Multiagent Systems Algorithmic Game Theoretic And Logical Foundations

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Lectures in Game Theory for Computer Scientists - Krzysztof R. Apt 2011-01-06
Games provide mathematical models for interaction. Numerous tasks in computer science can be formulated in game-theoretic terms. This fresh and intuitive way of thinking through complex issues reveals underlying algorithmic questions and clarifies the relationships between different domains. This collection of lectures, by specialists in the field, provides an excellent introduction to various aspects of game theory relevant for applications in computer science that concern program design, synthesis, verification, testing and design of multi-agent or distributed systems. Originally devised for a Spring School organised by the GAMES Networking Programme in 2009, these lectures have since been revised and expanded, and range from tutorials concerning fundamental notions and methods to more advanced presentations of current research topics. This volume is a valuable guide to current research on game-based methods in computer science for undergraduate and graduate students. It will also interest researchers working in mathematical logic, computer science and game theory.

Security and Game Theory - Milind Tambe 2011-12-12
Global threats of terrorism, drug-smuggling and other crimes have led to a significant increase in research on game theory for security. Game theory provides a sound mathematical approach to deploy limited security resources to maximize their effectiveness. A typical approach is to randomize security schedules to avoid predictability, with the randomization using artificial intelligence techniques to take into account the importance of different targets and potential adversary reactions. This book distills the forefront of this research to provide the first and only study of long-term deployed applications of game theory for security for key organizations such as the Los Angeles International Airport police and the US Federal Air Marshals Service. The author and his research group draw from their extensive experience working with security officials to intelligently allocate limited security resources to protect targets, outlining the applications of these algorithms in research and the real world.

Selfish Routing and the Price of Anarchy - Tim Roughgarden 2005-05-06

An analysis of the loss in performance caused by selfish, uncoordinated behavior in networks. Most of us prefer to commute by the shortest route available, without taking into account the traffic congestion that we cause for others. Many networks, including computer networks, suffer from some type of this "selfish routing." In Selfish Routing and the Price of Anarchy, Tim Roughgarden studies the loss of social welfare caused by selfish, uncoordinated behavior in networks. He quantifies the price of anarchy—the worst-possible loss of social welfare from selfish routing—and also discusses several methods for improving the price of anarchy with centralized control. Roughgarden begins with a relatively nontechnical introduction to selfish routing, describing two important examples that motivate the problems that follow. The first, Pigou's Example, demonstrates that selfish behavior need not generate a socially optimal outcome. The second, the counterintiuitve Braess's Paradox, shows that network improvements can degrade network performance. He then develops techniques for quantifying the price of anarchy (with Pigou's Example playing a central role). Next, he analyzes Braess's Paradox and the computational complexity of detecting it algorithmically, and he describes Stackelberg routing, which improves the price of anarchy using a modest degree of central control. Finally, he defines several open problems that may inspire further research. Roughgarden's work will be of interest not only to researchers and graduate students in theoretical computer science and optimization but also to other computer scientists, as well as to economists, electrical engineers, and mathematicians.

Multiagent Systems - Yoav Shoham 2008-12-15
This exciting and pioneering new overview of multiagent systems, which are online systems composed of multiple interacting intelligent agents, i.e., online trading, offers a newly seen computer science perspective on multiagent systems, while integrating ideas from operations research, game theory, economics, logic, and even philosophy and linguistics. The authors emphasize foundations to create a broad and rigorous treatment of their subject, with thorough presentations of distributed problem solving, game theory, multiagent communication and learning, social

choice, mechanism design, auctions, cooperative game theory, and modal logics of knowledge and belief. For each topic, basic concepts are introduced, examples are given, proofs of key results are offered, and algorithmic considerations are examined. An appendix covers background material in probability theory, classical logic, Markov decision processes and mathematical programming. Written by two of the leading researchers of this engaging field, this book will surely serve as THE reference for researchers in the fastest-growing area of computer science, and be used as a text for advanced undergraduate or graduate courses.

ICT Systems Security and Privacy Protection - Nora Cuppens-Boulahia 2014-05-12
This book constitutes the refereed proceedings of the 29th IFIP TC 11 International Information Security and Privacy Conference, SEC 2014, held in Marrakech, Morocco, in June 2014. The 27 revised full papers and 14 short papers presented were carefully reviewed and selected from 151 submissions. The papers are organized in topical sections on intrusion detection, data security, mobile security, privacy, metrics and risk assessment, information flow control, identity management, identifiability and decision making, malicious behavior and fraud and organizational security.

