

Contents

Preface	<i>page</i> xix
Chapter 1. Outline of heuristics and biases	1
Summary	1
Probabilities	2
A brief history of probability in the behavioral sciences	2
Alternative interpretations of probability	5
Heuristic or complex biases in dealing with probabilities	6
Apparent overconfidence	8
Hindsight bias	8
Small sample fallacy	8
Conjunction fallacy	9
Regression fallacy	9
Base rate neglect	10
Availability and simulation fallacies	10
Anchoring and adjustment biases	10
Expected utility fallacy	11
Bias by frames	12
Simple biases in quantifying judgments	12
Response contraction bias or regression effect	13
Sequential contraction bias	14
Stimulus range equalizing bias	15
Equal frequency bias	15
Transfer bias	16

Chapter 2. Practical techniques	17
Summary	17
Combining probabilities	17
Adding mutually exclusive probabilities	18
Averaging equivalent estimates of probability	19
Combining independent probabilities derived from distributions of scores	19
Combining independent probability estimates of the same event	20
Multiplying conjoint probabilities of independent events with unknown outcomes	22
Problems with multiple uncertainties	25
Decision analysis	26
A simple decision tree	26
Procedure for decision analysis	29
Biases of decision analysis	29
Sensitivity analysis for uncertain quantities	31
 Chapter 3. Apparent overconfidence	 33
Summary	33
Lack of confidence can produce apparent overconfidence	33
Two-choice general knowledge questions and a one-sided rating scale	34
Relative frequency judgments	38
Avoid a one-sided scale of probabilities	39
Apparent confidence in a predominantly perceptual task	42
Asymmetric transfer	43
Impossible perceptual tasks	44
Generalization of confidence	46
Equal frequency bias combined with a logarithmic scale with very long odds	46
Setting uncertainty bounds on unknown quantities	49
Conflicting interpretations	50
Sequential contraction bias transfers apparent underconfidence	53
Reducing apparent overconfidence	53
Train with feedback	54
Employ trained experts	55
Warnings	57
Reverse stimuli and responses in setting uncertainty bounds	58

<i>Contents</i>	xi
Make the response contraction bias oppose overconfidence	60
Practical example of overconfidence	60
Chapter 4. Hindsight bias	62
Summary	62
Relations between foresight and hindsight	62
Interactions between hindsight and memory of forecast	64
Hindsight increases the estimated probabilities of historic outcomes	65
Transfer from first to second passage	66
Showoff effect	66
Hindsight increases the estimated probabilities of medical diagnoses	67
Knowledge of the first experimental result increases the estimated probability of subsequent results	68
Hindsight belittles the outcome of investigations	69
Hindsight produces favorable distortions of memory	70
Retroactive interference	70
Hindsight degrades memory	71
Response contraction bias as great or greater than hindsight bias	73
Reducing hindsight bias	75
Strengthen memory of forecast	75
Practical examples of hindsight bias	77
Chapter 5. Small sample fallacy	78
Summary	78
Small samples assumed to be representative	78
Contradictions of the small sample fallacy for size or reliability	79
Predictions depend on the kind and size of a uniform sample	79
Greater confidence in larger samples: straightforward opinion surveys	81
Averages of baseball and football tests	84
Small sample fallacy for distributions	86
Over 60% of boys born each day in hospitals of different sizes	86
Above average lengths of words in pages and first lines	89

Familiar straightforward questions versus unfamiliar difficult questions	90
Median heights of groups of 3 men	90
Small sample fallacies for distributions that appear too regular	91
Asymmetric transfer	93
Neglecting exact birth order	94
Stimulus range equalizing bias	95
Gambler's fallacy	97
Contradictions of the gambler's fallacy	98
Reducing the incidence of the small sample fallacy for size	101
Reducing the incidence of the small sample fallacy for distributions	102
Avoid problem questions	102
Practical examples of the small sample fallacy for size	102
Small heterogeneous samples may give unrepresentative results	102
Replicating an unexpected result	103
The advantageous length for a game of squash	104
Chapter 6. Conjunction fallacy	105
Summary	105
Conjoint probabilities of independent events with unknown outcomes	106
Averaging the ranks of probabilities in the Linda and Bill problems	107
Similarity or representativeness versus probability	108
Indirect or separate groups task	109
Failing to detect a hidden binary sequence	110
Inverting the conventional medical probability	113
Causal conjunction fallacy	114
Independent probabilities of the same event	115
Dual conjunction fallacy	119
Reducing the conjunction fallacy	121
Avoid ranking probabilities	121
Change from percentages to numbers	122
Call attention to a causal conjunction	122
Other problem questions to avoid	123
Training	123
Practical examples of the causal conjunction fallacy	124

<i>Contents</i>	xiii
Forecasting with a scenario	124
Suggesting a motive for an alleged crime	125
Chapter 7. Regression fallacy	127
Summary	127
Regression towards the average	127
Relation to other biases	128
Regression in one or a number of scores	129
Regression in individuals	130
Failing to take account of regression in the Tom W. problem	130
Recognizing regression in football and acting	131
Right predictions of regression for individuals give wrong predictions for groups	133
Regression fallacy in predicting group performance	134
Looking out for regression	134
Practical examples of regression	135
Regression during a road safety campaign	135
Regression following reward and punishment	137
Regression during medical treatment	137
Chapter 8. Base rate neglect	138
Summary	138
Neglect of the base rate	138
Regression to the base rate	140
Logical fallacies in completely neglecting the base rate	140
Neglect of causal and statistical base rates: predicting success in an exam	141
Judging the probability of color of cab	143
Alternative accounts	147
The Bayes method of combining 2 probabilities for the cab problem	149
Predicting professions	150
Asymmetric transfer	153
Partial replication in Germany	154
Simulated random sampling emphasizes the base rate	155
Medical diagnosis problem	156
Avoiding base rate neglect	159

