

Contents

1	Introduction: Psychology and Technology	1
1.1	Classical System Testing	2
1.2	AI Testing Philosophy	4
1.2.1	AI Adaptability Testing	5
1.2.2	Testing AI Trust	8
1.3	Overview of the Book	9
1.3.1	Chapter 2: System-Level Thinking for Artificial Intelligent Systems.	10
1.3.2	Chapter 3: Psychological Constructs for AI Systems: The Information Continuum.	10
1.3.3	Chapter 4: Human–AI Collaboration.	10
1.3.4	Chapter 5: Abductive Artificial Intelligence Learning Models	11
1.3.5	Chapter 6: Artificial Creativity and Self-Evolution: Abductive Reasoning in Artificial Life Forms.	11
1.3.6	Chapter 7: Artificial Intelligent Inferences Utilizing Occam Abduction	11
1.3.7	Chapter 8: Artificial Neural Diagnostics and Prognostics: Self-Soothing in Cognitive Systems	12
1.3.8	Chapter 9: Ontology-Based Knowledge Management for Artificial Intelligent Systems	12
1.3.9	Chapter 10: Cognitive Control of Self-Evolving Life Forms (SELF) utilizing Artificial Procedural Memories	12
1.3.10	Chapter 11: Methodologies for Continuous, Life-Long Machine Learning for AI Systems	13
1.3.11	Chapter 12: Implicit Learning in Artificial Intelligence	13

1.3.12	Chapter 13: Data Analytics: The Big Data Analytics Process (BDAP) Architecture	13
1.3.13	Chapter 14: Conclusions and Next Steps.	14
2	Systems-Level Thinking for Artificial Intelligent Systems	15
2.1	Introduction	15
2.2	Systems Theory	16
2.2.1	Artificial Intelligence and System Reinforcement Theory	17
2.3	Dynamic AI System Consideration	19
2.4	AI System Solution-Focused Theory.	20
2.5	AI Narrative System Theory	21
2.6	Subclasses of AI Systems Theory	22
2.6.1	AI Systems Biology.	22
2.6.2	AI Systems Psychology	23
2.7	Conclusions	23
	References.	25
3	Psychological Constructs for AI Systems:	
	The Information Continuum	29
3.1	Introduction	29
3.2	Information Flow Within a Synthetic Continuum	29
3.3	Information Processing Models.	31
3.4	Discussion	32
	References.	33
4	Human-AI Collaboration	35
4.1	Introduction	35
4.2	The Essence of Meaning	36
4.2.1	AIS Constructivist Learning	37
4.2.2	Physical Representations of Meaning	38
4.2.3	Artificial Intelligence Representations of Meaning.	39
4.3	Bounded Conceptual Rationality (Cognitive Economy)	39
4.4	Human-AI Collaboration	41
4.4.1	Cognitive Architectures for Human-AI Communication	41
4.5	Communication for Human-AI Collaboration	43
4.6	Human Perception of Artificial Intelligence	44
4.7	Human Acceptance of Artificially Intelligent Entities.	45
4.8	Artificial Intelligence Perception.	46
4.9	Human-AI Interaction and Test Considerations	47
4.10	Conclusions and Discussion	49
	References.	50

- 5 Abductive Artificial Intelligence Learning Models** 51
 - 5.1 Introduction 51
 - 5.2 Representations of Learned Knowledge and Context 54
 - 5.3 Elementary Abduction 56
 - 5.4 Artificial Abduction Hypothesis Evaluation Logic 58
 - 5.5 Conclusions 62
 - References 62

- 6 Artificial Creativity and Self-Evolution: Abductive Reasoning in Artificial Life Forms** 65
 - 6.1 Introduction 65
 - 6.2 Human vs. Artificial Reasoning 66
 - 6.2.1 Human Reasoning Concepts 66
 - 6.2.2 Modular Reasoning 66
 - 6.3 Distributed Reasoning 67
 - 6.4 Types of Reasoning 67
 - 6.5 Artificial “SELF” Reasoning 68
 - 6.6 Artificial, Possibilistic Abductive Reasoning 69
 - 6.6.1 Artificial Creativity in a SELF 69
 - 6.7 The Advanced Learning Abductive Network (ALAN) 70
 - 6.7.1 Artificial Creativity Through Problem Solving 70
 - 6.7.2 ALAN Abductive Reasoning Framework 70
 - 6.8 Conclusions 72
 - References 74

