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 Mobility Patterns, Big Data and Transport Analytics  
 It Began with Babbage  
 Integrated Imaging of the Earth  
 Rethinking Neural Networks  
 Computational Collective Intelligence  
 Modern Mathematics and Mechanics  
 Intelligent Computing  
 Parallel Processing and Parallel Algorithms  
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 An Introduction to Metaheuristics for Optimization  
 How Nature Works  
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 Optischer Transistor  
 Information—Consciousness—Reality  
 Smart Sustainable Cities of the Future  
 Computational Nanophotonics  
 Applications of Evolutionary Computation  
 Algorithmen in C  
 Künstliche Intelligenz  
 Concise Guide to Numerical Algorithmics  
 Computational Philosophy of Science  
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 The Nature of Computation  
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### PHOEBE SANTIAGO

**Bio-Inspired Models for Natural and Formal Languages** Springer Nature

This volume is a collection of papers written by several researchers that have in common the use of bio-inspired models to approach formal and natural languages. The main goal of the volume is to promote interdisciplinarity among linguistics, biology and computation. The area of convergence between these three disciplines is giving rise to the emergence of new scientific paradigms that will have an epistemological, social and cultural impact. The book is organized around three thematic areas. Every area relates two of the three main topics: language, computation and biology. This volume stands out from existing publications because of its interdisciplinary nature. There has been a long tradition of interchanging methods among the aforementioned three disciplines, but it is difficult to find a single volume where this interchange of methods is shown. The volume includes chapters that clearly illustrate these interdisciplinary approaches and their benefits. This book will be of value to specialists who work in linguistics, biology or computation,

and have interest in using methods from other disciplines that can provide new ideas, new tools and new formalisms to approach their problems, and that can help in the improvement of their theories and models.

**Philosophy of Computer Science** Springer Science & Business Media

This reference offers tools for engineers, scientists, biologists, and others working with the computational techniques of nanophotonics. It introduces the key concepts of computational methods in a manner that is easily digestible for newcomers to the field. The book also examines future applications of nanophotonics in the technical industry and covers new developments and interdisciplinary research in engineering, science, and medicine. It provides an overview of the key computational nanophotonics and describes the technologies with an emphasis on how they work and their key benefits.

*Teacher Emotions Matter: Nature, Antecedents, and Effects* Springer

Numerical Algorithmic Science and Engineering (NAS&E), or more compactly, Numerical Algorithmics, is the theoretical and empirical study and the practical implementation and application of algorithms for solving finite-dimensional problems of a numeric nature. The variables

of such problems are either discrete-valued, or continuous over the reals, or, and as is often the case, a combination of the two, and they may or may not have an underlying network/graph structure. This re-emerging discipline of numerical algorithmics within computer science is the counterpart of the now well-established discipline of numerical analysis within mathematics, where the latter's emphasis is on infinite-dimensional, continuous numerical problems and their finite-dimensional, continuous approximates. A discussion of the underlying rationale for numerical algorithmics, its foundational models of computation, its organizational details, and its role, in conjunction with numerical analysis, in support of the modern *modus operandi* of scientific computing, or computational science & engineering, is the primary focus of this short monograph. It comprises six chapters, each with its own bibliography. Chapters 2, 3 and 6 present the book's primary content. Chapters 1, 4, and 5 are briefer, and they provide contextual material for the three primary chapters and smooth the transition between them. Mathematical formalism has been kept to a minimum, and, whenever possible, visual and verbal forms of presentation are employed and the discussion enlivened through the use of motivating quotations and illustrative examples. The reader is expected to have a working knowledge of the basics of computer science,

