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An Introduction to Agent-Based Modeling
Advances in Computational Modeling
Research Agent-Based Computational Sociology
A Broad View of Regional Science
Agent-Based Computational Economics
Methodological Investigations in Agent-Based Modelling
Generative Social Science
Agent-Based Simulation of Vulnerability Dynamics
Computational Modeling of Cognition and Behavior
Agent-Based Computational Demography
Agent-Based Modelling and Geographical Information Systems
Agent-Based Modeling and Simulation with Swarm
Innovative Approaches in Agent-Based Modelling and Business Intelligence
Agent-Based Models in Economics
Mediterranean Almanac 2019-20
Generative Social Science: Studies in Agent-Based Computational Modeling
Assessing the Use of Agent-Based Models for Tobacco Regulation
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Agent and Multi-Agent Systems: Technologies and Applications
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Molecular Computational Models
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The Oxford Handbook of Computational Economics and Finance
Spatial Analysis in Field Primatology
Towards Bayesian Model-Based Demography
Agent-Based Models of Geographical Systems
Introduction to Agent-Based Economics
Cognitive Agent-based Computing
IAgent-
An Introduction to Agent-Based Modeling

Agent-based models (ABM) and computational models simulate the actions and interactions of autonomous agents (both individual or collective entities such as organizations or groups) with a view to assessing their effects on the system as a whole. They combine elements of game theory, complex systems, emergence, computational sociology, multi-agent systems, and evolutionary programming. In this book, the authors discuss the modeling, simulation and optimization of resources management in hospital emergency departments using the agent-based approach; computational modeling in male reproduction; consumer-centric agent-based marketing models; Lattice-Boltzmann simulation of transport phenomena in agroindustrial biosystems; agent-based models in cancer prevention research; model-based approaches to diagnosis of multi-agent plans; and modeling behavior of web users as agents with reason and sentiment.

Advances in Computational Modeling Research

This book thoroughly prepares intermediate-level readers for research in social science, organization studies, economics, finance, marketing science, and business...
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science as complex adaptive systems. It presents the advantages of social simulation studies and business intelligence to those who are not familiar with the computational research approach, and offers experienced modelers various instructive examples of using agent-based modeling and business intelligence approaches to inspire their own work. In addition, the book discusses cutting-edge techniques for complex adaptive systems using their applications. To date, business science studies have focused only on data science and analyses of business problems. However, using these studies to enhance the capabilities of conventional techniques in the fields has not been investigated adequately. This book addresses managing the issues of societies, firms, and organizations to profit from interaction with agent-based modeling, human- and computer- mixed systems, and business intelligence approaches, an area that is fundamental for complex but bounded rational business environments. With detailed research by leading authors in the field, Innovative Approaches in Agent-Based Modelling and Business Intelligence inspires readers to join with other disciplines and extend the scope of the book with their own unique contributions. It also includes the common challenges encountered in computational social science and business science to enable researchers, students, and professionals to resolve their own problems.

Agent-Based Computational Sociology

Most of the intriguing social phenomena of our time, such as international terrorism, social inequality, and urban ethnic segregation, are consequences of complex forms of agent interaction that are difficult to observe methodically and experimentally. This book looks at a new research stream that makes use of advanced computer simulation modelling techniques to spotlight agent interaction that allows
us to explain the emergence of social patterns. It presents a method to pursue analytical sociology investigations that look at relevant social mechanisms in various empirical situations, such as markets, urban cities, and organisations. This book: Provides a comprehensive introduction to epistemological, theoretical and methodological features of agent-based modelling in sociology through various discussions and examples. Presents the pros and cons of using agent-based models in sociology. Explores agent-based models in combining quantitative and qualitative aspects, and micro- and macro levels of analysis. Looks at how to pose an agent-based research question, identifying the model building blocks, and how to validate simulation results. Features examples of agent-based models that look at crucial sociology issues. Supported by an accompanying website featuring data sets and code for the models included in the book. Agent-Based Computational Sociology is written in a common sociological language and features examples of models that look at all the traditional explanatory challenges of sociology. Researchers and graduate students involved in the field of agent-based modelling and computer simulation in areas such as social sciences, cognitive sciences and computer sciences will benefit from this book.

