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ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS

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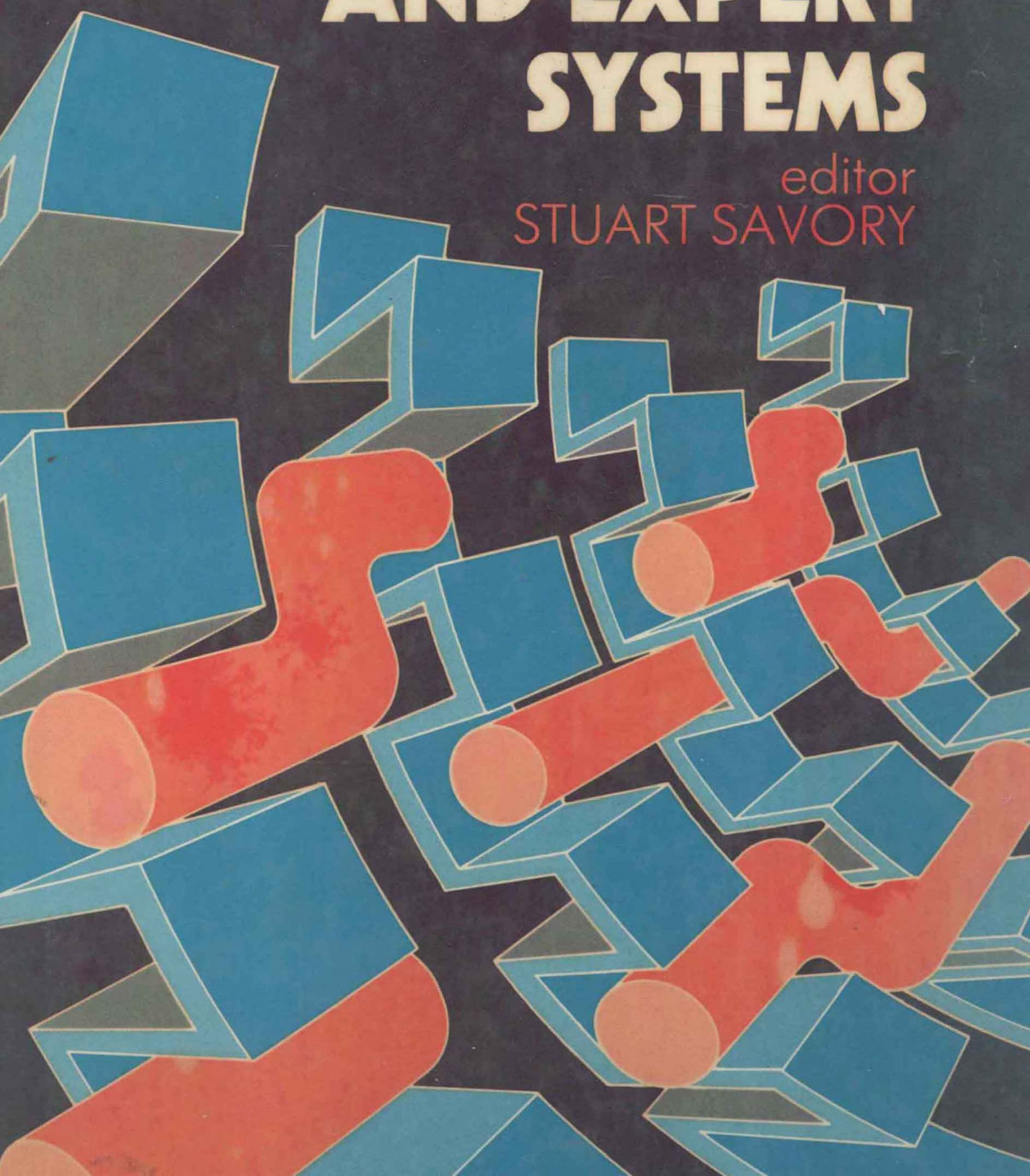
STUART SAVORY



ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS

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ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS

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ELLIS HORWOOD LIMITED
Publishers · Chichester

Halsted Press: a division of
JOHN WILEY & SONS
New York · Chichester · Brisbane · Toronto

This English edition first published in 1988 by
ELLIS HORWOOD LIMITED
Market Cross House, Cooper Street,
Chichester, West Sussex, PO19 1EB, England
The publisher's colophon is reproduced from James Gillison's drawing of the ancient Market Cross, Chichester.