an exposure to basic linear algebra and calculus (and perhaps some real analysis), and an understanding of elementary mathematical concepts such as convexity of sets and functions, networks and graphs, and so on. Although this book is not suitable for use as the principal textbook for a course on numerical algorithmics (NAS&E), it will be of value as a supplementary reference for a variety of courses. It can also serve as the primary text for a research seminar. And it can be recommended for self-study of the foundations and organization of NAS&E to graduate and advanced undergraduate students with sufficient mathematical maturity and a background in computing. When departments of computer science were first created within universities worldwide during the middle of the twentieth century, numerical analysis was an important part of the curriculum. Its role within the discipline of computer science has greatly diminished over time, if not vanished altogether, and specialists in that area are now to be found mainly within other fields, in particular, mathematics and the physical sciences. A central concern of this monograph is the regrettable, downward trajectory of numerical analysis within computer science and how it can be arrested and suitably reconstituted. Resorting to a biblical metaphor, numerical algorithmics (NAS&E) as envisioned herein is neither old wine in new bottles, nor new wine in old bottles, but rather this re-emerging discipline is a decantation of an age-old vintage that can hopefully find its proper place within the larger arena of computer science, and at what appears now to be an opportune time.

[The Nature of Computation](#) Springer Nature

This open access book chronicles the rise of a new scientific paradigm offering novel insights into the age-old enigmas of existence. Over 300 years ago, the human mind discovered the machine code of reality: mathematics. By utilizing abstract thought systems, humans began to decode the workings of the cosmos. From this understanding, the current scientific paradigm emerged, ultimately discovering the gift of technology. Today, however, our island of knowledge is surrounded by ever longer shores of ignorance. Science appears to have hit a dead end when confronted with the nature of reality and consciousness. In this fascinating and accessible volume, James Glatfelter explores a radical paradigm shift uncovering the ontology of reality. It is found to be information-theoretic and participatory, yielding a computational and programmable universe. [Mobility Patterns, Big Data and Transport Analytics](#) The Nature of Computation

This book is intended to help explore the field of smart sustainable cities in its complexity, heterogeneity, and breadth, the many faces of a topical subject of major importance for the future that encompasses so much of modern urban life in an increasingly computerized and urbanized world. Indeed, sustainable urban development is currently at the center of debate in light of several ICT visions becoming achievable and deployable computing paradigms, and shaping the way cities will evolve in the future and thus tackle complex challenges. This book integrates computer science, data science, complexity science, sustainability science, system thinking, and urban planning and design. As such, it contains innovative computer-based and data-analytic research on smart sustainable cities as complex and dynamic systems. It provides applied theoretical contributions fostering a better understanding of such systems and the synergistic relationships between the underlying physical and informational landscapes. It offers contributions pertaining to the ongoing development of computer-based and data science technologies for the processing, analysis, management, modeling, and simulation of big and context data and the associated applicability to urban systems that will advance different aspects of sustainability. This book seeks to explicitly bring together the smart city and sustainable city endeavors, and to focus on big data analytics and context-aware computing specifically. In doing so, it amalgamates the design concepts and planning principles of sustainable urban forms with the novel applications of ICT of ubiquitous computing to primarily advance sustainability. Its strength lies in combining big data and context-aware technologies and their novel applications for the sheer purpose of harnessing and leveraging the disruptive and synergetic effects of ICT on forms of city planning that are required for future forms of sustainable development. This is because the effects of such technologies reinforce one another as to their efforts for transforming urban life in a sustainable way by integrating data-centric and context-aware solutions for enhancing urban systems and facilitating coordination among urban domains. This timely and comprehensive book is aimed at a wide audience across science, academia industry, and policymaking. It provides the necessary material to inform relevant research communities of the state-of-the-art research and the latest development in the area of smart sustainable urban development, as well as a valuable reference for planners, designers, strategists, and ICT experts who are working towards the development and implementation of smart sustainable cities based on big data analytics and context-aware

computing.

