

Handbook Of Logic In Artificial Intelligence And Logic Programming Volume 5 Logic Programming Volume 5 Logic Programming

Perspectives in Computing: A Computational Logic Handbook contains a precise description of the logic and a detailed reference guide to the associated mechanical theorem proving system, including a primer for the logic as a functional programming language, an introduction to proofs in the logic, and a primer for the mechanical theorem. The publication first offers information on a primer for the logic, formalization within the logic, and a precise description of the logic. Discussions focus on induction and recursion, quantification, explicit value terms, dealing with features and omissions, elementary mathematical relationships, Boolean operators, and conventional data structures. The text then takes a look at proving theorems in the logic, mechanized proofs in the logic, and an introduction to the system. The text examines the processes involved in using the theorem prover, four classes of rules generated from lemmas, and aborting or interrupting commands. Topics include executable counterparts, toggle, elimination of irrelevancy, heuristic use of equalities, representation of formulas, type sets, and the crucial check points in a proof attempt. The publication is a vital reference for researchers interested in computational logic.

The Handbook of Logic in Artificial Intelligence and Logic Programming is a multi-author volume work covering all major areas of application of logic to AI and logic programming. Initially there will be six volumes containing a total of 43 articles, each article averaging around 75 pages in length but with some rather longer as the subject may demand. The authors are chosen on an international basis and are leaders in the fields covered. The Handbook is a closely co-ordinated work which has been under development for the past five years. Volume 2 covers deduction methodologies.

The logical study of language is becoming more interdisciplinary, playing a role in fields such as computer science, artificial intelligence, cognitive science and game theory. This new edition, written by the leading experts in the field, presents an overview of the latest developments at the interface of logic and linguistics as well as a historical perspective. It is divided into three parts covering Frameworks, General Topics and Descriptive Themes. Completely revised and updated - includes over 25% new material Discusses the interface between logic and language Many of the authors are creators or active developers of the theories

The Handbook of Artificial Intelligence, Volume II focuses on the improvements in artificial intelligence (AI) and its increasing applications, including programming languages, intelligent CAI systems, and the employment of AI in medicine, science, and education. The book first elaborates on programming languages for AI research and applications-oriented AI research. Discussions cover scientific applications, tereiasis, applications in chemistry, dependencies and assumptions, AI programming-language features, and LISP. The manuscript then examines applications-oriented AI research in medicine and education, including ICAI systems design, intelligent CAI systems, medical systems, and other applications of AI to education. The manuscript explores automatic programming, as well as the methods of program specification, basic approaches, and automatic programming systems. The book is a valuable source of data for computer science experts and researchers interested in conducting further research in artificial intelligence.

Artificial Intelligence

Reasoning with Actual and Potential Contradictions

Volume I. Logical Foundations

The Turn Towards the Practical

Essays Dedicated to Andre Scedrov on the Occasion of His 65th Birthday

A one-step reference, self-contained, with theoretical topics presented in conjunction with implementations for which code is supplied.

For decades, optimization methods such as Fuzzy Logic, Artificial Neural Networks, Firefly, Simulated annealing, and Tabu search, have been capable of handling and tackling a wide range of real-world application problems in society and nature. Analysts have turned to these problem-solving techniques in the event during natural disasters and chaotic systems research. The Handbook of Research on Artificial Intelligence Techniques and Algorithms highlights the cutting edge developments in this promising research area. This premier reference work applies Meta-heuristics Optimization (MO) Techniques to real world problems in a variety of fields including business,

logistics, computer science, engineering, and government. This work is particularly relevant to researchers, scientists, decision-makers, managers, and practitioners.

