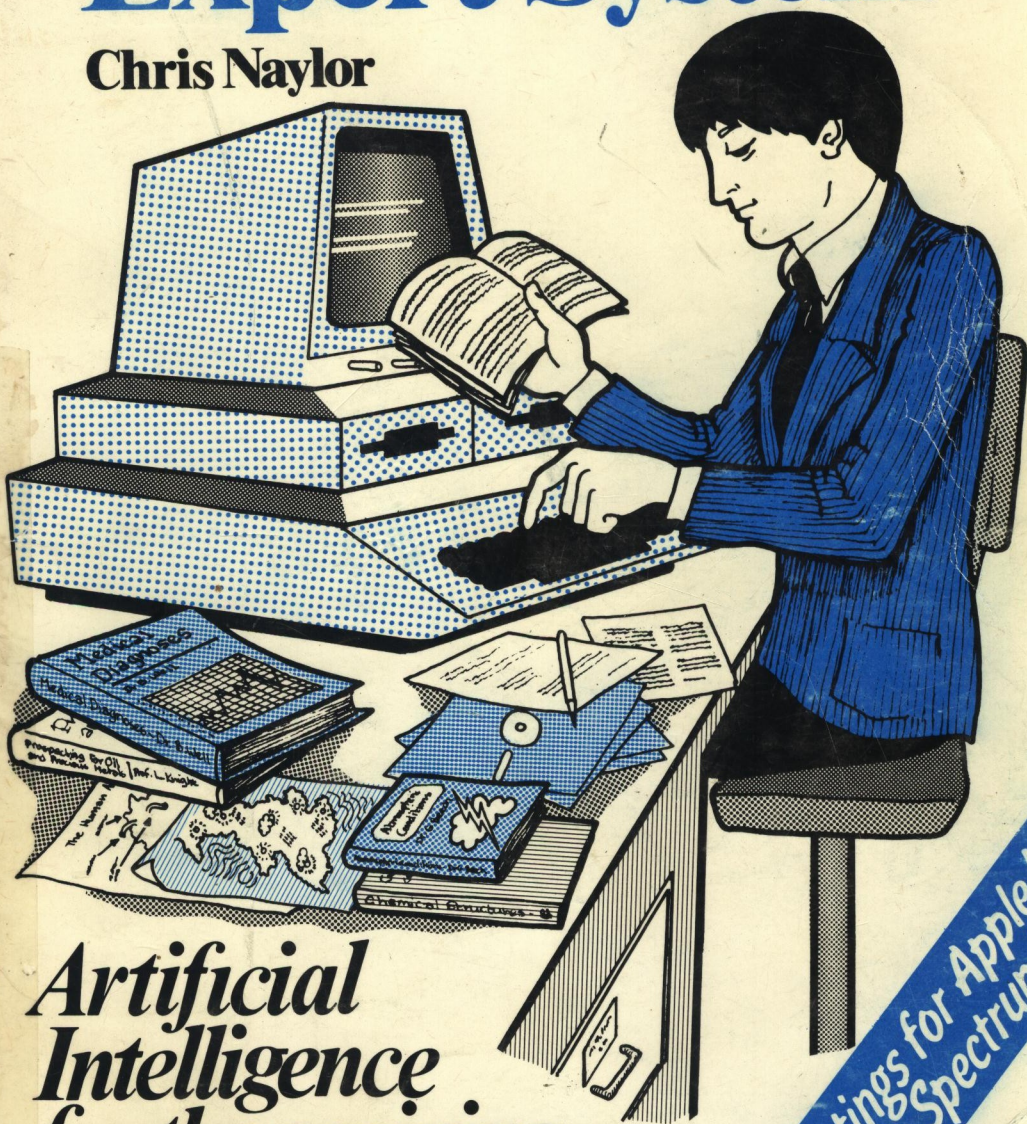



Build your own Expert System

Chris Naylor



*Artificial
Intelligence
for the aspiring
microcomputer*

 Sigma Technical Press

With listings for Apple II
and Sinclair Spectrum

CONTENTS

1. Why 'Expert Systems'?	1
1.1 What do You Want an Expert System for?	3
1.2 What do Other People Want an Expert System for?	4
1.3 What is an Expert System?	5
1.4 What do You Want Your Expert System to do?	9
1.5 Some Untrue Things about Expert Systems	11
2. A Statistical Scheme	13
2.1 Setting up a Matrix	13
2.2 Probabilities	20
2.3 More Probabilities	23
2.4 More Variables	26
2.5 Bayes' Theorem	33
3. Avoiding Probabilities	35
3.1 How to Make the Computer do the Hard Work	36
3.2 The Learning System	37
3.3 Other Types of Data	43
3.4 The Judgement Rule	45
3.5 Building a Rule	49
3.6 Prior Probabilities	53
3.7 Expanding your Options	54
3.8 Can it Make a Mistake?	58
3.9 Summing Up: The Program so far	61
4. Improving your Expert	65
4.1 Parallel and Sequential Decisions	65
4.2 Adding some Commonsense	72
4.3 A Trial Run of our New Expert	78

5. The Making of A Real-World Expert	89
5.1 The Weather Again	89
5.2 A Chi-Squared Program	98
5.3 Exercising your Expert	99
5.4 Direct Estimation	105
6. Running for Real	110
6.1 Using your Expert	110
6.2 Reserved Judgement	115
6.3 The Problem of Distance	117
6.4 Understanding your Problem	124
7. An Expert on Everything in the Entire Known World	125
7.1 Nodes	125
7.2 The Variables so Far	131
7.3 Going through the Nodes	137
7.4 Tailor-made Nodes	142
7.5 Specific Code	145
7.6 Saving your Expert	146
7.7 The Multi-Node Code	148
7.8 Some Examples	157
8. How can you Use your Expert	164
8.1 Choosing a Problem	164
8.2 Analysing the Problem	166
9. Large - Scale Expert Systems	170
9.1 MYCIN - Medical Diagnoses	170
9.2 PUFF - Breathing Disorders	178
9.3 DENDRAL - Chemical Structures	185
9.4 PROSPECTOR - Searching for minerals	190
9.5 Some Other Examples	196

10. A Rule-Based BASIC Expert	201
10.1 A System that Works Backwards	201
10.2 The BASIC Program	205
10.3 A Medical Knowledge Base	214
11. The Tower of Babel	221
12. Summary and Technical Overview	229
12.1 Events	229
12.2 Probabilities	229
12.2.1 Bayes' Theorem	230
12.2.2 Prior and Posterior Probabilities	231
12.2.3 Odds	232
12.2.4 Approximations	232
12.2.4 Combinations	233
12.2.5 Descriptive Statistics	233
12.2.6 Normal Distribution	234
12.2.7 Discrete and Continuous Variables	235
12.3 Surfaces	235
12.4 Discrimination	236
12.5 The Learning Algorithm	237
12.6 Parallel and Sequential Procedures	237
12.7 Maximum and Minimum Values	238
12.8 Processing Strategies	238
12.8.1 Goal Driven Strategies	238
12.8.2 Data Driven Strategies	239
12.8.3 Selecting the Next Variable	239
12.9 Intermediate Conclusions	240
12.9.1 Explanatory Systems	241
12.10 Linear Interpolation of Responses	241
12.11 Data Formats	242
13. Select Readings	244
Index	247