A Broad View of Regional Science

Simulation has become a tool difficult to substitute in many scientific areas like manufacturing, medicine, telecommunications, games, etc. Finance is one of such areas where simulation is a commonly used tool; for example, we can find Monte Carlo simulation in many financial applications like market risk analysis, portfolio optimization, credit risk related applications, etc. Simulation in Computational Finance and Economics: Tools and Emerging Applications presents a thorough
collection of works, covering several rich and highly productive areas of research including Risk Management, Agent-Based Simulation, and Payment Methods and Systems, topics that have found new motivations after the strong recession experienced in the last few years. Despite the fact that simulation is widely accepted as a prominent tool, dealing with a simulation-based project requires specific management abilities of the researchers. Economic researchers will find an excellent reference to introduce them to the computational simulation models. The works presented in this book can be used as an inspiration for economic researchers interested in creating their own computational models in their respective fields.

Agent-Based Computational Economics

Agent-based modelling in economics Lynne Hamill and Nigel Gilbert, Centre for Research in Social Simulation (CRESS), University of Surrey, UK New methods of economic modelling have been sought as a result of the global economic downturn in 2008. This unique book highlights the benefits of an agent-based modelling (ABM) approach. It demonstrates how ABM can easily handle complexity: heterogeneous people, households and firms interacting dynamically. Unlike traditional methods, ABM does not require people or firms to optimise or economic systems to reach equilibrium. ABM offers a way to link micro foundations directly to the macro situation. Key features: Introduces the concept of agent-based modelling and shows how it differs from existing approaches. Provides a theoretical and methodological rationale for using ABM in economics, along with practical advice on how to design and create the models. Each chapter starts with a short summary of the relevant economic theory and then shows how to apply ABM. Explores both topics covered in basic economics textbooks and current important policy themes; unemployment,
Methodological Investigations in Agent-Based Modelling

Agent-based computational modeling is changing the face of social science. In Generative Social Science, Joshua Epstein argues that this powerful, novel technique permits the social sciences to meet a fundamentally new standard of explanation, in which one "grows" the phenomenon of interest in an artificial society of interacting agents: heterogeneous, boundedly rational actors, represented as mathematical or software objects. After elaborating this notion of generative explanation in a pair of overarching foundational chapters, Epstein illustrates it with examples chosen from such far-flung fields as archaeology, civil conflict, the evolution of norms, epidemiology, retirement economics, spatial games, and organizational adaptation. In elegant chapter preludes, he explains how these widely diverse modeling studies support his sweeping case for generative explanation. This book represents a powerful consolidation of Epstein's interdisciplinary research activities in the decade since the publication of his and Robert Axtell's landmark volume, Growing Artificial Societies. Beautifully illustrated, Generative Social Science includes a CD that contains animated movies of core model runs, and programs allowing users to easily change assumptions and explore models, making it an invaluable text for
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courses in modeling at all levels.

Generative Social Science

Augmented and virtual reality (AR and VR) offer exciting opportunities for human computer interaction (HCI), the enhancement of places, and new business cases. Though VR is most popular for video games, especially among younger generations, AR and VR can also be used in applications that include military, medical, navigational, tourism, marketing, and maintenance uses. Research in these technologies along with 3D user interfaces has gained momentum in recent years and has solidified it as a staple technology for the foreseeable future. Multimedia and Sensory Input for Augmented, Mixed, and Virtual Reality includes a collection of business case studies covering a variety of topics related to AR, VR, and mixed reality (MR) including their use in possible applications. This book also touches on the diverse uses of AR and VR in many industries and discusses their importance, challenges, and opportunities. While discussing the use these technologies in sectors such as education, healthcare, and computer science, this book is ideal for computer scientists, engineers, practitioners, stakeholders, researchers, academicians, and students who are interested in the latest research on augmented, mixed, and virtual reality.

Agent-Based Simulation of Vulnerability Dynamics

Computational Modeling of Cognition and Behavior
Agent-based computational modeling is changing the face of social science. This book argues that this powerful technique permits the social sciences to meet an explanation, in which one 'grows' the phenomenon of interest in an artificial society of interacting agents: heterogeneous, boundedly rational actors.

Agent-Based Computational Demography

"This book is a comprehensive and in-depth reference to the most recent developments in the field covering theoretical developments, techniques, technologies, among others"--Provided by publisher.