We are happy to present the second volume of the Handbook of Defeasible Reasoning and Uncertainty Management Systems. Uncertainty pervades the real world and must therefore be addressed by every system that attempts to represent reality. The representation of un certainty is a major concern of philosophers, logicians, artificial intelligence researchers and computer scientists, psychologists, statisticians, economists and engineers. The present Handbook volumes provide frontline coverage of this area. This Handbook was produced in the style of previous handbook series like the Handbook of Philosophical Logic, the Handbook of Logic in Computer Science, the

Handbook of Logic in Artificial Intelligence and Logic Programming, and can be seen as a companion to them in covering the wide applications of logic and reasoning. We hope it will answer the needs for adequate representations of uncertainty. This Handbook series grew out of the ESPRIT Basic Research Project DRUMS II, where the acronym is made out of the Handbook series title. This project was financially supported by the European Union and regroupts 20 major European research teams working in the general domain of uncer tainty. As a fringe benefit of the DRUMS project, the research community was able to create this Handbook series, relying on the DRUMS partici pants as the core of the authors for the Handbook together with external international experts.

This excellent and engaging textbook presents a concise introduction to the existing field of artificial intelligence (AI). The broad-ranging discussion covers the key subdisciplines within the field, describing practical algorithms and concrete applications in the areas of agents, logic, search, reasoning under uncertainty, machine learning, neural networks, and reinforcement learning. Fully revised and updated, this much-anticipated second edition also includes new material on deep learning. Topics and features: presents an application-focused and hands-on approach to learning, with supplementary teaching resources provided at an associated website; contains numerous study exercises and solutions, highlighted examples, definitions, theorems, and illustrative cartoons; includes chapters on predicate logic, PROLOG, heuristic search, probabilistic reasoning, machine learning and data mining, neural networks and reinforcement learning; reports on developments in deep learning, including applications of neural networks to generate creative content such as text, music and art (NEW); examines performance evaluation of clustering algorithms, and presents two practical examples explaining Bayes' theorem and its relevance in everyday life (NEW); discusses search algorithms, analyzing the cycle check, explaining route planning for car navigation systems, and introducing Monte Carlo Tree Search (NEW); includes a section in the introduction on AI and society, discussing the implications of AI on topics such as employment and transportation (NEW). Ideal for foundation courses or modules on AI, this easy-to-read textbook offers an excellent overview of the field for students of computer science and modules on AI, this easy-to-read textbook offers an excellent overview of the field of mathematics to understand the material.

Introduction to Artificial Intelligence

The Artificial Intelligence Handbook for Investors, Entrepreneurs and FinTech Visionaries

Volume 10

Handbook of Research on Artificial Intelligence Techniques and Algorithms

Handbook of Paraconsistency

Paraconsistent logics are logics which allow solid deductive reasoning under contradictions by offering a mathematical and philosophical support to contradictory yet non-trivial theories. Due to its role in models of scientific reasoning and to its philosophical implications, as well as to its connections to topics such as abduction, automated reasoning, logic programming, and belief revision, paraconsistency has become a fast growing area. During the III World Congress on Paraconsistency (WCPS) held in Toulouse, France, in July, 2003, it became apparent that there is a need for a Handbook covering the most recent results on several aspects of paraconsistent logic, including philosophical debates on paraconsistency and its connections to philosophy of language, argumentation theory, computer science, information theory, and artificial intelligence. This book is a basic tool for those who want to know more about paraconsistent logic, its history and philosophy, the various systems of paraconsistent logic and their applications. The present volume is edited by Jean-Yves Beziau, Walter Carnielli and Dov Gabbay, expert logicians versed in a variety of logics.

This book introduces the notions and methods of formal logic from a computer science standpoint, covering propositional logic, predicate logic, and foundations of logic programming. The classic text is replete with illustrative examples and exercises. It presents applications and themes of computer science research such as resolution, automated deduction, and logic programming in a rigorous but readable way. The style and scope of the work, rounded out by the inclusion of exercises, make this an excellent textbook for an advanced undergraduate course in logic for computer scientists.