Distributors:
Australia and New Zealand:
JACARANDA WILEY LIMITED
GPO Box 859, Brisbane, Queensland 4001, Australia
Canada:
JOHN WILEY & SONS CANADA LIMITED
22 Worcester Road, Rexdale, Ontario, Canada
Europe and Africa:
JOHN WILEY & SONS LIMITED
Baffins Lane, Chichester, West Sussex, England
North and South America and the rest of the world:
Halsted Press: a division of
JOHN WILEY & SONS
605 Third Avenue, New York, NY 10158, USA

This English edition is translated from the original German edition *Künstliche Intelligenz und Expertensysteme* edited by S. E. Savory and published in 1985 by R. Oldenbourg Verlag GmbH, Munich, © the copyright holders.

© 1988 English Edition, Ellis Horwood Limited

British Library Cataloguing in Publication Data
Artificial intelligence and expert systems. —
(Ellis Horwood series in artificial intelligence).
1. Expert systems (Computer science)
I. Savory, Stuart
II. Künstliche Intelligenz und Expertensysteme. *English*
006.3'3 QA76.76.E95

Library of Congress Card No. 87–29766

ISBN 0–7458–0147–1 (Ellis Horwood Limited)
ISBN 0–470–21038–9 (Halsted Press)

Phototypeset in Times by Ellis Horwood Limited
Printed in Great Britain by Unwin Bros., Woking

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Preface to the English edition

This book originally appeared in German, published by Oldenbourg Verlag, Munich, in 1985. The material dated from 1984. During 1986 it was revised and appeared as a second revised edition in 1986. Mike Rogers of the EEC produced this English translation in 1987, adding Appendices A and C. I then amended his translation to include some more up-to-date research work, and also updated the bibliography where possible. So the book you hold in your hand is current today. Biographical details of the (senior) authors of each paper have also been added as Appendix B.

Paderborn, FRG
7th November 1987

Stu Savory

Introduction

0.1 OBJECTIVES

The objective of this book is to give the reader an overall insight into a specific area of industrial research in Artificial Intelligence (AI): that of Expert Systems.

Artificial Intelligence is a key technology for the software of the future. AI concerns itself with the areas of application that involve human reasoning, in that it attempts to imitate reasoning and draw inferences. AI, it should be stated, is not a special methodology, but a framework of interwoven processes that are used together to achieve these goals.

The application areas that are included in the common definition of AI include, amongst others:

— knowledge based systems or expert systems
— intelligent/learning systems
— natural language translation/understanding
— automatic programming with correctness proven
— understanding/generation of speech
— image and scene analysis in real time.

The major part of the above list reflects priorities that are apparent in industrial research and development, especially as seen by one leading company, Nixdorf AG of the Federal Republic of Germany. Nixdorf have been committed to research and development of expert systems since 1982, with an ever increasing team.

The core of this book is made up from contributions of results from this team, or from complementary co-ordinated work in universities. The work is presented in such a way as to represent a complete, albeit brief, overview of the developments up to 1984/85. Subsequent looks by Dr Savory will decribe further progress made in 1985/86 and onwards.

The reader will be able to gain an insight into what can realistically be expected from a current state of the art in knowledge based systems in the sense of what it can and, more importantly perhaps, what it cannot do.

0.2 CHAPTER 1

This is a scene setting overview of the mature state of the art in AI in general, as well as a brief résumé of the historic stages in the main research areas over three decades. The seminal publications are referred to.

The objective of the chapter is to give the reader a feel for the type of application that may be supported by AI tools and methods. In order to make the subsequent sections more palatable, the reader needs to appreciate just what expert systems are and where they fit into the scheme of AI.

0.3 WHAT IS AN EXPERT SYSTEM?

Expert systems are a specific group of methods and tools as a subtopic in the wider area of artificial intelligence. What is AI, though? Almost every author has his own opinion and endless debate on this topic is commonplace.

Some of the more notable definitions are:

[R. Davis and D. B. Lenat] in *Knowledge Based Systems in Artificial Intelligence* (1982):

> AI is the symbolic, non algorithmic reasoning process. Intelligence can be explained as a symbol manipulating activity, and that this can be realised on a physical symbol machine such as a digital computer.

This view is shared by Newell and Simon in a classic Turing Award lecture in 1976 [Newell and Simon].

[N. J. Nilsson] in *Principles of Artificial Intelligence* (1982) states that:

> Human activities such as writing books, computer programs, commonsense reasoning, natural language understanding or driving a car are said to be demanding a level of "intelligence". Over the years, computer programs have been built that can perform tasks such as these. We might say that such systems possess some degree of artificial intelligence.

[E. Rich] in *Artificial Intelligence* states that:

> AI is the study of how to make computers do things at which, at the moment, people are better. This ephemeral definition only betrays the current state of the art, not the objectives.

However, probably the widest accepted definition is that of Minsky [in Semantic Information Processing, 1982]:

> AI is the science of making machines do things that would require intelligence if done by humans.

This is an attractive definition, since it avoids saying anything about "intelligence" of course.

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