

CONTENTS

<i>Foreword</i>	ix
1 Introduction	1
1.1 <i>The Singularity</i>	1
1.2 <i>Approach</i>	3
1.3 <i>Limits to the modelling of animate nature</i>	7
1.4 <i>The AI hype cycle</i>	9
1.5 <i>Why machines will not inherit the earth</i>	11
1.6 <i>How to read this book</i>	18
PART I	
Properties of the human mind	21
2 The human mind	23
2.1 <i>Basic characteristics of the human mind</i>	23
2.2 <i>The mind-body problem: monism and its varieties</i>	24
3 Human and machine intelligence	37
3.1 <i>Capabilities and dispositions</i>	37
3.2 <i>Intelligence</i>	41
3.3 <i>AI and human intelligence</i>	48

4	The nature of human language	63
	4.1 <i>Why conversation matters</i>	63
	4.2 <i>Aspects of human language</i>	64
5	The variance and complexity of human language	74
	5.1 <i>Conversations: an overview</i>	74
	5.2 <i>Levels of language production and interpretation</i>	77
	5.3 <i>Conversation contexts</i>	77
	5.4 <i>Discourse economy: implicit meaning</i>	82
	5.5 <i>Structural elements of conversation</i>	85
	5.6 <i>How humans pass the Turing test</i>	88
6	Social and ethical behaviour	90
	6.1 <i>Can we engineer social capabilities?</i>	91
	6.2 <i>Intersubjectivity</i>	93
	6.3 <i>Social norms</i>	95
	6.4 <i>Moral norms</i>	98
	6.5 <i>Power</i>	106
PART II		
	The limits of mathematical models	107
7	Complex systems	109
	7.1 <i>Models</i>	109
	7.2 <i>Computability</i>	115
	7.3 <i>Systems</i>	117
	7.4 <i>The scope of extended Newtonian mathematics</i>	119
	7.5 <i>Complex systems</i>	124
	7.6 <i>Examples of complex systems</i>	140
8	Mathematical models of complex systems	144
	8.1 <i>Multivariate distributions</i>	144
	8.2 <i>Deterministic and stochastic computable system models</i>	146
	8.3 <i>Newtonian limits of stochastic models of complex systems</i>	149
	8.4 <i>Descriptive and interpretative models of complex systems</i>	153
	8.5 <i>Predictive models of complex systems</i>	158

- 8.6 *Naïve approaches to complex system modelling* 160
- 8.7 *Refined approaches* 180
- 8.8 *The future of complex system modelling* 187

Part III

The limits and potential of AI	193
9 Why there will be no machine intelligence	195
9.1 <i>Brain emulation and machine evolution</i>	195
9.2 <i>Intentions and drivenness</i>	203
9.3 <i>Consciousness</i>	205
9.4 <i>Philosophy of mind, computation, and AI</i>	213
9.5 <i>Objectifying intelligence and theoretical thinking</i>	214
10 Why machines will not master human language	217
10.1 <i>Language as a necessary condition for AGI</i>	217
10.2 <i>Why machine language production always falls short</i>	219
10.3 <i>AI conversation emulation</i>	226
10.4 <i>Mathematical models of human conversations</i>	235
10.5 <i>Why conversation machines are doomed to fail</i>	242
11 Why machines will not master social interaction	245
11.1 <i>No AI emulation of social behaviour</i>	245
11.2 <i>AI and legal norms</i>	248
11.3 <i>No machine emulation of morality</i>	250
12 Digital immortality	259
12.1 <i>Infinity stones</i>	259
12.2 <i>What is a mind?</i>	261
12.3 <i>Transhumanism</i>	282
12.4 <i>Back to Bostrom</i>	287
13 AI spring eternal	288
13.1 <i>AI for non-complex systems</i>	288
13.2 <i>AI for complex systems</i>	295
13.3 <i>AI boundaries</i>	298
13.4 <i>How AI will change the world</i>	301

viii Contents

<i>Appendix: Turbulence: Mathematical details</i>	302
<i>Glossary</i>	304
<i>References</i>	313
<i>Index</i>	335