[It Began with Babbage](#) Pearson Deutschland GmbH

Künstliche Intelligenz (KI) ist die neue Zauberformel des digitalen Kapitalismus. Sie steht für Maschinen, die können, was der Mensch kann: hören und sehen, sprechen, lernen, Probleme lösen. In manchem sind sie inzwischen nicht nur schneller, sondern auch besser als der Mensch. Wie funktionieren diese klugen Maschinen? Bedrohen sie uns, machen sie uns gar überflüssig? Intelligente Computersysteme stellen medizinische Diagnosen und geben Rechtsberatung. Sie managen den Aktienhandel und steuern bald unsere Autos. Sie malen, dichten, dolmetschen und komponieren. Immer klügere Roboter stehen an den Fließbändern, begrüßen uns im Hotel, führen uns durchs Museum oder braten Burger und schnipseln den Salat dazu. Doch neben die Utopie einer schönen neuen intelligenten Technikwelt sind längst Schreckbilder getreten: von künstlichen Intelligenzen, die uns auf Schritt und Tritt überwachen, die unsere Arbeitsplätze übernehmen und sich unserer Kontrolle entziehen. Die Journalistin und KI-Expertin Manuela Lenzen zeigt, welche Hoffnungen und Befürchtungen realistisch sind und welche in die Science-Fiction gehören. Sie beschreibt, wie ein gutes Leben mit der Künstlichen Intelligenz aussehen könnte – und dass wir von klugen Maschinen eine Menge über uns selbst lernen können.

[Integrated Imaging of the Earth](#) MIT Press

This book is based on the outcome of the "2012 Interdisciplinary Symposium on Complex Systems" held at the island of Kos. The book consists of 12 selected papers of the symposium starting with a comprehensive overview and classification of complexity problems, continuing by chapters about complexity, its observation, modeling and its applications to solving various problems including real-life applications. More exactly, readers will have an encounter with the structural complexity of vortex flows, the use of chaotic dynamics within evolutionary algorithms, complexity in synthetic biology, types of complexity hidden inside evolutionary dynamics and possible controlling methods, complexity of rugged landscapes, and more. All selected papers represent innovative ideas, philosophical overviews and state-of-the-art discussions on aspects of complexity. The book will be useful as instructional material for senior undergraduate and entry-level graduate students in computer science, physics, applied mathematics and engineering-type work in the area of complexity. The book will also be valuable as a resource of knowledge for practitioners who want to apply complexity to solve real-life problems in their own challenging applications. The authors and editors hope that readers will be inspired to do their own experiments and simulations, based on information reported in this book, thereby moving beyond the scope of the book.

[Rethinking Neural Networks](#) Springer Nature

As a field, computer science occupies a unique scientific space, in that its subject matter can exist in both physical and abstract realms. An artifact such as software is both tangible and not, and must be classified as something in between, or "liminal." The study and production of liminal artifacts allows for creative possibilities that are, and have been, possible only in computer science. In *It Began with Babbage*, computer scientist and writer Subrata Dasgupta examines the distinct history of computer science in terms of its creative innovations, reaching back to Charles Babbage in 1819. Since all artifacts of computer science are conceived with a use in mind, the computer scientist is not concerned with the natural laws that govern disciplines like physics or chemistry; instead, the field is more concerned with the concept of purpose. This requirement lends itself to a type of creative thinking that, as Dasgupta shows us, has exhibited itself throughout the history of computer science. More than any other, computer science is the science of the artificial, and has a unique history to accompany its unique focus. The book traces a path from Babbage's Difference Engine in the early 19th century to the end of the 1960s by when a new academic discipline named "computer science" had come into being. Along the way we meet characters like Babbage and Ada Lovelace, Turing and von Neumann, Shannon and Chomsky, and a host of other people from a variety of backgrounds who collectively created this new science of the artificial. And in the end, we see how and why computer science acquired a nature and history all of its own.

