the most intriguing theoretical and practical challenges confronting the social sciences. Engagingly written, and balancing technical detail with intuitive explanations, Complex Adaptive Systems focuses on the key tools and ideas that have emerged in the field since the mid-1990s, as well as the techniques needed to investigate such systems. It provides a detailed introduction to

concepts such as emergence, self-organized criticality, automata, networks, diversity, adaptation, and feedback. It also demonstrates how complex adaptive systems can be explored using methods ranging from mathematics to computational models of adaptive agents. John Miller and Scott Page show how to combine ideas from economics, political science, biology, physics, and computer science to illuminate topics in organization, adaptation, decentralization, and robustness. They also demonstrate how the usual extremes used in modeling can be fruitfully transcended.

Computational modeling of neuronal networks enables the study of variables in isolation while approximating the biological state. In conditions such as the exposure to radiation and epilepsy, a large number of structural and network parameters are altered, making the role of any individual abnormality unclear. The goal of the presented work is to develop realistic computational models of the hippocampus for the incorporation of experimental observations and to shed light on the relative importance and deleteriousness of pathological alterations. The introduction summarizes our motivations and the utility of realistic computational models, particularly for the hippocampus, and gives a background for the abnormalities present in the irradiated and epileptic conditions. Chapter 1 describes our work translating our previous model to be compatible with parallel computing and then expanding the model to run at full-scale, with over a million neurons. It then outlines a methodology for the generation of computational models for the dendritic trees of granule cells, the most prevalent cell type in the dentate gyrus, using previous tools that contained a microscopic focus. In Chapter 2, we report an entirely new methodology for morphology generation that instead shifts the focus to the macroscopic neuroanatomy, growing dendrites within a realistic three-dimensional structure and enabling the population-level study of morphology. Chapter 3 describes a study in which our computational modeling was used to interpret experimental observations in area CA1 of the hippocampus after exposure to proton radiation. The study reports long-term but subtle changes in the passive properties of pyramidal neurons, the principal excitatory cell type in CA1, which were found in a computational model to have a surprisingly dramatic effect on network function. Chapter 4 reviews the ever-growing observations of the non-recurrent microscopic nature of seemingly repetitive macroscopic events in epilepsy. Chapter 5 provides the immediate next steps and future directions for computational modeling in health and disease, building on the foundation and framework provided in the previous chapters to suggest several avenues to bring computational models ever closer to the experimental, biological, and clinical conditions.

Computational Models of Reading is a reference book that can be used to learn about reading research and how computer models have been used to explain and simulate the mental processes involved in reading. These mental processes include the identification of printed words, the active construction of larger units of meaning (for example, of sentences), and the integration of the latter into memory so that a text can be understood and remembered. The finalchapter describes a new model of reading, in its entirety, and then reports simulations showing how it explains important findings related to reading.

This book provides a comprehensive introduction to computational epidemiology, highlighting its major methodological paradigms throughout the development of the field while emphasizing the needs for a new paradigm shift in order to most effectively address the increasingly complex real-world challenges in disease control and prevention. Specifically, the book presents the basic concepts, related computational models, and tools that are useful for characterizing disease transmission dynamics with respect to a heterogeneous host population. In addition, it shows how to develop and apply computational methods to tackle the challenges involved in population-level intervention, such as prioritized vaccine allocation. A unique feature of this book is that its examination on the issues of vaccination decision-making is not confined only to the question of how to develop strategic policies on prioritized interventions, as it further approaches the issues from the perspective of individuals, offering a well integrated cost-benefit and social-influence account for voluntary vaccination decisions. One of the most important contributions of this book lies in it offers a blueprint on a novel methodological paradigm in epidemiology, namely, systems epidemiology, with detailed systems modeling principles, as well as practical steps and real-world examples, which can readily be applied in addressing future systems epidemiological challenges. The book is intended to serve as a reference book for researchers and practitioners in the fields of computer science and epidemiology. Together with the provided references on the key concepts, methods, and examples being introduced, the book can also readily be adopted as an introductory text for undergraduate and graduate courses in computational epidemiology as well as systems epidemiology, and as training materials for practitioners and field workers.

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.

Language—that is, oral or written content that references abstract concepts in subtle ways—is what sets us apart as a species, and in an age defined by such content, language has become both the fuel and the currency of our modern information society. This has posed a vexing new challenge for linguists and engineers working in the field of language-processing: how do we parse and process not just language itself, but language in vast, overwhelming quantities? Modern Computational Models of Semantic Discovery in Natural Language compiles and reviews the most prominent linguistic theories into a single source that serves as an essential reference for future solutions to one of the most important challenges of our age. This comprehensive publication benefits an audience of students and professionals, researchers, and practitioners of linguistics and language discovery. This book includes a comprehensive range of topics and chapters covering digital media, social interaction in online environments, text and data mining, language processing and translation, and contextual documentation, among others.