The papers presented in this volume examine topics of central interest in contemporary philosophy of logic. They include reflections on the nature of logic and its relevance for philosophy today, and explore in depth developments in informal logic and the relation of informal to symbolic logic, mathematical metatheory and the limiting metatheorems, modal logic, many-valued logic, relevance and paraconsistent logic, free logics, extensional v. intensional logics, the logic of fiction, epistemic logic, formal logical and semantic paradoxes, the concept of truth, the formal theory of entailment, objectual and substitutional interpretation of the quantifiers, infinity and domain constraints, the Löwenheim-Skolem theorem and Skolem paradox, vagueness, modal realism v. actualism, counterfactuals and the logic of causation, applications of logic and mathematics to the physical sciences, logically possible worlds and counterpart semantics, and the legacy of Hilbert's program and logicism. The handbook is meant to be both a compendium of new work in symbolic logic and an authoritative resource for students and researchers, a book to be consulted for specific information about recent developments in logic and to be read with pleasure for its technical acumen and philosophical insights. - Written by leading logicians and philosophers - Comprehensive authoritative coverage of all major areas of contemporary research in symbolic logic - Clear, in-depth expositions of technical detail - Progressive organization from general considerations to informal to symbolic logic to nonclassical logics - Presents current work in symbolic logic within a unified framework - Accessible to students, engaging for experts and professionals - Insightful philosophical discussions of all aspects of logic - Useful bibliographies in every chapter

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A Modern Approach

The AI Book

Handbook of Proof Theory

Formerly Notes and Reports in Computer Science and Applied Mathematics

Handbook of Logic in Artificial Intelligence and Logic Programming: Volume 2: Deduction Methodologies

The first edition of the Handbook of Philosophical Logic (four volumes) was published in the period 1983-1988 and has proven to be an invaluable reference work to both students and researchers in formal philosophy, language and logic. The second edition of the Handbook is intended to comprise some 18 volumes and will provide a very up-to-date authoritative, in-depth coverage of all major topics in philosophical logic and its applications in many cutting-edge fields relating to computer science, language, argumentation, etc. The volumes will no longer be as topic-oriented as with the first edition because of the way the subject has evolved over the last 15 years or so. However the volumes will follow some natural groupings of chapters. Audience: Students and researchers whose work or interests involve philosophical logic and its applications

The Handbook of the Logic of Argument and Inference is an authoritative reference work in a single volume, designed for the attention of senior undergraduates, graduate students and researchers in all the leading research areas concerned with the logic of practical argument and inference. After an introductory chapter, the role of standard logics is surveyed in two chapters. These chapters can serve as a mini-course for interested readers, in deductive and inductive logic, or as a refresher. Then follow two chapters of criticism; one the internal critique and the other the empirical critique. The first deals with objections to standard logics (as theories of argument and inference) arising from the research programme in philosophical logic. The second canvasses criticisms arising from work in cognitive and experimental psychology. The next five chapters deal with developments in dialogue logic, interrogative logic, informal logic, probability logic and artificial intelligence. The last chapter surveys formal approaches to practical reasoning and anticipates possible future developments. Taken as a whole the Handbook is a single-volume indication of the present state of the logic of argument and inference at its conceptual and theoretical best. Future editions will periodically incorporate significant new developments.

The Handbook of Defeasible Reasoning and Uncertainty Management Systems is unique in its mastery survey of the computational and algorithmic problems of systems of applied reasoning. The various theoretical and modelling aspects of defeasible reasoning were dealt with in the first four volumes, and Volume 5 now turns to the algorithmic aspect. Topics covered include: Computation in valuation algebras; consequence finding algorithms; possibilistic logic; probabilistic argumentation systems, networks and satisfiability; algorithms for imprecise probabilities, for Dempster-Shafer, and network based decisions.

The Handbook of Logic in Artificial Intelligence and Logic Programming is a multi-volume work covering all major areas of the application of logic to artificial intelligence and logic programming. The authors are chosen on an international basis and are leaders in the fields covered. Volume 5 is the last in this well-regarded series. Logic is now widely recognized as one of the foundational disciplines of computing. It has found applications in virtually all aspects of the subject, from software and hardware engineering to programming languages and artificial intelligence. In response to the growing need for an in-depth survey of these applications the Handbook of Logic in Artificial Intelligence and its companion, the Handbook of Logic in Computer Science have been created. The Handbooks are a combination of authoritative exposition, comprehensive survey, and fundamental research exploring the underlying themes in the various areas. Some mathematical background is assumed, and much of the material will be of interest to logicians and mathematicians. Volume 5 focuses particularly on logic programming. The chapters, which in many cases are of monograph length and scope, emphasize possible unifying themes.

