Contents

	Preface	page ix
	Acknowledgments	xi
1	Introduction	1
1.1	"Sirens going off now!! Take cover be safe!"	2
1.2	What Is a Disaster?	3
1.3	Information Flows in Social Media	5
1.4	The Data Deluge	8
1.5	Requirements: "Big Picture" Versus "Actionable Insights"	9
1.6	Organizational Challenges	11
1.7	Scope and Organization of This Book	13
1.8	Further Reading and Online Appendix	16
2	Volume: Data Acquisition, Storage, and Retrieval	18
2.1	Social Media Data Sizes	18
2.2	Data Acquisition	22
2.3	Postfiltering and De-Duplication	28
2.4	Data Representation / Feature Extraction	29
2.5	Storage and Indexing	31
2.6	Research Problems	32
2.7	Further Reading	34
3	Vagueness: Natural Language and Semantics	35
3.1	Social Media Is Conversational	36
3.2	Text Preprocessing	37
3.3	Sentiment Analysis	41
3.4	Named Entities	42
3.5	Geotagging and Geocoding	44

vi Contents

3.6	Extracting Structured Information	46
3.7	Ontologies for Explicit Semantics	47
3.8	Research Problems	48
3.9	Further Reading	49
4	Variety: Classification and Clustering	51
4.1	Content Categories	52
4.2	Supervised Classification	57
4.3	Unsupervised Classification / Clustering	63
4.4	Research Problems	66
4.5	Further Reading	66
5	Virality: Networks and Information Propagation	68
5.1	Crisis Information Networks	69
5.2	Cascading of Crisis Information	73
5.3	User Communities and User Roles	76
5.4	Research Problems	78
5.5	Further Reading	78
6	Velocity: Online Methods and Data Streams	79
6.1	Stream Processing	80
6.2	Analyzing Temporal Data	81
6.3	Event Detection	83
6.4	Event-Detection Methods	85
6.5	Incremental Update Summarization	90
6.6	Domain-Specific Approaches	92
6.7	Research Problems	94
6.8	Further Reading	94
7	Volunteers: Humanitarian Crowdsourcing	96
7.1	Digital Volunteering	97
7.2	Organized Digital Volunteering	99
7.3	Motivating Volunteers	102
7.4	Digital Volunteering Tasks	104
7.5	Hybrid Systems	107
7.6	Research Problems	108
7.7	Further Reading	109
8	Veracity: Misinformation and Credibility	110
8.1	Emergencies, Media, and False Information	111
8.2	Policy-Based Trust and Social Media	113
8.3	Misinformation and Disinformation	114

C .	
Contents	V11

8.4	Verification Practices	115
8.5	Automatic Credibility Analysis	117
8.6	Research Problems	121
8.7	Further Reading	122
9	Validity: Biases and Pitfalls of Social Media Data	123
9.1	Studying the "Offline" World Using "Online" Data	124
9.2	The Digital Divide	126
	Content Production Issues	128
9.4	Infrastructure and Technological Factors	129
	The Geography of Events and Geotagged Social Media	130
9.6	Evaluation of Alerts Triggered from Social Media	134
9.7	Research Problems	135
9.8	Further Reading	136
10	Visualization: Crisis Maps and Beyond	138
10.1	Crisis Maps	138
10.2	Crisis Dashboards	142
10.3	Interactivity	145
10.4	Research Problems	149
10.5	Further Reading	150
11	Values: Privacy and Ethics	152
11.1	Protecting the Privacy of Individuals	153
11.2	Intentional Human-Induced Disasters	156
11.3	Protecting Citizen Reporters and Digital Volunteers	157
11.4	Ethical Experimentation	158
11.5	Giving Back and Sharing Data	159
11.6	Research Problems	161
11.7	Further Reading	162
12	Conclusions and Outlook	164
12.1	The Quality of Crisis Information	165
12.2	Peer Production of Crisis Information	166
12.3	Technologies for Crisis Communications in Social Media	167
12.4	User-Generated Images, Video, and Aerial Photography	167
12.5	Outlook	168
	Bibliography	171
	Index	209
	Terms and Acronyms	211