Harness State-of-the-Art Computational Modeling Tools Computational Modeling of Pulverized Coal Fired Boilers successfully establishes the use of computational modeling as an effective means to simulate and enhance boiler performance. This text factors in how computational flow models can provide a framework for developing a greater understanding of the underlying processes in PC boilers. It also provides a detailed account of the methodology of computational modeling of pulverized coal boilers, as well as an apt approach to modeling complex processes occurring in PC boilers in a manageable way. Connects Modeling with Real-Life Applications Restricted to the combustion side of the boiler (the authors assume some prior background of reaction engineering and numerical techniques), the book describes the individual aspects of combustion and heat recovery sections of PC boilers that can be used to further improve the design methodologies, optimize boiler performance, and solve practical boiler-related problems. The book provides guidelines on implementing the material in commercial CFD solvers, summarizes key points, and presents relevant case studies. It can also be used to model larger boilers based on conventional, super-critical, or ultra-super critical technologies as well as based on oxy-fuel technologies. Consisting of six chapters, this functional text: Provides a general introduction Explains the overall approach and methodology Explores kinetics of coal pyrolysis (devolatilization) and combustion and methods of its evaluation Presents computational flow modeling approach to simulate pulverized coal fired boiler Covers modeling aspects from formulation of model equations to simulation methodology Determines typical results obtained with computational flow models Discusses the phenomenological models or reactor network models Includes practical applications of computational modeling Computational Modeling of Pulverized Coal Fired Boilers explores the potential of computational models for better engineering of pulverized coal boilers, providing an ideal resource for practicing engineers working in utility industries. It also benefits boiler design companies, industrial consultants, R & D laboratories, and engineering scientists/research students.

An accessible introduction to the principles of computational and mathematical modeling in psychology and cognitive science This practical and readable work provides students and researchers, who are new to cognitive modeling, with the background and core knowledge they need to interpret published reports, and develop and apply models of their own. The book is structured to help readers understand the logic of individual component techniques and their relationships to each other.

Traditional research methodologies in the human respiratory system have always been challenging due to their invasive nature. Recent advances in medical imaging and computational fluid dynamics (CFD) have accelerated this research. This book compiles and details recent advances in the modelling of the respiratory system for researchers, engineers, scientists, and health practitioners. It breaks down the complexities of this field and provides both students and scientists with an introduction and starting point to the physiology of the respiratory system, fluid dynamics and advanced CFD modeling tools. In addition to a brief introduction to the physics of the respiratory system and an overview of computational methods, the book contains best-practice guidelines for establishing high-quality computational models and simulations. Inspiration for new simulations can be gained through innovative case studies as well as hands-on practice using pre-made computational code. Last but not least, students and researchers are presented the latest biomedical research activities, and the computational visualizations will enhance their understanding of physiological functions of the respiratory system.

This book is for students and researchers who have a specific interest in learning and memory and want to understand how computational models can be integrated into experimental research on the hippocampus and learning. It emphasizes the function of brain structures as they give rise to behavior, rather than the molecular or neuronal details. It also emphasizes the process of modeling, rather than the mathematical details of the models themselves. The book is divided into two parts. The first part provides a tutorial introduction to topics in neuroscience, the psychology of learning and memory, and the theory of neural network models. The second part, the core of the book, reviews computational models of how the hippocampus cooperates with other brain structures -- including the entorhinal cortex, basal forebrain, cerebellum, and primary sensory and motor cortices -- to support learning and memory in both animals and humans. The book assumes no prior knowledge of computational modeling or mathematics. For those who wish to delve more deeply into the formal details of the models, there are optional "mathboxes" and appendices. The book also includes extensive references and suggestions for further readings.

Visual attention is a relatively new area of study combining a number of disciplines: artificial neural networks, artificial intelligence, vision science and psychology. The aim is to build computational models similar to human vision in order to solve tough problems for many potential applications including object recognition, unmanned vehicle navigation, and image and video coding and processing. In this book, the authors provide an up to date and highly applied introduction to the topic of visual attention, aiding researchers in creating powerful computer vision systems. Areas covered include the significance of vision research, psychology and computer vision, existing computational visual attention models, and the authors' contributions on visual attention models, and applications in various image and video processing tasks. This book is geared for graduates students and researchers in neural networks, image processing, machine learning, computer vision, and other areas of biologically inspired model building and applications. The book can also be used by practicing engineers looking for techniques involving the application of image coding, video processing, machine vision and brain-like robots to real-world systems. Other students and researchers with interdisciplinary interests will also find this book appealing. Provides a key knowledge boost to developers of image processing applications Is unique in emphasizing the practical utility of attention mechanisms Includes a number of real-world examples that readers can implement in their own work: robot navigation and object selection image and video quality assessment image and video coding Provides codes for users to apply in practical attentional models and mechanisms

Briefly taces the history of cognitive science, looks at computational models of how the human mind works, and discusses visual perception, learning, memory, reasoning, and the formation of new ideas

A comprehensive Introduction to the world of brain and behavior computational models This book provides a broad collection of articles covering different aspects of computational modeling efforts in psychology and neuroscience. Specifically, it discusses models that span different brain regions (hippocampus, amygdala, basal ganglia, visual cortex), different species (humans, rats, fruit flies), and different modeling methods (neural network, Bayesian, reinforcement learning, data fitting, and Hodgkin-Huxley models, among others). Computational Models of Brain and Behavior is divided into four sections: (a) Models of brain disorders; (b) Neural models of behavioral processes; (c) Models of neural processes, brain regions and neurotransmitters, and (d) Neural modeling approaches. It provides in-depth coverage of models of psychiatric disorders, including depression, posttraumatic stress disorder (PTSD), schizophrenia, and dyslexia; models of neurological disorders, including Alzheimer’s disease, Parkinson’s disease, and epilepsy; early sensory and perceptual processes; models of olfaction; higher/systems level models and low-level models; Pavlovian and instrumental conditioning; linking information theory to neurobiology; and more. Covers computational approximations to intellectual disability in down syndrome Discusses computational models of pharmacological and immunological treatment in Alzheimer's disease Examines neural circuit models of serotonergic system (from microcircuits to cognition) Educates on information theory, memory, prediction, and timing in associative learning Computational Models of Brain and Behavior is written for advanced undergraduate, Master's and PhD-level students—as well as researchers involved in computational neuroscience modeling research.