

Bachelorarbeit

User-aided Pattern Search and Analysis on Business Graphs

Nutzergestuetzte Graphanalyse und Mustersuche auf Unternehmensgraphen

Milan Gruner milangruner@gmail.com

 $Eingereicht\ am\ <\! TBD\! >$

Fachgebiet Informationssysteme Betreuung: Prof. Dr. Felix Naumann, Michael Loster, Toni Gruetze

Abstract

Costructing a graph made up of thousands of businesses may be hard, but actually making sense of it is a lot harder. With huge amounts of data being integrated into the data lake every day, automatic methods for finding interesting spots in the graph are needed. This paper discusses different approaches that can be taken to extract useful knowledge from such a graph.

Contents

1	Intro	oduction	4			
	1.1	Glossary	4			
	1.2	Motivation	4			
	1.3	Understanding risk analysis on graphs	4			
	1.4	Used techniques and related works	4			
2	Data	a structures for business entities	5			
	2.1	Graph encoding for column family storage	5			
	2.2	The <i>subject</i> data structure	5			
	2.3	A versioning scheme that stands the test of time	5			
3	Architecture 6					
	3.1	Job and Data Management	6			
		3.1.1 Modularizing Spark jobs	6			
		3.1.2 Coordinating Spark jobs from NodeJS	6			
		3.1.3 Managing Cassandra tables from NodeJS	6			
		3.1.4 Data flow using column family storage	6			
	3.2	Using Apache Spark and Cassandra for Graph Analysis	6			
		3.2.1 Writing efficient Spark GraphX code	6			
		3.2.2 Optimizing Cassandra data structures for Graph Processing	6			
4	Patt	tern Search	7			
	4.1	Discerning patterns from randomness	7			
	4.2	Operating on graph diffs	7			
	4.3	Pattern types and their applications	7			
5	Pattern Analysis 8					
	5.1	User-aided approaches for Pattern Categorization	8			
	5.2	Pattern importance measures	8			
	5.3	Machine Learning Models for analyzing user feedback	8			
6		ph Summarization	9			
	6.1	What users actually want to see	9			
	6.2	Compressing graph information to the bare minimum	9			
	6.3	Presenting graph data appealingly	9			
7	Less	sons learned	10			
	7.1	Benchmarks and Experiments	10			
	7.2	Design decisions and trade-offs	10			
	7.3	Technical challenges	10			
8	Lite	rature	11			

1 Introduction

1 Introduction

1.1 Glossary

1.2 Motivation

1.3 Understanding risk analysis on graphs

1.4 Used techniques and related works

2 Data structures for business entities
2.1 Graph encoding for column family storage
2.1 Graph encouning for column family storage
2.2 The subject data structure
2.3 A versioning scheme that stands the test of time

3 Architecture

3 Architecture

 3.1.1 Modularizing Spark jobs 3.1.2 Coordinating Spark jobs from NodeJS 3.1.3 Managing Cassandra tables from NodeJS 3.1.4 Data flow using column family storage 3.2 Using Apache Spark and Cassandra for Graph Analysis 3.2.1 Writing efficient Spark GraphX code 3.2.2 Optimizing Cassandra data structures for Graph Processing 	3.1 Job and Data Management
 3.1.3 Managing Cassandra tables from NodeJS 3.1.4 Data flow using column family storage 3.2 Using Apache Spark and Cassandra for Graph Analysis 3.2.1 Writing efficient Spark GraphX code 	3.1.1 Modularizing Spark jobs
3.1.4 Data flow using column family storage3.2 Using Apache Spark and Cassandra for Graph Analysis3.2.1 Writing efficient Spark GraphX code	3.1.2 Coordinating Spark jobs from NodeJS
3.2 Using Apache Spark and Cassandra for Graph Analysis 3.2.1 Writing efficient Spark GraphX code	3.1.3 Managing Cassandra tables from NodeJS
3.2.1 Writing efficient Spark GraphX code	3.1.4 Data flow using column family storage
	3.2 Using Apache Spark and Cassandra for Graph Analysis
3.2.2 Optimizing Cassandra data structures for Graph Processing	3.2.1 Writing efficient Spark GraphX code
	3.2.2 Optimizing Cassandra data structures for Graph Processing

4	Pattern Search
/l 1	Discerning patterns from randomness
7.1	Discerning patterns from fandomness
4.2	Operating on graph diffs

4.3 Pattern types and their applications

5 Pattern Analysis

5.1 User-aided approaches for Pattern Categorization

5.2 Pattern importance measures

5.3 Machine Learning Models for analyzing user feedback

6 Graph Summarization
6.1 What users actually want to see
6.2 Compressing graph information to the bare minimum
6.3 Presenting graph data appealingly

7 Lessons learned

7.1 Benchmarks and Experiments

7.2 Design decisions and trade-offs

7.3 Technical challenges

8 Literature

References