[Computational Collective Intelligence](#) Springer

Computational complexity is one of the most beautiful fields of modern mathematics, and it is increasingly relevant to other sciences ranging from physics to biology. But this beauty is often buried underneath layers of unnecessary formalism, and exciting recent results like interactive proofs, phase transitions, and quantum computing are usually considered too advanced for the typical student. This book bridges these gaps by explaining the deep ideas of theoretical computer science in a clear and enjoyable fashion, making them accessible to non-computer scientists and

to computer scientists who finally want to appreciate their field from a new point of view. The authors start with a lucid and playful explanation of the P vs. NP problem, explaining why it is so fundamental, and so hard to resolve. They then lead the reader through the complexity of mazes and games; optimization in theory and practice; randomized algorithms, interactive proofs, and pseudorandomness; Markov chains and phase transitions; and the outer reaches of quantum computing. At every turn, they use a minimum of formalism, providing explanations that are both deep and accessible. The book is intended for graduate and undergraduate students, scientists from other areas who have long wanted to understand this subject, and experts who want to fall in love with this field all over again.

[Modern Mathematics and Mechanics](#) Springer Science & Business Media

This volume provides a cutting-edge view of the world's leading authorities in fields where information and computation play a central role.

[Intelligent Computing](#) John Wiley & Sons

In this book international expert authors provide solutions for modern fundamental problems including the complexity of computing of critical points for set-valued mappings, the behaviour of solutions of ordinary differential equations, partial differential equations and difference equations, or the development of an abstract theory of global attractors for multi-valued impulsive dynamical systems. These abstract mathematical approaches are applied to problem-solving in solid mechanics, hydro- and aerodynamics, optimization, decision making theory and control theory. This volume is therefore relevant to mathematicians as well as engineers working at the interface of these fields.

[Parallel Processing and Parallel Algorithms](#) Springer

There are very few concepts that fascinate equally a theoretical physicist studying black holes and a patient undergoing serious mental psychosis. Time, undoubtedly, can well be ranked among them. For the measure of time inside a black hole is no less bizarre than the perception of time by a schizophrenic, who may perceive it as completely "suspended," "standing still," or even "reversing its direction." The nature of time is certainly shrouded in profound mystery. This, perhaps, since the concept entails multifarious, and occasionally incongruous, facets. No wonder the subject attracts the serious attention of scholars on the one hand, and of the lay public on the other. Our Advanced Research Workshop is an excellent illustration of this point, as the reader will soon discover. It turned out to be a unique professional forum for an unusually lively, effective and fruitful exchange of ideas and beliefs among 48 participants from 20 countries worldwide, selected out of more than a hundred applicants. The present book is based on the select talks presented at the meeting, and aims to provide the interested layperson and specialist alike with a multidisciplinary sampling of the most up-to-date scholarly research on the nature of time. It represents a coherent, state-of-the-art volume showing that research relevant to this topic is necessarily interdisciplinary and does not ignore such delicate issues as "altered" states of consciousness, religion and metaphysics.

[The Nature of Business Transformation](#) "O'Reilly Media, Inc."

The result of the first Appalachian Conference on neurodynamics, this volume focuses on processing in biological neural networks. How do brain processes become organized during decision making? That is, what are the neural antecedents that determine which course of action is to be pursued? Half of the contributions deal with modelling synapto-dendritic and neural ultrastructural processes; the remainder, with laboratory research findings, often cast in terms of the models. The interchanges at the conference and the ensuing publication also provide a foundation for further meetings. These will address how processes in different brain systems, coactive with the neural residues of experience and with sensory input, determine decisions.

[An Introduction to Metaheuristics for Optimization](#) World Scientific

This volume discusses the advances in numerical heat transfer modeling by applying high-performance computing resources, striking a balance between generic fundamentals, specific fundamentals, generic applications, and specific applications.

[Routledge](#)

Complexity science uses computation to explore the physical and social sciences. In *Think Complexity*, you'll use graphs, cellular automata, and agent-based models to study topics in physics, biology, and economics. Whether you're an intermediate-level Python programmer or a student of computational modeling, you'll delve into examples of complex systems through a series of worked examples, exercises, case studies, and easy-to-understand explanations. In this updated second edition, you will: Work with NumPy arrays and SciPy methods, including basic

signal processing and Fast Fourier Transform Study abstract models of complex physical systems, including power laws, fractals and pink noise, and Turing machines Get Jupyter notebooks filled with starter code and solutions to help you re-implement and extend original experiments in complexity; and models of computation like Turmites, Turing machines, and cellular automata Explore the philosophy of science, including the nature of scientific laws, theory choice, and realism and instrumentalism Ideal as a text for a course on computational modeling in Python, Think Complexity also helps self-learners gain valuable experience with topics and ideas they might not encounter otherwise.