A Course in Game Theory - Thomas S. Ferguson 2019
"Game theory is a fascinating subject. We all know many entertaining games, such as chess, poker, tic-tac-toe, bridge, baseball, computer games - the list is quite varied and almost endless. In addition, there is a vast area of economic games, discussed in Myerson (1991) and Kreps (1990), and the related political games [Ordeshook (1986), Shubik (1982), and Taylor (1995)]. The competition between firms, the conflict between management and labor, the fight to get bills through congress, the power of the judiciary, war and peace negotiations between countries, and so on, all provide examples of games in action. There are also psychological games played on a personal level, where the weapons are words, and the payoffs are good or bad feelings [Berne (1964)]. There are biological games, the competition between species, where

natural selection can be modeled as a game played between genes [Smith (1982)]. There is a connection between game theory and the mathematical areas of logic and computer science. One may view theoretical statistics as a two-person game in which nature takes the role of one of the players, as in Blackwell and Girshick (1954) and Ferguson (1968). Games are characterized by a number of players or decision-makers who interact, possibly threaten each other and form coalitions, take actions under uncertain conditions, and finally receive some benefit or reward or possibly some punishment or monetary loss. In this text, we present various mathematical models of games and study the phenomena that arise. In some cases, we will be able to suggest what courses of action should be taken by the players. In others, we hope simply to be able to understand what is happening in order to make better predictions about the future"--

Information, Interaction, and Agency - Wiebe van der Hoek 2005-07-22
Contemporary epistemological and cognitive studies, as well as recent trends in computer science and game theory have revealed an increasingly important and intimate relationship between Information, Interaction, and Agency. Agents perform actions based on the available information and in the presence of other interacting agents. From this perspective Information, Interaction, and Agency neatly ties together classical themes like rationality, decision-making and belief revision with games, strategies and learning in a multi-agent setting. Unified by the central notions Information, Interaction, and Agency, the essays in this volume provide refreshing methodological perspectives on belief revision, dynamic epistemic logic, von Neumann games, and evolutionary game theory; all of which in turn are central approaches to understanding our own rationality and that of other agents. Reprinted from Synthese, 139:2 and 142:2 (2004), Special Section Knowledge, Rationality, and Action.

Programming Multi-Agent Systems in AgentSpeak using Jason - Rafael H. Bordini 2007-10-24
Jason is an Open Source interpreter for an extended version of AgentSpeak – a logic-based agent-oriented programming language – written in JavaTM. It enables users to build complex multi-agent systems that are capable of operating in environments previously considered too unpredictable for computers to handle. Jason is easily customisable and is suitable for the implementation of reactive planning systems according to the Belief-Desire-Intention (BDI) architecture. Programming Multi-Agent Systems in AgentSpeak using Jason provides a brief introduction to multi-agent systems and the BDI agent architecture on which AgentSpeak is based. The authors explain Jason's AgentSpeak variant and provide a comprehensive, practical guide to using Jason to program multi-agent systems. Some of the examples include diagrams generated using an agent-oriented software engineering methodology particularly suited for implementation using BDI-based programming languages. The authors also give guidance on good programming style with AgentSpeak. Programming Multi-Agent Systems in AgentSpeak using Jason Describes and explains in detail the AgentSpeak extension interpreted by Jason and shows how to create multi-agent systems using the Jason platform. Reinforces learning with examples, problems, and illustrations. Includes two case studies which demonstrate the use of Jason in practice. Features an accompanying website that provides further learning resources including sample code, exercises, and slides This essential guide to AgentSpeak and Jason will be invaluable to senior undergraduate and postgraduate students studying multi-agent systems. The book will also be of interest to software engineers, designers, developers, and programmers interested in multi-agent systems.

An Introduction to MultiAgent Systems - Michael Wooldridge 2002-05-13
This book will introduce students to intelligent agents, explain what these agents are, how they are constructed and how they can be made to co-operate effectively with one another in large-scale systems.

Optimization Theory for Large Systems - Leon S. Lasdon 2013-01-17
Important text examines most significant algorithms for optimizing large systems and clarifying relations between optimization procedures. Initial chapter on linear and nonlinear programming provide the foundation for

the rest of the book. Appendixes.