A Computational Logic Handbook

Handbook of Epistemic Logic

Logical foundations

Handbook of Philosophical Logic

Handbook of Temporal Reasoning in Artificial Intelligence

It is with great pleasure that we are presenting to the community the second edition of this extraordinary handbook. It has been over 15 years since the publication of the first edition and there have been great changes in the landscape of philosophical logic since then. The first edition has proved invaluable to generations of students and researchers in formal philosophy and language, as well as to consumers of logic in many applied areas. The main logic article in the Encyclopaedia Britannica 1999 has described the first edition as 'the best starting point for exploring any of the topics in logic'. We are confident that the second edition will prove to be just as good! The first edition was the second handbook published for the logic commu nity. It followed the North Holland one volume Handbook 0/ Mathematical Logic, published in 1977, edited by the late Jon Barwise. The four volume Handbook 0/ Philosophical Logic, published 1983-1989 came at a fortunate temporal junction at the evolution of logic. This was the time when logic was gaining ground in computer science and artificial intelligence circles. These areas were under increasing commercial pressure to provide devices which help and/or replace the human in his daily activity. This pressure required the use of logic in the modelling of human activity and organisa tion on the one hand and to provide the theoretical basis for the computer program constructs on the other.

BL A comprehensive five volume work BL Sets the standard in reference for logic and artificial intelligence The Handbook of Logic in Artificial Intelligence and Logic Programming will be published in five volumes. The handbook comes in response to the growing need for an in-depth survey of the applications of logic in artificial intelligence and computer science. This first volume presents the logical foundations and deduction methodologies extensively used in AI.

Propositional logic has been recognized throughout the centuries as one of the cornerstones of reasoning in philosophy and mathematics. Over time, its formalization into Boolean algebra was accompanied by the recognition that a wide range of combinatorial problems can be expressed as propositional satisfiability (SAT) problems. Because of this dual role, SAT developed into a mature, multi-faceted scientific discipline, and from the earliest days of computing a search was underway to discover how to solve SAT problems in an automated fashion. This book, the Handbook of Satisfiability, is the first updated and revised edition of the book first published in 2009 under the same name. The handbook aims to capture the full breadth and depth of SAT and to bring together significant progress and advances in automated solving. Topics covered span practical and theoretical research on SAT and its applications and include search algorithms, heuristics, analysis of algorithms, hard instances, randomized formulae, problem encodings, industrial applications, solvers, simplifiers, tools, case studies and empirical results.

SAT is interpreted in a broad sense, so as well as propositional satisfiability, there are chapters covering the domain of quantified Boolean formulae (QBF), constraints programming techniques (CSP) for word-level problems and their propositional encoding, and satisfiability modulo theories (SMT). An extensive bibliography completes each chapter. This second edition of the handbook will be of interest to researchers, graduate students, final-year undergraduates, and practitioners using or contributing to SAT, and will provide both an inspiration and a rich resource for their work. Edmund Clarke, 2007 ACM Turing Award Recipient: "SAT solving is a key technology for 21st century computer science." Donald Knuth, 1974 ACM Turing Award Recipient: "SAT is evidently a killer app, because it is key to the solution of so many other problems." Stephen Cook, 1982 ACM Turing Award Recipient: "The SAT problem is at the core of arguably the most fundamental question in computer science: What makes a problem hard?"

This volume contains articles covering a broad spectrum of proof theory, with an emphasis on its mathematical aspects. The articles should not only be interesting to specialists of proof theory, but should also be accessible to a diverse audience, including logicians, mathematicians, computer scientists and philosophers. Many of the central topics of proof theory have been included in a self-contained expository of articles, covered in great detail and depth. The chapters are arranged so that the two introductory articles come first; these are then followed by articles from core classical areas of proof theory; the handbook concludes with articles that deal with topics closely related to computer science.