- 7 Artificial Intelligent Inferences Utilizing Occam Abduction** 75
 - 7.1 Introduction 75
 - 7.2 Elementary Artificial Occam Abduction 76
 - 7.3 Synthesis of Artificial Occam Abduction 79
 - 7.4 Artificial Occam Abduction Hypothesis Evaluation Logic 80
 - 7.5 Conclusion 84
 - References 85

- 8 Artificial Neural Diagnostics and Prognostics: Self-Soothing in Cognitive Systems** 87
 - 8.1 Introduction 87
 - 8.2 Prognostics and Diagnostics: Integrated System Health Management (ISHM) 88
 - 8.3 Prognostic Technologies 91
 - 8.4 Abductive Logic and Emotional Reasoners 91
 - 8.5 The Dialectic Search 93
 - 8.6 Self-Soothing in AI Systems 94
 - 8.6.1 Acupressure 95
 - 8.6.2 Deep Breathing 95
 - 8.6.3 Amplification of the Feeling 95

8.6.4	Imagery	95
8.6.5	Mindfulness	96
8.6.6	Positive Psychology	96
8.7	Artificial Social Intelligence	97
8.8	Conclusions and Discussion	98
	References	98
9	Ontology-Based Knowledge Management for Artificial Intelligent Systems	99
9.1	Introduction	99
9.2	Taxonomies	100
9.2.1	Underlying Notions	101
9.3	Related Database Fundamentals	102
9.4	Ontology Analysis	103
9.4.1	Preliminary Discussion	104
9.4.2	Knowledge Analysis	105
9.5	Knowledge Management Upper Ontology	106
9.6	Upper Services Fault Ontology	112
9.7	Example: Technical Publications Taxonomy	115
9.8	Knowledge Relativity Threads for Knowledge Context Management.	115
9.9	Discussion	119
	References	119
10	Cognitive Control of Self-Evolving Life Forms (SELF) Utilizing Artificial Procedural Memories	121
10.1	Introduction	121
10.2	Analog Neural Structures	121
10.3	Self-Evolution Utilizing Procedural Memories	123
10.4	Test Scenarios	124
10.5	Procedural Implicit Memory	124
10.6	Creation and Retrieval of Artificial Procedural Memories	125
10.7	Conclusions	127
	References	127
11	Methodologies for Continuous, Life-Long Machine Learning for AI Systems	129
11.1	Introduction: Life-Long Machine Learning	129
11.2	Artificial Intelligence Machine Learning with Occam Abduction	133
11.2.1	Elementary Occam Abduction	134
11.3	Elementary Continuous Abduction	137
11.4	Conclusions and Discussion	138
	References	138

12 Implicit Learning in Artificial Intelligence. 139

12.1 Introduction 139

12.2 Implicit Learning in Artificial Intelligent Systems 140

12.3 Measuring Implicit Learning Within
an Artificial Intelligent System 143

12.3.1 Measuring Implicit Learning
in Artificial Intelligent Systems. 144

12.3.2 Measuring Implicit Learning
in Human–Machine Interfaces. 145

12.4 Conclusions 146

References. 146

**13 Data Analytics: The Big Data Analytics
Process (BDAP) Architecture.** 149

13.1 Introduction: Enhancing Big Data Analytics 149

13.2 The Big Data Analytical Process (BDAP) 150

13.3 Data Characterization and Classification Process 151

13.4 Feedback-Driven Analysis/Classification 152

13.5 State Change Prediction Process 152

13.6 Hypothesis-Driven Prediction/Classification Process 154

13.7 Stochastic Diffusion Method for State Classification 158

13.8 Conclusions and Discussion 158

References. 158

14 Conclusions and Next Steps 161

14.1 More Complicated Is Not Necessarily Better 162

14.2 Where Are We Going? 163

14.2.1 Artificial Psychology 163

14.2.2 Artificial Psychology as a Discipline. 164

References. 165

Index. 167