xiv	<i>Contents</i>	
	Subjective sensitivity analysis	160
	Practical examples of base rate neglect	160
	Chapter 9. Availability and simulation fallacies	162
	Summary	162
	Judged frequency or probability depends on subjective availability or ease of simulation	162
	Accuracy in judging the subjective availability of category members	163
	Availability fallacy when familiarity assists recall	165
	Famous and less famous names	165
	Familiar and unfamiliar causes of death	166
	Availability	168
	Overestimation of unfamiliar causes of death	170
	Effectiveness with which memory can be searched	170
	Unrepresentative branching trees bias subjective availability	171
	Equal frequency bias when 3 main branches are omitted	174
	Response contraction bias can reduce the availability fallacy	175
	Redefining main systems	176
	Equal frequency bias when main branches are split or fused	176
	Simulation fallacy from imaginability	177
	Binomial distribution represented by paths through a matrix	178
	Switch from simulation fallacy to representativeness	180
	Different committees or bus-stops of r out of 10 alternatives	181
	Avoiding the availability and simulation fallacies	183
	Practical examples of the availability and simulation fallacies	183
	Associations in the Draw a Person test	183
	Memory deficits following disease or damage of the brain	186
	Evaluating a unique course of action	186
	Chapter 10. Anchoring and adjustment biases	187
	Summary	187
	Response contraction bias and sequential contraction bias versions	187
	Sequential contraction bias	188
	Making a final estimate from an initial reference magnitude	188

	xv
Underestimating the product of the first 8 single digit numbers	189
Overestimating conjunctive probabilities	190
Underestimating disjunctive probabilities	190
Avoiding the anchoring and adjustment bias	191
Practical examples of the anchoring and adjustment bias	191
Conjunctive and disjunctive events	192
Conservatism in revising a probability estimate	192
Chapter 11. Expected utility fallacy	194
Summary	194
Normative theory of expected utility	195
Heuristic preferences for high probability gains but for low probability losses	195
Heuristic preferences reverse when probabilities are very low	198
Cautions	199
Prospect theory	199
Response contraction bias for decision weights	200
Subjectively losses matter more than gains	202
Response contraction bias for subjective values of gains and losses	202
Prospective values	205
Confused choices not conforming to either expected utility theory or prospect theory	208
Sequential contraction bias in pricing reverse preferences	208
Response contraction bias with 5 simultaneous choices of insurance	209
Central tendency transfer bias with repeated choices	213
Individual differences in taking risks	216
Avoiding the expected utility fallacy	216
Practical examples of the expected utility fallacy	217
Amount of preparation for an examination or interview	217
Greater aversion to certain death soon than to highly probable death soon	217
Popularity of lotteries and football pools	218
Preference for lottery tickets over cash discounts	218
Preference for short-stay hospital insurance	218

xvi	<i>Contents</i>	
Chapter 12. Bias by frames		220
Summary		220
Change of reference level		221
Sure saving of people rejected when framed as sure death of people		221
Sure monetary gain rejected when framed as sure monetary loss		223
Isolation of contingencies		226
Probable protection chosen when framed as partial sure protection		226
Possible win chosen when framed as sure win		226
Reliably improbable cash win chosen when framed as sure cash win		230
Change of frame from preference to insurance		231
Asymmetric transfer between frames		233
Change of frame from paths through a matrix to rounds of single cards		235
Avoiding bias by frames		236
Practical examples of bias by frames		237
Change from percent alive to percent dead		237
Change from serious road accidents per trip to serious road accidents per lifetime		239
Change from credit card surcharge to cash discount		240
Chapter 13. Simple biases accompanying complex biases		241
Summary		241
Investigations with both simple and complex biases		241
1. A simple bias can account for the full effect attributed to a complex bias		247
2. A simple bias can have a greater or as great an effect as a complex bias		249
3. A simple bias can increase or reduce the effect of a complex bias		250
4. A simple bias can account for an incidental effect		251
Chapter 14. Problem questions		254
Summary		254
Questions too difficult for the respondents		254

<i>Contents</i>	xvii
1. Impossible tasks	254
2. Use of percentages or other statistical techniques	260
3. Lack of other relevant knowledge	264
4. Covert relevant knowledge	265
5. Insufficient time available	266
6. Complex mental arithmetic	266
7. Questions with misleading contexts	267
Questions raised by problem questions	274
Avoiding the difficulties of problem questions	275
Chapter 15. Training	276
Summary	276
Training improves dealing with probabilities	276
1. Experts	276
2. Knowledge of statistics	282
3. Training in the laboratory	283
Chapter 16. Overview	286
Summary	286
Heuristics as substitutes for normative rules	286
Practical decision makers using heuristics	287
Assumed use of heuristics by students in laboratory tasks	288
Normative rules not used or not used correctly	288
Other reasons for errors	291
Training reduces errors	292
Revised interpretations	292
Lack of confidence can produce apparent overconfidence	293
Increased uncertainty can reduce apparent uncertainty	293
Possible small sample fallacy reinterpreted as guessing	294
Possible small sample fallacy reinterpreted as a stimulus range equalizing bias	295
Gambler's fallacy less common than supposed	297
Representativeness reinterpreted as response bias or concrete thinking	297
Changed dimensions of representativeness	300
References	302
Index	310