Artificial Intelligence: Foundations of Computational Agents

By David L. Poole, Alan K. Mackworth

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Recent decades have witnessed the emergence of artificial intelligence as a serious science and engineering discipline. Artificial Intelligence: Foundations of Computational Agents is a textbook aimed at junior to senior undergraduate students and first-year graduate students. It presents artificial intelligence (AI) using a coherent framework to study the design of intelligent computational agents. By showing how basic approaches fit into a multidimensional design space, readers can learn the fundamentals without losing sight of the bigger picture. The book balances theory and experiment, showing how to link them intimately together, and develops the science of AI together with its engineering applications. Although structured as a textbook, the book's straightforward, self-contained style will also appeal to a wide audience of professionals, researchers, and independent learners. AI is a rapidly developing field: this book encapsulates the latest results without being exhaustive and encyclopedic. It teaches the main principles and tools that will allow readers to explore and learn on their own. The text is supported by an online learning environment, artint.info, so that students can experiment with the main AI algorithms plus problems, animations, lecture slides, and a knowledge representation system for experimentation and problem solving.

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Editorial Review

Review
"This text is a modern and coherent introduction to the field of Artificial Intelligence that uses rational computational agents and logic as unifying threads in this vast field. Many fully worked out examples, a good collection of paper-and-pencil exercises at various levels of difficulty, programming assignments based on the custom-designed declarative AILog language, and well-integrated online support through the AISpace applets complement the presentation. If you plan to teach a course in Artificial Intelligence at the upper-division undergraduate level or beyond, you must give serious consideration to this thoroughly enjoyable book."
Marco Valtorta, University of South Carolina

"This book fills a real gap in the AI literature. It is accessible for advanced undergraduate students, without compromising technical rigor. It is concise, but still gives a modern presentation of all major areas of AI. It is an eminently useful textbook for introductory courses to AI. Poole and Mackworth have made a valiant effort to impose some order on the wide and heterogeneous field of Artificial Intelligence. In this order, all of AI is placed in a design space for intelligent agents defined by dimensions of complexity."
Manfred Jaeger, Aalborg University

"The clarity of this book is amazing! Material in each chapter is a perfect blend of accessible stuff for beginners, theory and challenges for advanced students, and reference materials for experts, organized into sections so you can split off the right bits for your students. Its like having three textbooks in one! Definitely the must-have textbook on AI for the 21st century. I know mine will be within reach for years to come."
Jesse Hoey, University of Dundee

"This book, by two of the foremost researchers in Artificial Intelligence, marks the transition of the field from a miscellaneous assortment of unrelated techniques to a genuine scientific discipline. It presents the fundamental concepts of AI in a coherent structure, which shows how different techniques are related and complementary. The book is written in a clear and engaging manner, which makes it suitable both for the serious student and for the intellectually curious layperson."
Robert Kowalski, Imperial College London

"This book is a wonderful, well-written introduction to a field that is interesting to many, fascinating to some; a field that involves tremendous complexity. The authors manage the complexity by beginning with the simplest elements and building on these to progressively broaden and deepen the treatment. They provide a large number of references for those who wish to go beyond the text. [I] recommend this excellent work."
G. R. Mayforth, Computing Reviews

"It has been about 15 years since the last major history, and a lot has happened. And Nilsson has a unique viewpoint: he has been a key early AI researcher, an influential lab leader, a AAAI president, author of three very different AI textbooks, and a teacher and department chair at a leading AI department. Furthermore, he has the disposition of a careful scholar and is not inclined to push just one viewpoint. From the beginning, his work has spanned the logical and probabilistic approaches to AI-he could give a more balanced overview than someone who has worked in only one of these camps. I wanted to hear his take on the history of AI. The Quest for Artificial Intelligence is more personal yet more comprehensive, and presents a more nuanced appreciation of the place in history of each event. Make no mistake: this book is a history-a true quest."

"There are several AI textbooks on the market at the moment with the same target audience but one of these books-by Russell and Norvig-is dominant, almost completely so, and is used in approximately 1100 universities in 100 countries. Over the years, I have taught from earlier editions of the texts by Luger and by Rich, Knight, and Nair. Like many, I switched to the text by Russell and Norvig (hereafter R&N) shortly after the first edition came out in 1995. R&N is an excellent and highly regarded text. Yet after more than a decade of teaching through three editions of R&N, I recently switched from R&N to the new text by Poole and Mackworth (hereafter P&M). Let me explain why. R&N has aimed at being comprehensive and is not as selective. The result, I believe, is that the book has become overly long and less integrated and less useful to the average student. Some topics and chapters in R&N contain much more material than can reasonably be covered in an introductory course that aims for breadth (as many AI courses are structured). The result is often unsatisfying for the instructor and students find it difficult to wade through the extra material to find what is relevant for their course. P&M, in contrast, is more selective in its coverage. In summary, I highly recommend this book to instructors of introductory AI courses and to those who wish to learn about the foundations of the field through self-study. As many will be aware, there is already an excellent textbook by Russell and Norvig with the same target audience that has dominated the field for more than ten years. However, all things considered-selective coverage, level of detail, quality of explanations, exercises, online materials, free availability, and so on-I believe the clear advantage goes to the newcomer. Certainly the book sets a new standard for AI textbooks with its supplementary online tools and tutorials."
Peter van Beek, University of Waterloo, AI Journal

About the Author
David Poole is a Professor of Computer Science at the University of British Columbia. He is known for his research on abductive and default reasoning, probabilistic inference, and relational probabilistic models, and he has recently been working on semantic science, combining ontologies, data, and rich probabilistic theories. He is a co-author of Computational Intelligence: A Logical Approach (1998), co-chair of AAAI-10 (Twenty-Fourth AAAI Conference on Artificial Intelligence), and co-editor of the Proceedings of the Tenth Conference in Uncertainty in Artificial Intelligence (1994). Poole is the former associate editor and on the advisory board of the Journal of AI Research. He is an associate editor of AI Journal and on the editorial boards of AI Magazine and AAAI Press. He is the secretary of the Association for Uncertainty in Artificial Intelligence and is a Fellow of the Association for the Advancement of Artificial Intelligence (AAAI).

Alan Mackworth is a Professor of Computer Science and Canada Research Chair in Artificial Intelligence at the University of British Columbia. He is known for his research on constraint-based systems and agents, hybrid systems, and robot soccer. He is a co-author of Computational Intelligence: A Logical Approach. He was President and Trustee of International Joint Conferences on AI (IJCAI) Inc. Mackworth was Vice President and President of the Canadian Society for Computational Studies of Intelligence (CSCSI). He has served as President of the Association for the Advancement of Artificial Intelligence (AAAI). He also served as the founding Director of the UBC Laboratory for Computational Intelligence. He is a Fellow of AAAI, the Canadian Institute for Advanced Research, and the Royal Society of Canada.

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