Multi-Agent Coordination - Arup Kumar Sadhu 2020-11-25
Discover the latest developments in multi-robot coordination techniques with this insightful and original resource Multi-Agent Coordination: A Reinforcement Learning Approach delivers a comprehensive, insightful, and unique treatment of the development of multi-robot coordination algorithms with minimal computational burden and reduced storage requirements when compared to traditional algorithms. The accomplished academics, engineers, and authors provide readers with both a high-level introduction to, and overview of, multi-robot coordination, and in-depth analyses of learning-based planning algorithms. You'll learn about how to accelerate the exploration of the team-goal and alternative approaches to speeding up the convergence of TMAQL by identifying the preferred joint action for the team. The authors also propose novel approaches to consensus Q-learning that address the equilibrium selection problem and a new way of evaluating the threshold value for uniting empires without imposing any significant computation overhead. Finally, the book concludes with an examination of the likely direction of future research in this rapidly developing field. Readers will discover cutting-edge techniques for multi-agent coordination, including: An introduction to multi-agent coordination by reinforcement learning and evolutionary algorithms, including topics like the Nash equilibrium and correlated equilibrium Improving convergence speed of multi-agent Q-learning for cooperative task planning Consensus Q-learning for multi-agent cooperative planning The efficient computing of correlated equilibrium for cooperative q-learning based multi-agent planning A modified imperialist competitive algorithm for multi-agent stick-carrying applications Perfect for academics, engineers, and professionals who regularly work with multi-agent learning algorithms, Multi-Agent Coordination: A Reinforcement Learning Approach also belongs on the bookshelves of anyone with an advanced interest in machine learning and artificial intelligence as it applies to the field of cooperative or competitive robotics.
Advances in Proof-Theoretic Semantics - Thomas Piecha 2015-10-24

This volume is the first ever collection devoted to the field of proof-theoretic semantics. Contributions address topics including the systematics of introduction and elimination rules and proofs of normalization, the categorial characterization of deductions, the relation between Heyting's and Gentzen's approaches to meaning, knowability paradoxes, proof-theoretic foundations of set theory, Dummett's justification of logical laws, Kreisel's theory of constructions, paradoxical reasoning, and the defence of model theory. The field of proof-theoretic semantics has existed for almost 50 years, but the term itself was proposed by Schroeder-Heister in the 1980s. Proof-theoretic semantics explains the meaning of linguistic expressions in general and of logical constants in particular in terms of the notion of proof. This volume emerges from presentations at the Second International Conference on Proof-Theoretic Semantics in Tübingen in 2013, where contributing authors were asked to provide a self-contained description and analysis of a significant research question in this area. The contributions are representative of the field and should be of interest to logicians, philosophers, and mathematicians alike.
Beyond the Worst-Case Analysis of Algorithms - Tim Roughgarden 2021-01-14
Introduces exciting new methods for assessing algorithms for problems ranging from clustering to linear programming to neural networks.
Self-organising Multi-agent Systems: Algorithmic Foundations Of Cyber-anarcho-socialism - Jeremy Pitt 2021-09-21
The paradigm of self-organisation is fundamental to theories of collective action in economic science and democratic governance in political science. Self-organisation in these social systems critically depends on voluntary compliance with conventional rules: that is, rules which are made up, mutually agreed, and modifiable 'on the fly'. How, then, can we use the self-organisation observed in such social systems as an inspiration for decentralised computer systems, which can face similar problems of coordination, cooperation and collaboration between autonomous peers?Self-Organising Multi-Agent Systems presents an innovative and systematic approach to transforming theories of

economics and politics (and elements of philosophy, psychology, and jurisprudence) into an executable logical specification of conventional rules. It shows how sets of such rules, called institutions, provide an algorithmic basis for designing and implementing cyber-physical systems, enabling intelligent software processes (called agents) to manage themselves in the face of competition for scarce resources. It also provides a basis for implementing socio-technical systems with interacting human and computational intelligences in a way that is sustainable, fair and legitimate.This interdisciplinary book is essential reading for anyone interested in the 'planned emergence' of global properties, commonly-shared values or successful collective action, especially as a product of social construction, knowledge management and political arrangements. For those studying both computer science and social sciences, this book offers a radically new gateway to a transformative understanding of complex system development and social system modelling.Understanding how a computational representation of qualitative values like justice and democracy can lead to stability and legitimacy of socio-technical systems is among the most pressing software engineering challenges of modern times. This book can be read as an invitation to make the Digital Society better.Related Link(s)

Political Game Theory - Nolan McCarty 2007-01-08
Political Game Theory is a self-contained introduction to game theory and its applications to political science. The book presents choice theory, social choice theory, static and dynamic games of complete information, static and dynamic games of incomplete information, repeated games, bargaining theory, mechanism design and a mathematical appendix covering, logic, real analysis, calculus and probability theory. The methods employed have many applications in various disciplines including comparative politics, international relations and American politics. Political Game Theory is tailored to students without extensive backgrounds in mathematics, and traditional economics, however there are also many special sections that present technical material that will appeal to more advanced students. A large number of exercises are also provided to practice the skills and techniques discussed.

