

Contents

Preface	xv
Chapter 1 What Is Case-Based Reasoning?	1
1.1 Representing Information	1
1.2 Representing Data in a Computer	3
1.3 Object Databases	5
1.4 A More Powerful Representation	6
1.5 Rule-Based Expert Systems	7
1.6 The Limitations of Rules	10
1.7 Elephants Never Forget!	11
1.8 I've Got the Answer, What's the Question?	13
1.9 Summary	14
1.10 Further Reading	14
Chapter 2 Understanding CBR	15
2.1 The CBR-Cycle	15
2.2 A Short History of Case-Based Reasoning	17
2.3 Case-Based Reasoning Techniques	19
2.3.1 Case Representation	19
2.3.2 Indexing	20

2.3.3	Storage	22
2.3.4	Retrieval	23
2.3.5	Adaptation	34
2.4	Summary	36
2.5	Further Reading	36
Chapter 3 The Application of CBR		39
3.1	A Classification of Applications	39
3.1.1	Classification Tasks	42
3.1.2	Synthesis Tasks	43
3.2	CBR vs. Other Techniques	44
3.2.1	CBR and Information Retrieval	44
3.2.2	CBR vs. Statistical Techniques	45
3.2.3	CBR vs. Rule-Based Expert Systems	46
3.2.4	CBR vs. Machine Learning	48
3.2.5	CBR vs. Neural Networks	48
3.2.6	Summary of Technology Comparisons	49
3.3	Academic Demonstrators	51
3.3.1	Diagnosis	51
3.3.2	Planning	52
3.3.3	Legal Reasoning	53
3.3.4	Design	54
3.3.5	Analogous Reasoning	55
3.3.6	Arbitration	55
3.3.7	Adaptation	56
3.3.8	Tutoring	56
3.4	Summary	57
3.5	Further Reading	57

Chapter 4	<i>Industrial Applications of CBR</i>	61
4.1	Lockheed—CLAVIER	66
4.1.1	Case Representation	68
4.1.2	Case Retrieval	68
4.1.3	Case Adaptation	68
4.1.4	Implementation	69
4.1.5	Impact	70
4.2	Kaye Presteigne—Wayland	70
4.2.1	The Pressure Die Design Problem	71
4.2.2	Implementation	73
4.2.3	Case Retrieval	73
4.2.4	Case Adaptation	74
4.2.5	Benefits of Wayland	76
4.2.6	Summary of Benefits	77
4.3	British Airways—CASELine	78
4.3.1	The Problem	78
4.3.2	Implementation	78
4.3.3	Impact	80
4.4	Deloitte & Touche—Top Management Fraud	81
4.4.1	Implementation	82
4.4.2	Evaluation	83
4.4.3	User Evaluation	84
4.4.4	Summary	85
4.5	Summary	85
4.6	Further Reading	86
Chapter 5	<i>CBR and Customer Service</i>	89
5.1	Help-Desk Architecture	91

5.2	The Compaq SMART System	93
5.2.1	The Problem	93
5.2.2	The Solution	95
5.2.3	SMART Implementation	97
5.2.4	Impact	99
5.3	Broderbund—The GizmoTapper	100
5.3.1	The Problem	101
5.3.2	The Solution	102
5.3.3	Implementation	102
5.3.4	Impact	103
5.4	Legal & General—SWIFT	106
5.4.1	The Problem	106
5.4.2	The Solution	107
5.4.3	Implementation	108
5.4.4	Impact	112
5.5	Summary	113
5.6	Further Reading	114
Chapter 6 CBR Software Tools		117
6.1	ART*Enterprise	117
6.2	Case-1	118
6.3	CaseAdvisor	119
6.4	CasePower	123
6.5	CBR3 (CBR Express, CasePoint, Generator, Tester, and CasePoint WebServer)	124
6.6	Eclipse—The Easy Reasoner	132
6.7	ESTEEM	133
6.8	KATE	135
6.9	ReCall	135

6.10	ReMind	138
6.11	Other CBR Tools	142
6.11.1	CASUEL	142
6.11.2	CASPIAN	143
6.11.3	Recon	143
6.11.4	CBRWorks	144
6.11.5	Public Domain CBR Software	146
6.12	Summary	148
6.13	Vendor Information	148
6.14	Further Reading	150
Chapter 7 Building a Diagnostic Case-Base		153
7.1	The Problem	153
7.1.1	The Existing Records	154
7.1.2	Analyzing the Cases	155
7.1.3	Authoring the First Case	155
7.1.4	Scoring Questions	157
7.1.5	Creating Actions	158
7.1.6	Adding More Cases	159
7.2	Preparing the Case-Base for Use	162
7.3	Using the Printer Case-Base	163
7.4	Acquiring New Experiences as Cases	166
7.5	Using Rules	168
7.6	Summary	173
7.7	Further Reading	174
Chapter 8 Building, Testing, and Maintaining Case-Bases		175
8.1	Characterizing a Good Case-Base	175
8.1.1	Representative Cases	176

8.1.2	Case Distribution	178
8.2	Tool Support	183
8.3	Testing Case-Bases	186
8.3.1	Check Retrieval Accuracy	188
8.3.2	Check Retrieval Consistency	188
8.3.3	Check for Case Duplication	188
8.3.4	Check Case Coverage	189
8.3.5	Global System Verification Tests	189
8.4	Maintaining Case-Bases	190
8.4.1	Obtain Case Utilization Statistics	191
8.4.2	Repeat the Verification Tests	192
8.5	Summary	193
8.6	Further Reading	195
Chapter 9 Conclusion		197
9.1	Learning Review	197
9.2	Assumptions and Key Concepts	200
9.2.1	CBR Assumptions	200
9.2.2	Similarity Is the Key	201
9.2.3	Case-Bases Must Be Large to be Useful	201
9.2.4	CBR Is Just Hype	202
9.3	The Case for Case-Based Reasoning	202
9.3.1	Corporate Memory	203
9.3.2	Case-Based Expert Systems	204
9.3.3	Case-Based Information Retrieval	207
9.3.4	CBR Is a Complementary Technique	207
9.4	The Way Ahead	208
9.5	Further Reading	212

Chapter 10	<i>Bibliography</i>	215
10.1	Essential Readings	216
10.2	The Origins of CBR	218
10.2.1	History	218
10.2.2	Feasibility and Uses of CBR	220
10.2.3	Background and Review of CBR	224
10.3	CBR Techniques	226
10.3.1	Representation	226
10.3.2	Indexing	231
10.3.3	Memory Organization	236
10.3.4	Retrieval	239
10.3.5	Adaptation and Repair	247
10.4	Applied CBR	253
10.4.1	CBR Software Tools	253
10.4.2	CBR Demonstrators	253
10.4.3	Commercial Applications	275
10.5	Hybrid CBR	278
10.5.1	CBR and Analogy	281
10.6	Internet Information Sources	282
10.6.1	AI-CBR	282
10.6.2	CBR-MED	282
10.6.3	The European CBR Newsletter	283
10.6.4	Other Internet Sites	283
	Index	285