Agent-Based Modelling and Geographical Information Systems

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

The present book describes the methodology to set up agent-based models and to study emerging patterns in complex adaptive systems resulting from multi-agent interaction. It offers the application of agent-based models in demography, social and economic sciences and environmental sciences. Examples include population dynamics, evolution of social norms, communication structures, patterns in ecosystems and socio-biology, natural resource management, spread of diseases and development processes. It presents and combines different approaches how to implement agent-based computational models and tools in an integrative manner that can be extended to other cases.

Innovative Approaches in Agent-Based Modelling and Business Intelligence

Introduction to Agent-Based Economics describes the principal elements of agent-based computational economics (ACE). It illustrates ACE’s theoretical foundations, which are rooted in the application of the concept of complexity to the social sciences, and it depicts its growth and development from a non-linear out-of-equilibrium approach to a state-of-the-art agent-based macroeconomics. The book helps readers gain a better understanding of the limits and perspectives of the ACE models and their capacity to reproduce economic phenomena and empirical patterns. Reviews the literature of agent-based computational economics Analyzes approaches to agents’ expectations Covers one of the few large macroeconomic agent-based models, the Modellaccio Illustrates both analytical and computational methodologies for producing tractable solutions of macro ACE models Describes diffusion and
amplification mechanisms Depicts macroeconomic experiments related to ACE implementations

Agent-Based Models in Economics

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This book celebrates the life and work of Peter Nijkamp, whose research provides a strong focus on regional science. His work follows a rigorous, comprehensive approach, centred around analytical modelling and methodological innovation. This edited volume, like Prof Nijkamp’s research, covers a wide range of topics in regional science, analysed through multi-criteria evaluation, evaluation modelling, econometrics, and simulations, among other methods. These tools are applied to the analysis of society and culture, tourism and information, cities, environment and sustainability. Professor Nijkamp is one of the founders and the past president of the Regional Science Association International. His work forms a valuable reference for researchers, scholars, policymakers, and students in the field of regional science and other disciplines. This volume, timed to coincide with his 75th birthday, celebrates Prof Nijkamp’s great contributions to regional science. He also promoted and participated in the education and development of young researchers not only in regional science but also in other fields, supervising many Ph.D. students and hosting even more as guests in Amsterdam. Contributors to this volume include Prof Nijkamp’s former doctoral students and guest researchers, as well as associates and colleagues.
Generative Social Science: Studies in Agent-Based Computational Modeling

The first step-by-step introduction to the methodology of agent-based models in economics, their mathematical and statistical analysis, and real-world applications.

Assessing the Use of Agent-Based Models for Tobacco Regulation

This thesis constitutes an extraordinary innovative research approach in transferring the concepts and methods of complex systems to risk research. It ambitiously bridges the barriers between theoretical, empirical and methodical research work and integrates these fields into one comprehensive approach of dealing with uncertainty in socio-ecological systems. The developed agent-based simulation aims at the dynamics of social vulnerability in the considered system of the German North Sea Coast. Thus, the social simulation provides an analytical method to explore the individual, relational, and spatial aspects leading to dynamics of vulnerability in society. Combining complexity science and risk research by the method of agent-based simulation hereby emphasizes the importance of understanding interrelations inside the system for the system's development, i.e. for the evolving. Based on a vulnerability assessment regarding vulnerability characteristics, present risk behavior and self-protection preferences of private households against the impacts of flooding and storm surges, possible system trajectories could be explored by means of simulation experiments. The system-analytical approach therefore contributes to an integrated consideration of multidimensional and context-sensitive social phenomena such as vulnerability. Furthermore it achieves conceptually and strategically relevant implications for risk research.
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Advanced HPC-based Computational Modeling in Biomechanics and Systems Biology

This interdisciplinary reference and guide provides an introduction to modeling methodologies and models which form the starting point for deriving efficient and effective solution techniques, and presents a series of case studies that demonstrate how heuristic and analytical approaches may be used to solve large and complex problems. Topics and features: introduces the key modeling methods and tools, including heuristic and mathematical programming-based models, and queueing theory and simulation techniques; demonstrates the use of heuristic methods to not only solve complex decision-making problems, but also to derive a simpler solution technique; presents case studies on a broad range of applications that make use of techniques from genetic algorithms and fuzzy logic, tabu search, and queueing theory; reviews examples incorporating system dynamics modeling, cellular automata and agent-based simulations, and the use of big data; supplies expanded descriptions and examples in the appendices.