Self-organizing Coalitions for Managing Complexity - Juan C. Burguillo 2017-12-13
This book provides an interdisciplinary approach to complexity, combining ideas from areas like complex networks, cellular automata, multi-agent systems, self-organization and game theory. The first part of the book provides an extensive introduction to these areas, while the second explores a range of research scenarios. Lastly, the book presents CellNet, a software framework that offers a hands-on approach to the scenarios described throughout the book. In light of the introductory chapters, the research chapters, and the CellNet simulating framework, this book can be used to teach undergraduate and master's students in disciplines like artificial intelligence, computer science, applied mathematics, economics and engineering. Moreover, the book will be particularly interesting for Ph.D. and postdoctoral researchers seeking a general perspective on how to design and create their own models.

A Concise Introduction to Multiagent Systems and Distributed Artificial Intelligence - Nikos Vlassis 2007-06-01
Multiagent systems is an expanding field that blends classical fields like game theory and decentralized control with modern fields like computer science and machine learning. This monograph provides a concise introduction to the subject, covering the theoretical foundations as well as more recent developments in a coherent and readable manner. The text is centered on the concept of an agent as decision maker. Chapter 1 is a short introduction to the field of multiagent systems. Chapter 2 covers the basic theory of singleagent decision making under uncertainty. Chapter 3 is a brief introduction to game theory, explaining classical concepts like Nash equilibrium. Chapter 4 deals with the fundamental problem of coordinating a team of collaborative agents. Chapter 5 studies the problem of multiagent reasoning and decision making under partial observability. Chapter 6 focuses on the design of protocols that are stable against manipulations by self-interested agents. Chapter 7 provides a short introduction to the rapidly expanding field of multiagent reinforcement learning. The material can be used for teaching a half-semester course on multiagent systems covering,

roughly, one chapter per lecture.

An Introduction to Semi-tensor Product of Matrices and Its Applications - Daizhan Cheng 2012
Proposes a generalization of Conventional Matrix Product (CMP), called the Semi-Tensor Product (STP). This book offers a comprehensive introduction to the theory of STP and its various applications, including logical function, fuzzy control, Boolean networks, analysis and control of nonlinear systems, amongst others.

Population Games and Evolutionary Dynamics - William H. Sandholm 2010-12-17
Evolutionary game theory studies the behaviour of large populations of strategically interacting agents & is used by economists to predict in settings where traditional assumptions about the rationality of agents & knowledge may be inapplicable.

Theory of Games and Statistical Decisions - David A. Blackwell 2012-06-14
A problem-oriented text for evaluating statistical procedures through decision and game theory. First-year graduates in statistics, computer experts and others will find this highly respected work best introduction to growing field.

An Introduction to Data Structures and Algorithms - J.A. Storer 2012-12-06
Data structures and algorithms are presented at the college level in a highly accessible format that presents material with one-page displays in a way that will appeal to both teachers and students. The thirteen chapters cover: Models of Computation, Lists, Induction and Recursion, Trees, Algorithm Design, Hashing, Heaps, Balanced Trees, Sets Over a Small Universe, Graphs, Strings, Discrete Fourier Transform, Parallel Computation. Key features: Complicated concepts are expressed clearly in a single page with minimal notation and without the "clutter" of the syntax of a particular programming language; algorithms are presented with self-explanatory "pseudo-code." * Chapters 1-4 focus on elementary concepts, the exposition unfolding at a slower pace. Sample exercises with solutions are provided. Sections that may be skipped for an introductory course are starred. Requires only some basic mathematics background and some computer programming experience. * Chapters 5-13 progress at a faster pace. The material is suitable for undergraduates or first-year graduates who need only review Chapters 1 -4. * This book may be used for a one-semester introductory course (based on Chapters 1-4 and portions of the chapters on algorithm design, hashing, and graph algorithms) and for a one-semester advanced course that starts at Chapter 5. A year-long course may be based on the entire book. * Sorting, often perceived as rather technical, is not treated as a separate chapter, but is used in many examples (including bubble sort, merge sort, tree sort, heap sort, quick sort, and several parallel algorithms). Also, lower bounds on sorting by comparisons are included with the presentation of heaps in the context of lower bounds for comparison-based structures. * Chapter 13 on parallel models of computation is something of a mini-book itself, and a good way to end a course. Although it is not clear what parallel