Handbook of Logic and Language

Quantified Representation of Uncertainty and Imprecision

Handbook of Defeasible Reasoning and Uncertainty Management Systems

Handbook of Satisfiability

Artificial Intelligence: A Modern Approach offers the most comprehensive, up-to-date introduction to the theory and practice of artificial intelligence. Number one in its field, this textbook is ideal for one or two-semester, undergraduate or graduate-level courses in Artificial Intelligence.

This Festschrift was published in honor of Andre Scedrov on the occasion of his 65th birthday. The 11 technical papers and 3 short papers included in this volume show the many transformative discoveries made by Andre Scedrov in the areas of linear logic and structural proof theory; formal reasoning for networked systems; and foundations of information security emphasizing cryptographic protocols. These papers are authored by researchers around the world, including North America, Russia, Europe, and Japan. The chapter "A Small Remark on Hilbert's Finitist View of Divisibility and Kanovich-Okada-Scedrov's Logical Analysis of Real-Time Systems" is available open access under a CC BY 4.0 license at link.springer.com.

This collection represents the primary reference work for researchers and students in the area of Temporal Reasoning in Artificial Intelligence. Temporal reasoning has a vital role to play in many areas, particularly Artificial Intelligence. Yet, until now, there has been no single volume collecting together the breadth of work in this area. This collection brings together the leading researchers in a range of relevant areas and provides an coherent description of the breadth of activity concerning temporal reasoning in the foundations: techniques and applications - Leading researchers around the world have written the chapters - Covers many vital applications - Source book for Artificial Intelligence, temporal reasoning - Approaches provide foundation for many future software systems - Broad range: foundations: techniques and applications - Leading researchers around the world have written the chapters - Covers many vital applications - Source book for Artificial Intelligence, temporal reasoning - Approaches provide foundation for many

Handbook of Knowledge Representation describes the essential foundations of Knowledge Representation, which lies at the core of Artificial Intelligence (AI). The book provides an up-to-date review of twenty-five key topics in knowledge representation, written by the leaders of each field. It includes a tutorial background and cutting-edge developments, as well as applications of Knowledge Representation in a variety of AI systems. This handbook is organized into three parts. Part I deals with general methods in Know classical logic in Knowledge Representation; satisfiability solvers; description logics; constraint programming; conceptual graphs; nonmonotonic reasoning; model-based problem solving; and Bayesian networks. Part II focuses on classes of knowledge and specialized representations, with chapters on temporal representation and reasoning; spatial and physical reasoning; reasoning about knowledge and belief; temporal action logics; and nonmonotonic causal logic. Part III discusses Knowledge Representation in application planning; cognitive robotics; multi-agent systems; and knowledge engineering. This book is an essential resource for graduate students, researchers, and practitioners in knowledge representation and AI. * Make your computer smarter * Handle qualitative and uncertain information * Improve computational tractability to solve your problems easily

Handbook of Logic in Artificial Intelligence and Logic Programming, 0- 19-853791-3

Volume 5: Algorithms For Uncertainty and Defeasible Reasoning

Handbook of Logic in Artificial Intelligence and Logic Programming

Deduction methodologies

Handbook of Practical Logic and Automated Reasoning

Epistemic logic and, more generally, logics of knowledge and belief, originated with philosophers such as Jaakko Hintikka and David Lewis in the early 1960s. Since then, such logics have played a significant role not only in philosophy, but also in computer science, artificial intelligence, and economics. This handbook reports significant progress in a field that, while more mature, continues to be very active. This book should make it easier for new researchers to enter the field, and give experts a chance to appreciate work in related areas. The book starts with a gentle introduction to the logics of knowledge and belief; it gives an overview of the area and the material covered in the book. The following eleven chapters, each written by a leading researcher (or researchers), cover the topics of only knowing, awareness, knowledge and probability, knowledge and time, the dynamics of knowledge and of belief, model checking, game theory, agency, knowledge and ability, and security protocols. The chapters have been written so that they can be read independently and in any order. Each chapter ends with a section of notes that provides some historical background, including references, and a detailed bibliography.