#### **How Nature Works** Springer Nature

Reliable and detailed information about the Earth's subsurface is of crucial importance throughout the geosciences. Quantitative integration of all available geophysical and geological data helps to make Earth models more robust and reliable. The aim of this book is to summarize and synthesize the growing literature on combining various types of geophysical and other geoscientific data. The approaches that have been developed to date encompass joint inversion, cooperative inversion, and statistical post-inversion analysis methods, each with different benefits and assumptions. Starting with the foundations of inverse theory, this book systematically describes the mathematical and theoretical aspects of how to best integrate different geophysical datasets with geological prior understanding and other complimentary data. This foundational basis is followed by chapters that demonstrate the diverse range of applications for which integrated methods have been used to date. These range from imaging the hydrogeological properties of the near-surface to natural resource exploration and probing the composition of the lithosphere and the deep Earth.

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Each chapter is written by leading experts in the field, which makes this book the definitive reference on integrated imaging of the Earth. Highlights of this volume include: Complete coverage of the theoretical foundations of integrated imaging approaches from inverse theory to different coupling methods and quantitative evaluation of the resulting models Comprehensive overview of current applications of integrated imaging including hydrological investigations, natural resource exploration, and imaging the deep Earth Detailed case studies of integrated approaches providing valuable guidance for both experienced users and researchers new to joint inversion. This volume will be a valuable resource for graduate students, academics, industry practitioners, and researchers who are interested in using or developing integrated imaging approaches.

#### *Advances in Unconventional Computing* Oxford University Press

Computational complexity is one of the most beautiful fields of modern mathematics, and it is increasingly relevant to other sciences ranging from physics to biology. But this beauty is often buried underneath layers of unnecessary formalism, and exciting recent results like interactive proofs, phase transitions, and quantum computing are usually considered too advanced for the typical student. This book bridges these gaps by explaining the deep ideas of theoretical computer science in a clear and enjoyable fashion, making them accessible to non-computer scientists and to computer scientists who finally want to appreciate their field from a new point of view. The authors start with a lucid and playful explanation of the P vs. NP problem, explaining why it is so fundamental, and so hard to resolve. They then lead the reader through the complexity of mazes and games; optimization in theory and practice; randomized algorithms, interactive proofs, and pseudorandomness; Markov chains and phase transitions; and the outer reaches of quantum

computing. At every turn, they use a minimum of formalism, providing explanations that are both deep and accessible. The book is intended for graduate and undergraduate students, scientists from other areas who have long wanted to understand this subject, and experts who want to fall in love with this field all over again.

#### **Artificial Intelligence, Learning and Computation in Economics and Finance** Elsevier

By applying research in artificial intelligence to problems in the philosophy of science, Paul Thagard develops an exciting new approach to the study of scientific reasoning. This approach uses computational ideas to shed light on how scientific theories are discovered, evaluated, and used in explanations. Thagard describes a detailed computational model of problem solving and discovery that provides a conceptually rich yet rigorous alternative to accounts of scientific knowledge based on formal logic, and he uses it to illuminate such topics as the nature of concepts, hypothesis formation, analogy, and theory justification.

#### *Advances in Numerical Heat Transfer, Volume 2* Springer

The Nature of Computation OUP Oxford

#### *Optischer Transistor* Springer

The authors stress the relative simplicity, efficiency, flexibility of use, and suitability of various approaches used to solve difficult optimization problems. The authors are experienced, interdisciplinary lecturers and researchers and in their explanations they demonstrate many shared foundational concepts among the key methodologies. This textbook is a suitable introduction for undergraduate and graduate students, researchers, and professionals in computer science, engineering, and logistics.