Twenty Lectures on Algorithmic Game Theory - Tim Roughgarden 2016-08-30
Computer science and economics have engaged in a lively interaction over the past fifteen years, resulting in the new field of algorithmic game theory. Many problems that are central to modern computer science, ranging from resource allocation in large networks to online advertising, involve interactions between multiple self-interested parties. Economics and game theory offer a host of useful models and definitions to reason about such problems. The flow of ideas also travels in the other direction, and concepts from computer science are increasingly important in economics. This book grew out of the author's Stanford University course on algorithmic game theory, and aims to give students and other newcomers a quick and accessible introduction to many of the most important concepts in the field. The book also includes case studies on online advertising, wireless spectrum auctions, kidney exchange, and network management.

Complex Engineered Systems - Dan Braha 2007-06-24
This book sheds light on the large-scale engineering systems that shape

and guide our everyday lives. It does this by bringing together the latest research and practice defining the emerging field of Complex Engineered Systems. Understanding, designing, building and controlling such complex systems is going to be a central challenge for engineers in the coming decades. This book is a step toward addressing that challenge.

Multiagent Systems, second edition - Gerhard Weiss 2016-10-28
The new edition of an introduction to multiagent systems that captures the state of the art in both theory and practice, suitable as textbook or reference. Multiagent systems are made up of multiple interacting intelligent agents—computational entities to some degree autonomous and able to cooperate, compete, communicate, act flexibly, and exercise control over their behavior within the frame of their objectives. They are the enabling technology for a wide range of advanced applications relying on distributed and parallel processing of data, information, and knowledge relevant in domains ranging from industrial manufacturing to e-commerce to health care. This book offers a state-of-the-art introduction to multiagent systems, covering the field in both breadth and depth, and treating both theory and practice. It is suitable for classroom use or independent study. This second edition has been completely revised, capturing the tremendous developments in multiagent systems since the first edition appeared in 1999. Sixteen of the book's seventeen chapters were written for this edition; all chapters are by leaders in the field, with each author contributing to the broad base of knowledge and experience on which the book rests. The book covers basic concepts of computational agency from the perspective of both individual agents and agent organizations; communication among agents; coordination among agents; distributed cognition; development and engineering of multiagent systems; and background knowledge in logics and game theory. Each chapter includes references, many illustrations and examples, and exercises of varying degrees of difficulty. The chapters and the overall book are designed to be self-contained and understandable without additional material. Supplemental resources are available on the book's Web site. Contributors Rafael Bordini, Felix Brandt, Amit Chopra, Vincent Conitzer, Virginia Dignum, Jürgen Dix, Ed Durfee, Edith Elkind, Ulle Endriss, Alessandro Farinelli, Shaheen Fatima, Michael Fisher, Nicholas R. Jennings, Kevin Leyton-Brown, Evangelos Markakis, Lin Padgham, Julian Padget, Iyad Rahwan, Talal Rahwan, Alex Rogers, Jordi Sabater-Mir, Yoav Shoham, Munindar P. Singh, Kagan Tumer, Karl Tuyls, Wiebe van der Hoek, Laurent Vercouter, Meritxell Vinyals, Michael Winikoff, Michael Wooldridge, Shlomo Zilberstein

An Introduction to MultiAgent Systems - Michael Wooldridge 2009-06-22
The eagerly anticipated updated resource on one of the most important areas of research and development: multi-agent systems Multi-agent systems allow many intelligent agents to interact with each other, and this field of study has advanced at a rapid pace since the publication of the first edition of this book, which was nearly a decade ago. With this exciting new edition, the coverage of multi-agents is completely updated to include several areas that have come to prominence in the last several years, including auctions, computational social choice, and markov decision processes. In turn, a variety of topics that were initially considered critical have dwindled in importance, so the coverage of that subject matter is decreased with this new edition. The result of this redefined balance of coverage is a timely and essential resource on a popular topic. Introduces you to the concept of agents and multi-agent systems and the main applications for which they are appropriate Discusses the main issues surrounding the design of intelligent agents and a multi-agent society Delves into a number of typical applications for agent technology Addresses deductive reasoning agents, practical reasoning agents, reactive and hybrid agents, and more Reviews multi-agent decision making, communication and cooperation, and intelligent autonomous agents By the end of the book, you will have a firm grasp on how agents are distinct from other software paradigms and understand the characteristics of applications that lend themselves to agent-oriented software.