We are happy to present the first volume of the Handbook of Defeasible Reasoning and Uncertainty Management Systems. Uncertainty pervades the real world and must therefore be addressed by every system that attempts to represent reality. The representation of uncertainty is a ma jor concern of philosophers, logicians, artificial intelligence researchers and com puter scientists, psychologists, statisticians, economists and engineers. The present Handbook volumes provide frontline coverage of this area. This Handbook was produced in the style of previous handbook series like the Handbook of Philosoph ical Logic, the Handbook of Logic in Computer Science, the Handbook of Logic in Artificial Intelligence and Logic Programming, and can be seen as a companion to them in covering the wide applications of logic and reasoning. We hope it will answer the needs for adequate representations of uncertainty. This Handbook series grew out of the ESPRIT Basic Research Project DRUMS II, where the acronym is made out of the Handbook series title. This project was financially supported by the European Union and regroupts 20 major European research teams working in the general domain of uncertainty. As a fringe benefit of the DRUMS project, the research community was able to create this Hand book series, relying on the DRUMS participants as the core of the authors for the Handbook together with external international experts.

The use of mathematical logic as a formalism for artificial intelligence was recognized by John McCarthy in 1959 in his paper on Programs with Common Sense. In a series of papers in the 1960's he expanded upon these ideas and continues to do so to this date. It is now 41 years since the idea of using a formal mechanism for AI arose. It is therefore appropriate to consider some of the research, applications and implementations that have resulted from this idea. In early 1995 John McCarthy suggested to me that we have a workshop on Logic-Based Artificial Intelligence (LBAI). In June 1999, the Workshop on Logic-Based Artificial Intelligence was held as a consequence of McCarthy's suggestion. The workshop came about with the support of Ephraim Gilmer of the National Science Foundation (HS-9520135), the American Association for Artificial Intelligence who provided support for graduate students to attend, and Joseph Jaja, Director of the University of Maryland Institute for Advanced Computer Studies who provided both manpower and financial support, and the Department of Computer Science. We are grateful for their support. This book consists of refereed papers based on presentations made at the Workshop. Not all of the Workshop participants were able to contribute papers for the book. The common theme of papers at the workshop and in this book is the use of logic as a formalism to solve problems in AI.

The Handbook of Artificial Intelligence, Volume I focuses on the progress in artificial intelligence (AI) and its increasing applications, including parsing, grammars, and search methods. The book first elaborates on AI, AI handbook and literature, problem representation, search methods, and sample search programs. The text then ponders on representation of knowledge, including survey of representation techniques and representation schemes. The manuscript explores understanding natural languages, as well as machine translation, grammars, parsing, test generation, and natural language processing systems. The book also takes a look at understanding spoken language, including systems architecture and the ARPA SUR projects. The text is a valuable source of information for computer science experts and researchers interested in pursuing further research in artificial intelligence

Volume 3. Nonmonotonic Reasoning and Uncertain Reasoning

Second Edition

Logic for Computer Scientists

Epistemic and Temporal Reasoning

Handbook of Knowledge Representation

Written by prominent thought leaders in the global fintech space, The AI Book aggregates diverse expertise into a single, informative volume and explains what artificial intelligence really means and how it can be used across financial services today. Key industry developments are explained in detail, and critical insights from cutting-edge practitioners offer first-hand information and lessons learned. Coverage includes: · Understanding the AI Portfolio: from machine learning to chatbots, to natural language processing (NLP); a deep dive into the Machine Intelligence Landscape; essentials on core technologies, rethinking enterprise, rethinking industries, rethinking humans; quantum computing and next-generation AI · AI experimentation and embedded usage, and the change in business model, value proposition, organisation, customer and co-worker experiences in today's Financial Services Industry · The future state of financial services and capital markets - what's next for the real-world implementation of AI?Tech · The innovating customer - users are not waiting for the financial services industry to work out how AI can re-shape their sector, profitability and competitiveness · Boardroom issues created and magnified by AI trends, including conduct, regulation & oversight in an algo-driven world, cybersecurity, diversity & inclusion, data privacy, the 'unbundled corporation' & the future of work, social responsibility, sustainability, and the new leadership imperatives · Ethical considerations of deploying AI solutions and why explainable AI is so important

