

KNOWLEDGE PROCESSING & APPLIED ARTIFICIAL INTELLIGENCE

- COMPREHENSIVE
- PRACTICAL
- CONCEPTS *and*
- APPLICATIONS *covered*
- ideal for*
- BUSINESS STUDENTS
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- I.T. STUDENTS

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Knowledge processing and applied artificial intelligence

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To my mother, Tara Dutta and my father, Raj Kumar Dutta

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Preface

Within the short span of a few decades, computers have had a dramatic impact on business by automating storage and access of large amounts of data, and by facilitating configuration of information flows. While the foci of most business computing so far has been on data and information, new advances in artificial intelligence technology are making it possible for computing applications to directly impact storage, processing, and application of knowledge. We are entering the era of knowledge processing, the next phase of the computing revolution.

There are significant implications of such a change in the scope of computing applications. Organizations are constantly in the search for new, sustainable sources of competitive advantage. It is recognized today that the cumulative knowledge of an organization (or its intellectual capital) is a rich and largely untapped source of true competitive advantage. Applied artificial intelligence technology offers the ability to process knowledge and harness the potential of a corporation's intellectual capital for achieving a competitive advantage.

Purpose of this book is to help managers and students understand the competitive potential of knowledge processing and the fundamentals of the different facets of applied artificial intelligence technology. It is my belief that both these aspects go together. It is not very useful to study technology without seeing its business impact, and it is not possible to gauge the competitive potential of knowledge processing without understanding advantages and disadvantages of the underlying technologies.

This effort bridges the gap between applied artificial intelligence technologies and the competitive impact of their business applications. The description of artificial intelligence technologies should be easily accessible to business managers and students. The competitive potential of these technologies is clearly described with examples of real business applications. Guidelines and insights are presented at appropriate places for strategic planning and implementation of knowledge processing applications.

A comprehensive view of different technologies underlying knowledge processing is presented in this book. Besides knowledge-based systems, technologies covered here include natural language processing, image and speech processing, fuzzy logic, and neural networks. It has been my aim to balance the breadth of coverage with depth on individual topics. As the focus is on the applications of knowledge processing, more time is spent on technological aspects which have the maximum relevance for and impact on business applications. Bibliography lists at the end of each chapter direct the reader to other references for more details on specific topics.

This book can be used by managers and students from both business and computing disciplines. Business managers and students can learn about applied artificial intelligence technologies and the strategic impact of their business applications. Computing professionals and students without prior knowledge of artificial intelligence can benefit in much the same manner as their business counterparts. Computing professionals and students with some prior knowledge of artificial intelligence will find the discussions on the business relevance of knowledge processing and its links to a corporation's competitive position very interesting and helpful.

It is possible to use this book as a text for courses in both business and computing departments. It would perhaps be most suitable at the senior undergraduate and graduate (masters) levels. I have used it successfully as a textbook for teaching elective courses to MBA students at INSEAD. Alternatively, it can be read by a reader independently. The book is self-contained and technical concepts are explained in a simple language. Several figures and detailed examples also aid the reader.

I believe that this book is the first to offer a comprehensive view of knowledge processing technologies and the competitive potentials of their business applications. Writing the manuscript was both a challenge and a pleasure for me. I hope that you find the book useful and stimulating!

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The production of this book would not be possible without the skilled assistance of the editorial staff at Butterworth-Heinemann. I would like to extend my gratitude to them for their help.

Finally, I would like to specially thank my family for putting up with my late nights and idiosyncrasies during the many months I spent working on the manuscript. Without their patience and understanding this book would not have been possible.

The book is certainly a better book due to the cumulative efforts of the above groups of people. While I have tried hard for accuracy and perfection, I know that I must have failed in some aspects. All responsibility for any errors or shortcomings in the book are entirely mine.

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List of abbreviations

Abbreviations in the following list have been used widely in this book. Abbreviations defined and used only in specific parts of the text are not included in the following list.

AI	artificial intelligence
DIP	document image processing
ES	expert system
FL	fuzzy logic
KBS	knowledge-based system
LISP	list processing language
MT	machine translation
NLP	natural language processing
NN	neural network
PC	personal computer
XCON	expert configurer

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Part I

Computers have had a tremendous impact on business and industry within the short period of about four decades. Over the years, the emphasis of business computing has evolved from the storage of data and the retrieval of information to the processing of knowledge. This era of knowledge processing promises to fundamentally alter the manner in which business is structured and conducted.

This introductory part of the book consists of a single chapter titled Knowledge Processing and Applied Artificial Intelligence. Aim of this chapter is to motivate the theme of the book and to provide a background for positioning succeeding chapters.

The chapter begins with a description of the evolution of business computing from data processing to knowledge processing, then reviews the origins of the multi-disciplinary field of artificial intelligence (AI). Developments within AI over the last four decades are traced and the emergence of the different sub-fields of AI are described. Next, the lack of our knowledge about the true nature of intelligence and its impact on business applications of AI are detailed. Overall trends in the commercialization of AI technology are described, and general guidelines are provided for successfully introducing AI in an organization. The chapter ends with a description of the structure and organization of the remainder of the book.

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