Interdisciplinary Applications of Agent-Based Social Simulation and Modeling

While the significance of networks in various human behavior and activities has a history as long as human's existence, network awareness is a recent scientific phenomenon. The neologism network science is just one or two decades old.
Nevertheless, with this limited time, network thinking has substantially reshaped the recent development in economics, and almost all solutions to real-world problems involve the network element. This book integrates agent-based modeling and network science. It is divided into three parts, namely, foundations, primary dynamics on and of social networks, and applications. The authors begin with the network origin of agent-based models, known as cellular automata, and introduce a number of classic models, such as Schelling's segregation model and Axelrod's spatial game. The essence of the foundation part is the network-based agent-based models in which agents follow network-based decision rules. Under the influence of the substantial progress in network science in late 1990s, these models have been extended from using lattices into using small-world networks, scale-free networks, etc. The text also shows that the modern network science mainly driven by game-theorists and sociophysicists has inspired agent-based social scientists to develop alternative formation algorithms, known as agent-based social networks. It reviews a number of pioneering and representative models in this family. Upon the given foundation, the second part reviews three primary forms of network dynamics, such as diffusions, cascades, and influences. These primary dynamics are further extended and enriched by practical networks in goods-and-service markets, labor markets, and international trade. At the end, the book considers two challenging issues using agent-based models of networks: network risks and economic growth.

Agent and Multi-Agent Systems: Technologies and Applications

Aimed at readers with minimal experience in computer programming, this brief book provides a theoretical and methodological rationale for using ABM in the social sciences. It goes on to describe some carefully chosen examples from different
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disciplines, illustrating different approaches to ABM. It concludes with practical advice about how to design and create ABM, a discussion of validation procedures, and some guidelines about publishing articles based on ABM.

Simulation in Computational Finance and Economics: Tools and Emerging Applications

This book presents an integrated framework for developing and testing computational models in psychology and related disciplines. Researchers and students are given the knowledge and tools to interpret models published in their area, as well as to develop, fit, and test their own models.

Agent-Based Modelling in Economics

Tobacco consumption continues to be the leading cause of preventable disease and death in the United States. The Food and Drug Administration (FDA) regulates the manufacture, distribution, and marketing of tobacco products—specifically cigarettes, cigarette tobacco, roll-your-own tobacco, and smokeless tobacco—to protect public health and reduce tobacco use in the United States. Given the strong social component inherent to tobacco use onset, cessation, and relapse, and given the heterogeneity of those social interactions, agent-based models have the potential to be an essential tool in assessing the effects of policies to control tobacco. Assessing the Use of Agent-Based Models for Tobacco Regulation describes the complex tobacco environment; discusses the usefulness of agent-based models to inform tobacco policy and regulation; presents an evaluation framework for policy-relevant agent-based models; examines the role and type of data needed to develop.
agent-based models for tobacco regulation; provides an assessment of the agent-based model developed for FDA; and offers strategies for using agent-based models to inform decision making in the future.

**Multimedia and Sensory Input for Augmented, Mixed, and Virtual Reality**

A comprehensive and hands-on introduction to the core concepts, methods, and applications of agent-based modeling, including detailed NetLogo examples. The advent of widespread fast computing has enabled us to work on more complex problems and to build and analyze more complex models. This book provides an introduction to one of the primary methodologies for research in this new field of knowledge. Agent-based modeling (ABM) offers a new way of doing science: by conducting computer-based experiments. ABM is applicable to complex systems embedded in natural, social, and engineered contexts, across domains that range from engineering to ecology. An Introduction to Agent-Based Modeling offers a comprehensive description of the core concepts, methods, and applications of ABM. Its hands-on approach—with hundreds of examples and exercises using NetLogo—enables readers to begin constructing models immediately, regardless of experience or discipline. The book first describes the nature and rationale of agent-based modeling, then presents the methodology for designing and building ABMs, and finally discusses how to utilize ABMs to answer complex questions. Features in each chapter include step-by-step guides to developing models in the main text; text boxes with additional information and concepts; end-of-chapter explorations; and references and lists of relevant reading. There is also an accompanying website with all the models and code.