Reinforcement Learning - Marco Wiering 2012-03-05
Reinforcement learning encompasses both a science of adaptive behavior of rational beings in uncertain environments and a computational methodology for finding optimal behaviors for challenging problems in

control, optimization and adaptive behavior of intelligent agents. As a field, reinforcement learning has progressed tremendously in the past decade. The main goal of this book is to present an up-to-date series of survey articles on the main contemporary sub-fields of reinforcement learning. This includes surveys on partially observable environments, hierarchical task decompositions, relational knowledge representation and predictive state representations. Furthermore, topics such as transfer, evolutionary methods and continuous spaces in reinforcement learning are surveyed. In addition, several chapters review reinforcement learning methods in robotics, in games, and in computational neuroscience. In total seventeen different subfields are presented by mostly young experts in those areas, and together they truly represent a state-of-the-art of current reinforcement learning research. Marco Wiering works at the artificial intelligence department of the University of Groningen in the Netherlands. He has published extensively on various reinforcement learning topics. Martijn van Otterlo works in the cognitive artificial intelligence group at the Radboud University Nijmegen in The Netherlands. He has mainly focused on expressive knowledge representation in reinforcement learning settings.

Essentials of Game Theory - Kevin Leyton-Brown 2008-07-08
Game theory is the mathematical study of interaction among independent, self-interested agents. The audience for game theory has grown dramatically in recent years, and now spans disciplines as diverse as political science, biology, psychology, economics, linguistics, sociology, and computer science, among others. What has been missing is a relatively short introduction to the field covering the common basis that anyone with a professional interest in game theory is likely to require. Such a text would minimize notation, ruthlessly focus on essentials, and yet not sacrifice rigor. This Synthesis Lecture aims to fill this gap by providing a concise and accessible introduction to the field. It covers the main classes of games, their representations, and the main concepts used to analyze them.

Algorithmic Game Theory - Noam Nisan 2007-09-24
In recent years game theory has had a substantial impact on computer science, especially on Internet- and e-commerce-related issues. Algorithmic Game Theory, first published in 2007, develops the central ideas and results of this exciting area in a clear and succinct manner. More than 40 of the top researchers in this field have written chapters that go from the foundations to the state of the art. Basic chapters on algorithmic methods for equilibria, mechanism design and combinatorial auctions are followed by chapters on important game theory applications such as incentives and pricing, cost sharing, information markets and cryptography and security. This definitive work will set the tone of research for the next few years and beyond. Students, researchers, and practitioners alike need to learn more about these fascinating theoretical developments and their widespread practical application.

Multi-Agent Machine Learning - H. M. Schwartz 2014-08-26
The book begins with a chapter on traditional methods of supervised learning, covering recursive least squares learning, mean square error methods, and stochastic approximation. Chapter 2 covers single agent reinforcement learning. Topics include learning value functions, Markov games, and TD learning with eligibility traces. Chapter 3 discusses two player games including two player matrix games with both pure and mixed strategies. Numerous algorithms and examples are presented. Chapter 4 covers learning in multi-player games, stochastic games, and Markov games, focusing on learning multi-player grid games—two player grid games, Q-learning, and Nash Q-learning. Chapter 5 discusses differential games, including multi player differential games, actor critique structure, adaptive fuzzy control and fuzzy interference systems, the evader pursuit game, and the defending a territory games. Chapter 6 discusses new ideas on learning within robotic swarms and the innovative idea of the evolution of personality traits. • Framework for understanding a variety of methods and approaches in multi-agent machine learning. • Discusses methods of reinforcement learning such as a number of forms of multi-agent Q-learning • Applicable to research professors and graduate students studying electrical and computer engineering, computer science, and mechanical and aerospace engineering

Game Theory Relaunched - Hardy Hanappi 2013-03-27
The game is on. Do you know how to play? Game theory sets out to explore what can be said about making decisions which go beyond accepting the rules of a game. Since 1942, a well elaborated mathematical apparatus has been developed to do so; but there is more. During the last three decades game theoretic reasoning has popped up in many other fields as well - from engineering to biology and psychology. New simulation tools and network analysis have made game theory omnipresent these days. This book collects recent research papers in game theory, which come from diverse scientific communities all across the world; they combine many different fields like economics, politics, history, engineering, mathematics, physics, and psychology. All of them have as a common denominator some method of game theory. Enjoy.

