Contents

Prefi	ace	page x
ı.	Introduction to Text Mining	1
	I.1 Defining Text Mining	1
	I.2 General Architecture of Text Mining Systems	13
II.	Core Text Mining Operations	19
	II.1 Core Text Mining Operations	19
	II.2 Using Background Knowledge for Text Mining	41
	II.3 Text Mining Query Languages	51
III.	Text Mining Preprocessing Techniques	57
	III.1 Task-Oriented Approaches	58
	III.2 Further Reading	62
IV.	Categorization	64
	IV.1 Applications of Text Categorization	65
	IV.2 Definition of the Problem	66
	IV.3 Document Representation	68
	IV.4 Knowledge Engineering Approach to TC	70
	IV.5 Machine Learning Approach to TC	70
	IV.6 Using Unlabeled Data to Improve Classification	78
	IV.7 Evaluation of Text Classifiers	79
	IV.8 Citations and Notes	80
V.	Clustering	82
	V.1 Clustering Tasks in Text Analysis	82
	V.2 The General Clustering Problem	84
	V.3 Clustering Algorithms	85
	V.4 Clustering of Textual Data	88
	V.5 Citations and Notes	92

VI.	Informat	ion Extraction	94
	VI.1	Introduction to Information Extraction	94
	VI.2	Historical Evolution of IE: The Message Understanding	
		Conferences and Tipster	96
	VI.3	IE Examples	101
		Architecture of IE Systems	104
		Anaphora Resolution	109
		Inductive Algorithms for IE	119
		Structural IE	122
	VI.8	Further Reading	129
VII.	Probabili	stic Models for Information Extraction	131
	VII.1	Hidden Markov Models	131
	VII.2	Stochastic Context-Free Grammars	137
	VII.3	Maximal Entropy Modeling	138
	VII.4	Maximal Entropy Markov Models	140
	VII.5	Conditional Random Fields	142
	VII.6	Further Reading	145
VIII.	Preproce	essing Applications Using Probabilistic	
	and Hybi	rid Approaches	146
	VIII.1	Applications of HMM to Textual Analysis	146
		Using MEMM for Information Extraction	152
	VIII.3	Applications of CRFs to Textual Analysis	153
	VIII.4	TEG: Using SCFG Rules for Hybrid	
		Statistical–Knowledge-Based IE	155
	VIII.5	Bootstrapping	166
	VIII.6	Further Reading	175
IX.		ition-Layer Considerations for Browsing	
	and Que	ry Refinement	177
	IX.1	Browsing	177
	IX.2	Accessing Constraints and Simple Specification Filters	
		at the Presentation Layer	185
	IX.3	Accessing the Underlying Query Language	186
	IX.4	Citations and Notes	187
Χ.	Visualiza	tion Approaches	189
	X.1	Introduction	189
		Architectural Considerations	192
	X.3	Common Visualization Approaches for Text Mining	194
		Visualization Techniques in Link Analysis	225
		Real-World Example: The Document Explorer System	235
XI.	Link Ana	lysis	244
		Preliminaries	244

		Contents	ix
XI.2	Automatic Layout of Networks	246	
	Paths and Cycles in Graphs	250	
	Centrality	251	
	Partitioning of Networks	259	
	Pattern Matching in Networks	272	
	Software Packages for Link Analysis	273	
	Citations and Notes	274	
XII. Text Min	ing Applications	275	
XII.1	General Considerations	276	
XII.2	Corporate Finance: Mining Industry Literature for		
	Business Intelligence	281	
XII.3	A "Horizontal" Text Mining Application: Patent Analysis		
	Solution Leveraging a Commercial Text Analytics		
	Platform	297	
XII.4	Life Sciences Research: Mining Biological Pathway		
	Information with GeneWays	309	
Appendix A: D	NAL: A Dedicated Information Extraction Language for		
Text Mining		317	
A.1	What Is the DIAL Language?	317	
A.2	Information Extraction in the DIAL Environment	318	
A.3	Text Tokenization	320	
A.4	Concept and Rule Structure	320	
A.5	Pattern Matching	322	
A.6	Pattern Elements	323	
A.7	Rule Constraints	327	
A.8	Concept Guards	328	
A.9	Complete DIAL Examples	329	
Bibliography		337	
Index		391	