**Agent-Based Models**
This unique book brings together a comprehensive set of papers on the background, theory, technical issues and applications of agent-based modelling (ABM) within geographical systems. This collection of papers is an invaluable reference point for the experienced agent-based modeller as well those new to the area. Specific geographical issues such as handling scale and space are dealt with as well as practical advice from leading experts about designing and creating ABMs, handling complexity, visualising and validating model outputs. With contributions from many of the world’s leading research institutions, the latest applied research (micro and macro applications) from around the globe exemplify what can be achieved in geographical context. This book is relevant to researchers, postgraduate and advanced undergraduate students, and professionals in the areas of quantitative geography, spatial analysis, spatial modelling, social simulation modelling and geographical information sciences.

Molecular Computational Models

Complex Systems are made up of numerous interacting sub-components. Non-linear interactions of these components or agents give rise to emergent behavior observable at the global scale. Agent-based modeling and simulation is a proven paradigm which has previously been used for effective computational modeling of complex systems in various domains. Because of its popular use across different scientific domains, research in agent-based modeling has primarily been vertical in nature. The goal of this manuscript is to provide a single hands-on guide to developing cognitive agent-based models for the exploration of emergence across various types of complex systems. We present practical ideas and examples for researchers and practitioners for the building of agent-based models using a horizontal approach – applications
are demonstrated in a number of exciting domains as diverse as wireless sensors networks, peer-to-peer networks, complex social systems, research networks, epidemiological HIV

**Agent-Based Computational Modelling**

This book aims to answer two questions that are fundamental to the study of agent-based economic models: what is agent-based computational economics and why do we need agent-based economic modelling of economy? This book provides a review of the development of agent-based computational economics (ACE) from a perspective on how artificial economic agents are designed under the influences of complex sciences, experimental economics, artificial intelligence, evolutionary biology, psychology, anthropology and neuroscience. This book begins with a historical review of ACE by tracing its origins. From a modelling viewpoint, ACE brings truly decentralized procedures into market analysis, from a single market to the whole economy. This book also reviews how experimental economics and artificial intelligence have shaped the development of ACE. For the former, the book discusses how ACE models can be used to analyse the economic consequences of cognitive capacity, personality and cultural inheritance. For the latter, the book covers the various tools used to construct artificial adaptive agents, including reinforcement learning, fuzzy decision rules, neural networks, and evolutionary computation. This book will be of interest to graduate students researching computational economics, experimental economics, behavioural economics, and research methodology.

**The Oxford Handbook of Computational Economics and Finance**
Spatial Analysis in Field Primatology

A primatologist's guide to using geographic information systems (GIS); from mapping and field accuracy, to tracking travel routes and the impact of logging.

Towards Bayesian Model-Based Demography

This open access book examines the methodological complications of using complexity science concepts within the social science domain. The opening chapters take the reader on a tour through the development of simulation methodologies in the fields of artificial life and population biology, then demonstrates the growing popularity and relevance of these methods in the social sciences. Following an in-depth analysis of the potential impact of these methods on social science and social theory, the text provides substantive examples of the application of agent-based models in the field of demography. This work offers a unique combination of applied simulation work and substantive, in-depth philosophical analysis, and as such has potential appeal for specialist social scientists, complex systems scientists, and philosophers of science interested in the methodology of simulation and the practice of interdisciplinary computing research.

Agent-Based Models of Geographical Systems

This book examines the use of agent-based modelling (ABM) in population studies, from concepts to applications, best practices to future developments. It features papers written by leading experts in the field that will help readers to better understand the usefulness of ABM for population projections, how ABM can be injected...
with empirical data to achieve a better match between model and reality, how geographic information can be fruitfully used in ABM, and how ABM results can be reported effectively and correctly. Coverage ranges from detailing the relation between ABM and existing paradigms in population studies to infusing agent-based models with empirical data. The papers show the benefits that ABM offers the field, including enhanced theory formation by better linking the micro level with the macro level, the ability to represent populations more adequately as complex systems, and the possibility to study rare events and the implications of alternative mechanisms in artificial laboratories. In addition, readers will discover guidelines and best practices with detailed examples of how to apply agent-based models in different areas of population research, including human mating behaviour, migration, and socio-structural determinants of health behaviours. Earlier versions of the papers in this book have been presented at the workshop “Recent Developments and Future Directions in Agent-Based Modelling in Population Studies,” which took place at the University of Leuven (KU Leuven), Belgium, in September 2014. The book will contribute to the development of best practices in the field and will provide a solid point of reference for scholars who want to start using agent-based modelling in their own research.