Computational Aspects of Cooperative Game Theory - Georgios Chalkiadakis 2011-10-25
This cross-disciplinary book dives into the technical and computational aspects that make cooperative games possible. It is appropriate for professional researchers, graduate students, and advanced undergraduates hoping to pursue careers in academia and / or industry.

More Games of No Chance - Richard Nowakowski 2002-11-25
This 2003 book provides an analysis of combinatorial games - games not involving chance or hidden information. It contains a fascinating collection of articles by some well-known names in the field, such as Elwyn Berlekamp and John Conway, plus other researchers in mathematics and computer science, together with some top game players. The articles run the gamut from theoretical approaches (infinite games, generalizations of game values, 2-player cellular automata, Alpha-Beta pruning under partial orders) to other games (Amazons, Chomp, Dot-and-Boxes, Go, Chess, Hex). Many of these advances reflect the interplay of the computer science and the mathematics. The book ends with a bibliography by A. Fraenkel and a list of combinatorial game theory problems by R. K. Guy. Like its predecessor, Games of No Chance, this should be on the shelf of all serious combinatorial games enthusiasts.

Multiagent Systems - Yoav Shoham 2008-12-15
Multiagent systems combine multiple autonomous entities, each having diverging interests or different information. This overview of the field offers a computer science perspective, but also draws on ideas from game theory, economics, operations research, logic, philosophy and linguistics. It will serve as a reference for researchers in each of these fields, and be used as a text for advanced undergraduate or graduate courses. The authors emphasize foundations to create a broad and rigorous treatment of their subject, with thorough presentations of distributed problem solving, game theory, multiagent communication and learning, social choice, mechanism design, auctions, cooperative game theory, and modal logics of knowledge and belief. For each topic, basic concepts are introduced, examples are given, proofs of key results are offered, and algorithmic considerations are examined. An appendix covers background material in probability theory, classical logic, Markov decision processes and mathematical programming.

Specification and Verification of Multi-agent Systems - Mehdi Dastani 2010-07-20
Specification and Verification of Multi-agent Systems presents a coherent treatment of the area of formal specification and verification of agent-based systems with a special focus on verification of multi-agent programs. This edited volume includes contributions from international leading researchers in the area, addressing logical formalisms and techniques, such as model checking, theorem proving, and axiomatisations for (semi) automatic verification of agent-based systems. Chapters include: • Using Theorem Proving to Verify Properties of Agent Programs • The Refinement of Multi-Agent Systems • Model Checking Agent Communication • Directions for Agent Model Checking • Model Checking Logics of Strategic Ability: Complexity • Correctness of Mult-Agent Programs: A Hybrid Approach • The Norm Implementation Problem in Normative Multi-Agent Systems • A Verification Logic for GOAL Agents • Using the Maude Term Rewriting Language for Agent Development with Formal Foundations • The Cognitive Agents Specification Language and Verification Environment • A Temporal

Trace Language for Formal Modelling and Analysis of Agent Systemns • Assurance of Agent Systems: What Role Should Formal Verification Play? Specification and Verification of Multi-agent Systems is a comprehensive guide that makes a useful tool for researchers, practitioners and students, and serves as a reference work summarizing the state of the art in an accessible manner.

Game Theory And Mechanism Design - Y Narahari 2014-03-13
This book offers a self-sufficient treatment of a key tool, game theory and mechanism design, to model, analyze, and solve centralized as well as decentralized design problems involving multiple autonomous agents that interact strategically in a rational and intelligent way. The contents of the book provide a sound foundation of game theory and mechanism design theory which clearly represent the "science" behind traditional as well as emerging economic applications for the society.The importance of the discipline of game theory has been recognized through numerous Nobel prizes in economic sciences being awarded to game theorists, including the 2005, 2007, and 2012 prizes. The book distills the marvelous contributions of these and other celebrated game theorists and presents it in a way that can be easily understood even by senior undergraduate students.A unique feature of the book is its detailed coverage of mechanism design which is the art of designing a game among strategic agents so that a social goal is realized in an equilibrium of the induced game. Another feature is a large number of illustrative examples that are representative of both classical and modern applications of game theory and mechanism design. The book also includes informative biographical sketches of game theory legends, and is specially customized to a general engineering audience.After a thorough reading of this book, readers would be able to apply game theory and mechanism design in a principled and mature way to solve relevant problems in computer science (esp, artificial intelligence/machine learning), computer engineering, operations research, industrial engineering and microeconomics.

