Contents

1	Wha	at Is a Knowledge Graph?	1
	1.1	Introduction	1
	1.2	Example 1: Academic Domain	4
	1.3	Example 2: Products and Companies	5
	1.4	Example 3: Geopolitical Events	6
	1.5	Conclusion	7
2	Info	rmation Extraction	9
	2.1	Introduction	9
	2.2	Challenges of IE	10
	2.3	Scope of IE Tasks	11
		2.3.1 Named Entity Recognition	12
		2.3.2 Relation Extraction	22
		2.3.3 Event Extraction	24
		2.3.4 Web IE	26
	2.4	Evaluating IE Performance	29
	2.5	Summary	30
3	Enti	ity Resolution	33
	3.1	Introduction	33
	3.2	Challenges and Requirements	34
	3.3	Two-Step Framework	38
		3.3.1 Blocking	39
		3.3.2 Similarity	44
	3.4	Measuring Performance	47
		3.4.1 Measuring Blocking Performance	48
		3.4.2 Measuring Similarity Performance	50
	2.5	Extending the Two Stan Worldow A Priof Note	51

xii Contents

	3.6	3.6.1 Automated ER Solutions	51 52 55 56
	3.7		57
4	Adv	anced Topic: Knowledge Graph Completion	59
	4.1	Introduction	59
	4.2	Knowledge Graph Embeddings	61
		4.2.1 TransE	63
		4.2.2 TransE Extensions and Alternatives	64
		4.2.3 Limitations and Alternatives	66
		4.2.4 Research Frontiers and Recent Work	66
		4.2.5 Applications of KGEs	72
	4.3	Summary	74
5	Ecos	systems	75
	5.1	•	75
	5.2		75
			77
			78
			79
			80
	5.3	1 1	82
	5.4		84
	5.5	.	86
		•	
Gl	ossar	y	89
Re	feren	ces	93
In	dex		03