Introduction to Agent-Based Economics

Social simulation can be a difficult discipline to encompass fully. There are many methods, models, directions, and theories that can be discussed and applied to various social sciences. Anthropology, sociology, political science, economy, government, and management can all benefit from social simulation. Interdisciplinary Applications of Agent-Based Social Simulation and Modeling aims to bring a different
perspective to this interdisciplinary topic. This book presents current discussions and new insights on social simulation as a whole, focusing on its dangers, pitfalls, deceits, and challenges. This book is an essential reference for researchers in this field, professionals using social simulation, and even students studying this discipline.

Cognitive Agent-based Computing—I

Swarm-based multi-agent simulation leads to better modeling of tasks in biology, engineering, economics, art, and many other areas. It also facilitates an understanding of complicated phenomena that cannot be solved analytically. Agent-Based Modeling and Simulation with Swarm provides the methodology for a multi-agent-based modeling approach that integrates computational techniques such as artificial life, cellular automata, and bio-inspired optimization. Each chapter gives an overview of the problem, explores state-of-the-art technology in the field, and discusses multi-agent frameworks. The author describes step by step how to assemble algorithms for generating a simulation model, program, method for visualization, and further research tasks. While the book employs the commonly used Swarm system, readers can model and develop the simulations with their own simulator. To encourage hands-on exploration of emergent systems, Swarm-based software and source codes are available for download from the author’s website. A thorough overview of multi-agent simulation and supporting tools, this book shows how this type of simulation is used to acquire an understanding of complex systems and artificial life. It carefully explains how to construct a simulation program for various applications.

Agent-based Modeling and Simulation
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The only single-source guide to understanding, using, adapting, and designing state-of-the-art agent-based modelling of tax evasion. A computational method for simulating the behavior of individuals or groups and their effects on an entire system, agent-based modeling has proven itself to be a powerful new tool for detecting tax fraud. While interdisciplinary groups and individuals working in the tax domain have published numerous articles in diverse peer-reviewed journals and have presented their findings at international conferences, until Agent-based Modelling of Tax Evasion there was no authoritative, single-source guide to state-of-the-art agent-based tax evasion modeling techniques and technologies. Featuring contributions from distinguished experts in the field from around the globe, Agent-Based Modelling of Tax Evasion provides in-depth coverage of an array of field tested agent-based tax evasion models. Models are presented in a unified format so as to enable readers to systematically work their way through the various modeling alternatives available to them. Three main components of each agent-based model are explored in accordance with the Overview, Design Concepts, and Details (ODD) protocol, each section of which contains several sub elements that help to illustrate the model clearly and that assist readers in replicating the modeling results described. Presents models in a unified and structured manner to provide a point of reference for readers interested in agent-based modelling of tax evasion. Explores the theoretical aspects and diversity of agent-based modeling through the example of tax evasion. Provides an overview of the characteristics of more than thirty agent-based tax evasion frameworks. Functions as a solid foundation for lectures and seminars on agent-based modelling of tax evasion. The only comprehensive treatment of agent-based tax evasion models and their applications, this book is an indispensable working resource for practitioners and tax evasion modelers both in the agent-based computational domain and using other methodologies. It is also an
excellent pedagogical resource for teaching tax evasion modeling and/or agent-based modeling generally.