An Introduction to the Theory of Mechanism Design - Tilman Borgers 2015-05-01

What is the best way to auction an asset? How should a group of people organize themselves to ensure the best provision of public goods? How should exchanges be organized? In An Introduction to the Theory of Mechanism Design, Tilman Börgers addresses these questions and more through an exploration of the economic theory of mechanism design. Mechanism design is reverse game theory. Whereas game theory takes the rules of the game as a given and makes predictions about the behavior of strategic players, the theory of mechanism design goes a step further and selects the optimal rules of the game. A relatively new economic theory, mechanism design studies the instrument itself as well as the results of the instrument. An Introduction to the Theory of Mechanism Design provides rigorous but accessible explanations of classic results in the theory of mechanism design, such as Myerson's theorem on expected revenue maximizing auctions, Myerson and Satterthwaite's theorem on the impossibility of ex post efficient bilateral trade with asymmetric information, and Gibbard and Satterthwaite's theorem on the non-existence of dominant strategy voting mechanisms. Börgers also provides an examination of the frontiers of current research in the area with an original and unified perspective that will appeal to advanced students of economics.

Logics in Artificial Intelligence - Steffen Hölldobler 2008-09-19
This book constitutes the refereed proceedings of the 11th European Conference on Logics in Artificial Intelligence, JELIA 2008, held in Dresden, Germany, Liverpool, in September/October 2008. The 32 revised full papers presented together with 2 invited talks were carefully reviewed and selected from 98 submissions. The papers cover a broad range of topics including belief revision, description logics, non-monotonic reasoning, multi-agent systems, probabilistic logic, and temporal logic.

Markov Decision Processes in Artificial Intelligence - Olivier Sigaud 2013-03-04
Markov Decision Processes (MDPs) are a mathematical framework for modeling sequential decision problems under uncertainty as well as Reinforcement Learning problems. Written by experts in the field, this

book provides a global view of current research using MDPs in Artificial Intelligence. It starts with an introductory presentation of the fundamental aspects of MDPs (planning in MDPs, Reinforcement Learning, Partially Observable MDPs, Markov games and the use of non-classical criteria). Then it presents more advanced research trends in the domain and gives some concrete examples using illustrative applications.

Interactive Logic - J. F. A. K. van Benthem 2007
Traditionally, logic has dealt with notions of truth and reasoning. In the past several decades, however, research focus in logic has shifted to the vast field of interactive logic—the domain of logics for both communication and interaction. The main applications of this move are logical approaches to games and social software; the wealth of these applications was the focus of the seventh Augustus de Morgan Workshop in November 2005. This collection of papers from the workshop serves as the initial volume in the new series Texts in Logics and Games—touching on research in logic, mathematics, computer science, and game theory. "A wonderful demonstration of contemporary topics in logic."—Wiebe van der Hoek, University of Liverpool

Game Theory and Machine Learning for Cyber Security - Charles A. Kamhoua 2021-09-08
Move beyond the foundations of machine learning and game theory in cyber security to the latest research in this cutting-edge field In Game Theory and Machine Learning for Cyber Security, a team of expert security researchers delivers a collection of central research contributions from both machine learning and game theory applicable to cybersecurity. The distinguished editors have included resources that address open research questions in game theory and machine learning applied to cyber security systems and examine the strengths and limitations of current game theoretic models for cyber security. Readers will explore the vulnerabilities of traditional machine learning algorithms and how they can be mitigated in an adversarial machine learning approach. The book offers a comprehensive suite of solutions to a broad range of technical issues in applying game theory and machine learning to solve cyber security challenges. Beginning with an introduction to foundational concepts in game theory, machine learning, cyber security, and cyber deception, the editors provide readers with resources that discuss the latest in hypergames, behavioral game theory, adversarial machine learning, generative adversarial networks, and multi-agent reinforcement learning. Readers will also enjoy: A thorough introduction to game theory for cyber deception, including scalable algorithms for identifying stealthy attackers in a game theoretic framework, honeypot allocation over attack graphs, and behavioral games for cyber deception An exploration of game theory for cyber security, including actionable game-theoretic adversarial intervention detection against persistent and advanced threats Practical discussions of adversarial machine learning for cyber security, including adversarial machine learning in 5G security and machine learning-driven fault injection in cyber-physical systems In-depth examinations of generative models for cyber security Perfect for researchers, students, and experts in the fields of computer science and engineering, Game Theory and Machine Learning for Cyber Security is also an indispensable resource for industry professionals, military personnel, researchers, faculty, and students with an interest in cyber security.