With the publication of the present volume, the Handbook of the History of Logic turns its attention to the remarkable renaissance of modal logic in the 20th century. Beginning with the early systems of C. I. Lewis in 1912, modal logic was a fixture in the century's research programme in logic, but for many years it ran on a parallel track to the rich developments in the more dominant classical logic. One of the great achievements of classical logic was the comparatively early production of a deep semantics for it. Modal logic would have to wait until the seminal work of Hintikka, Kanger and Kripke in the late 1950s and early 1960s. With modal semantics now in hand, it is not too much to say that modal logic leapt its tracks and challenged classical logic head-on for dominance. Part of what makes this an interesting challenge is the sheer proliferation of well-studied systems that burst out of the modal research programme. Further expansion came by way of adaptation of model operators to epistemic and deontic interpretations, and an ensuing exuberance of further systems. Another important development was relevant logic, and with it a change to a more general conception of modal logic, in which the modalities of a system are now represented by a broader range of qualifications on its sentences. Under press of developments in computer science and argumentation theory (chiefly dialogue logic), recognition started to be given to sentence-qualifications other than necessity, obligatoriness and relevance. These include agents, times,tense, change, situations, roles, and with them the modalization of logic came to encompass, temporal and tense logic, dynamic logic, situation logic, dialogue logic, game theoretic logic, and much more. Logic and the Modalities in the Twentieth Century is an indispensable research tool for anyone interested in the development of logic, including researchers, graduate and senior undergraduate students in logic, history of logic, mathematics, history of mathematics, computer science and AI, linguistics, cognitive science, argumentation theory, philosophy, and the history of ideas. This volume is number seven in the eleven volume Handbook of the History of Logic. It concentrates on the development of modal logic in the 20th century, one of the most important undertakings in logic's long history. Written by the leading researchers and scholars in the field, the volume explores the logics of necessity and possibility, knowledge and belief, obligation and permission, time, tense and change, relevance, and more. Both this volume and the Handbook as a whole are definitive reference tools for senior undergraduates, graduate students and researchers in the history of logic, the history of philosophy, and any discipline, such as mathematics, computer science, artificial intelligence, for whom the historical background of his or her work is a salient consideration. · Unique. There is no other such work in English. · Authoritative. Authors of chapters are leading scholars. · Rich. Authors have not been constrained by scanty page limitations. · Detailed. Some chapters are the size of small monographs. · Comprehensive. The entire range of modal logic is covered. · Important. A singular contribution to the intellectual history of the 20th century. · Original. Contains the latest scholarly discoveries and interpretative insights · Exciting. Authors attack open questions with gusto.

It is with great pleasure that we are presenting to the community the second edition of this extraordinary handbook. It has been over 15 years since the publication of the first edition and there have been great changes in the landscape of philosophical logic since then. The first edition has proved invaluable to generations of students and researchers in formal philosophy and language, as well as to consumers of logic in many applied areas. The main logic article in the Encyclopaedia Britannica 1999 has described the first edition as 'the best starting point for exploring any of the topics in logic'. We are confident that the second edition will prove to be just as good. ! The first edition was the second handbook published for the logic commu nity. It followed the North Holland one volume Handbook 0/ Mathematical Logic, published in 1977, edited by the late Jon Barwise. The four volume Handbook 0/ Philosophical Logic, published 1983-1989 came at a fortunate temporal junction at the evolution of logic. This was the time when logic was gaining ground in computer science and artificial intelligence circles. These areas were under increasing commercial press ure to provide devices which help and/or replace the human in his daily activity. This pressure required the use of logic in the modelling of human activity and organisa tion on the one hand and to provide the theoretical basis for the computer program constructs on the other.

The Handbook of Artificial Intelligence

Handbook of the Logic of Argument and Inference

Volume 12

Logic-Based Artificial Intelligence

Handbook of Logic in Artificial Intelligence and Logic Programming: Volume 5: Logic Programming