

Contents

1	Shannonian Versus Semantic Information and Cognition	1
1.1	Shannonian Information	1
1.2	Semantic Information	2
1.3	Applications to Cognition	3
1.4	Semantic Information Enters in Disguise	6
1.5	Toward Information Adaptation	10
2	Information Versus Data	11
2.1	General Discussion	11
2.1.1	On Knowledge	11
2.2	Mathematical Formulation. Some Basic General Concepts	14
2.2.1	Information Deflation	15
2.3	Data, Information and Meaning. How Are These Related?	16
3	The Empirical Basis of Information Adaptation	19
3.1	Introduction	19
3.2	Deconstruction–Reconstruction	19
3.3	Analysis–Synthesis	20
3.4	Hybrid Images and the Meaning of the Deconstruction/Analysis Process	21
3.4.1	Hybrid Images	22
3.4.2	A Model of Hybrid Images	26
3.5	Computational Models: Link Between Bottom-Up and Top-Down	27
4	A Complexity Theory Approach to Information	31
4.1	Complexity Theory	31
4.2	Complexity and Information	32
4.3	Forms of Communication	34
4.3.1	Complexity, Cognition and Information Adaptation	36

4.4	A Communication System of a Complex Adaptive Cognitive System	38
5	On Synergetic Computers and Other Machines	43
5.1	Can Machines Think?	43
5.2	Trivial Versus Non-Trivial Machines in Relation to Simple Versus Complex Systems	44
5.3	The Synergetic Computer	47
5.3.1	Motivation	47
5.3.2	Self-organization	47
5.3.3	From Pattern Formation to Pattern Recognition	49
5.3.4	SIRN—Synergetic Inter-Representation Networks	50
6	Pattern Recognition as a Paradigm for Information Adaptation	53
6.1	Pattern Recognition	53
6.2	Pattern Recognition of Faces as Information Adaptation by Means of Deflation	53
6.3	Pattern Recognition of Caricatures as Information Adaptation.	56
6.4	Pattern Recognition as Information Adaptation by Means of Inflation	57
7	From General Principles of Information Adaptation to Concrete Specific Models	61
7.1	Introductory Remarks	61
7.2	Task: Define Probability of Patterns	62
7.3	Information Deflation via Correlation Functions. Jaynes' Maximum (Information) Entropy Principle	62
7.4	Need for Models: Prototype Patterns.	63
7.5	Learning	64
7.6	Recognition	65
7.7	Some More Properties of the SC	67
7.8	On Attention Parameters	69
7.9	Time Dependent Data Set	70
7.10	Machinery	72
7.10.1	First Step: Preprocessing.	72
7.10.2	Second Step: Learning	72
7.10.3	Third Step: Recognition	73
7.11	The HMAX Model: Outline—Relation to Information Adaptation.	73
7.11.1	The Invariance Problem	73
7.11.2	The HMAX Model.	74
7.11.3	Information Adaptation	76

8 Some Further Applications and Discussions of Information

Adaptation. 79

8.1 A Baby Learning the Concept “Mother” 79

8.2 Information Adaptation to an Approaching Object 80

8.3 Adapting the Face of the City to Humans’ Information
Processing Capabilities 81

Concluding Notes 85

References. 87

Information Adaptation: The Interplay Between
Shannon Information and Semantic Information in
Cognition

Haken, H.; Portugali, J.

2015, XIV, 90 p. 49 illus., 12 illus. in color., Softcover

ISBN: 978-3-319-11169-8