Agent-based Modeling of Tax Evasion

This is the era of Big Data and computational social science. It is an era that requires tools which can do more than visualise data but also model the complex relation between data and human action and interaction. Agent-Based Models (ABM) – computational models which simulate human action and interaction – do just that. This textbook explains how to design and build ABM and how to link the models to Geographical Information Systems. It guides you from the basics through to constructing more complex models which work with data and human behaviour in a spatial context. All of the fundamental concepts are explained and related to practical examples to facilitate learning (with models developed in NetLogo with all code examples available on the accompanying website). You will be able to use these models to develop your own applications and link, where appropriate, to Geographical Information Systems. All of the key ideas and methods are explained in detail: geographical modelling; an introduction to ABM; the fundamentals of Geographical Information Science; why ABM and GIS; using QGIS; designing and building an ABM; calibration and validation; modelling human behaviour; visualisation and 3D ABM; using Big Geosocial Data, GIS and ABM. An applied primer, that provides fundamental knowledge and practical skills, it will provide you with the skills to build and run your own models, and to begin your own research projects.
Skin is the main organ of our body in direct contact with the external environment. Its core role is to protect the body against various kinds of potential damages. In this work, we have used a systems biology approach and agent-based computational modelling to study skin acute inflammation resulting from topical application of an irritant. We have built a structural and dynamic model of the epidermis. The model can display several clinically observed features such as: the skin barrier effect on water loss and external substance penetration, the dynamic homeostatic state of the epidermis, the steady state water and calcium profiles, etc. Furthermore, we have implemented a simple model of skin acute inflammation, that could be used as baseline for future works. We have studied the kinetic of the inflammatory reaction simulated with the model, as well as the influence of various parameters on that process. We demonstrated that the inflammation as produced by the model, shows a dose-dependent behaviour and that different inflammation intensities can be obtained by changing the values of parameters relating to the physical properties of the irritant. The model enabled the study of scenarios that cannot be studied by 'traditional' methods. In this case, studying an induced inflammation process on baby skin, while excluding the physiological properties of the tissue and only considering the influence of its structure, would have been extremely difficult if not impossible in vivo.

Guide to Computational Modelling for Decision Processes

Agent-based Computational Economics using NetLogo explores how researchers can create, use and implement multi-agent computational models in Economics by using NetLogo software platform. Problems of economic science can be solved using multi-agent modelling (MAM). This technique uses a computer model to simulate the actions
and interactions of autonomous entities in a network, in order to analyze the effects on the entire economic system. MAM combines elements of game theory, complex systems, emergence and evolutionary programming. The Monte Carlo method is also used in this e-book to introduce random elements. The 11 models presented in this text simulate the simultaneous operations of several agents in an attempt to recreate and predict complex economic phenomena. This e-book explains the topic in a systematic manner, starting with an introduction for readers followed subsequently by methodology and implementation using NetLogo. The volume ends with conclusions based on the results of the experiments presented. The e-book is intended as a concise and vital resource for economists, applied mathematicians, social sciences scientists, systems analysts, operations researchers and numerical analysts

Agent-Based Modeling and Network Dynamics

This book constitutes the refereed proceedings of the 5th KES International Conference on Agent and Multi-Agent Systems, KES-AMSTA 2011, held in Manchester, UK, in June/July 2011. The 69 revised papers presented were carefully reviewed and selected for inclusion in the book. In addition the volume contains one abstract and one full paper length keynote speech. The papers are organized in topical sections on conversational agents, dialogue systems and text processing; agents and online social networks; robotics and manufacturing; agent optimisation; negotiation and security; multi-agent systems; mining and profiling; agent-based optimization; doctoral track; computer-supported social intelligence for human interaction; digital economy; and intelligent workflow, cloud computing and systems.

Encyclopedia of Artificial Intelligence
Agent-Based Computational Demography (ABCD) aims at starting a new stream of research among social scientists whose interests lie in understanding demographic behaviour. The book takes a micro-demographic (agent-based) perspective and illustrates the potentialities of computer simulation as an aid in theory building. The chapters of the book, written by leading experts either in demography or in agent-based modelling, address several key questions. Why do we need agent-based computational demography? How can ABCD be applied to the study of migrations, family demography, and historical demography? What are the peculiarities of agent-based models as applied to the demography of human populations? ABCD is of interest to all scientists interested in studying demographic behaviour, as well as to computer scientists and modellers who are looking for a promising field of application.

Agent-based Computational Modeling of the Human Epidermis and Applications

"Molecular Computation Models: Unconventional Approaches is looking into new computational paradigms from both a theoretical perspective which offers a solid foundation of the models developed, as well as from a modeling angle, in order to reveal their effectiveness in modeling and simulating, especially biological systems. Tools and programming concepts and implementation issues are also discussed in the context of some experiments and comparative studies"--Provided by publisher.

Agent-Based Computational Economics Using NetLogo

This is an insightful survey of approaches to computational analysis of economics