

19th International Conference on Database Theory

ICDT'16, March 15–18, 2016, Bordeaux, France

Edited by

Wim Martens

Thomas Zeume



Editors

Wim Martens	Thomas Zeume
University of Bayreuth	TU Dortmund University
Bayreuth, Germany	Dortmund, Germany
wim.martens@uni-bayreuth.de	thomas.zeume@tu-dortmund.edu

ACM Classification 1998

H.2 Database Management, H.2.1 Normal forms, H.2.2 Schema and subschema, H.2.3 Query languages, H.2.4 Query processing, H.2.4 Relational databases, H.2.4 Distributed databases, H.2.5 Heterogeneous Databases, H.3.5 Online Information Services, H.1 Miscellaneous – Privacy, H.4.1 Office Automation: Workflow management, B.4.4 Performance Analysis and Design Aids: Formal models, Verification, F.1.3 Complexity measures and classes, F.4.1 Computational Logic, Model Theory, G.2.2 Graph Theory|Hypergraphs

ISBN 978-3-95977-002-6

Published online and open access by

Schloss Dagstuhl – Leibniz-Zentrum für Informatik GmbH, Dagstuhl Publishing, Saarbrücken/Wadern, Germany. Online available at <http://www.dagstuhl.de/dagpub/978-3-95977-002-6>.

Publication date

March, 2016

Bibliographic information published by the Deutsche Nationalbibliothek

The Deutsche Nationalbibliothek lists this publication in the Deutsche Nationalbibliografie; detailed bibliographic data are available in the Internet at <http://dnb.d-nb.de>.

License

This work is licensed under a Creative Commons Attribution 3.0 Unported license (CC-BY 3.0): <http://creativecommons.org/licenses/by/3.0/legalcode>.



In brief, this license authorizes each and everybody to share (to copy, distribute and transmit) the work under the following conditions, without impairing or restricting the authors' moral rights:

- Attribution: The work must be attributed to its authors.

The copyright is retained by the corresponding authors.

Digital Object Identifier: 10.4230/LIPIcs.ICDT.2016.0

ISBN 978-3-95977-002-6

ISSN 1868-8969

<http://www.dagstuhl.de/lipics>

LIPICs – Leibniz International Proceedings in Informatics

LIPICs is a series of high-quality conference proceedings across all fields in informatics. LIPICs volumes are published according to the principle of Open Access, i.e., they are available online and free of charge.

Editorial Board

- Susanne Albers (TU München)
- Chris Hankin (Imperial College London)
- Deepak Kapur (University of New Mexico)
- Michael Mitzenmacher (Harvard University)
- Madhavan Mukund (Chennai Mathematical Institute)
- Catuscia Palamidessi (INRIA)
- Wolfgang Thomas (*Chair*, RWTH Aachen)
- Pascal Weil (CNRS and University Bordeaux)
- Reinhard Wilhelm (Saarland University)

ISSN 1868-8969

<http://www.dagstuhl.de/lipics>

■ Contents

Preface	0:ix
Organization	0:xi
External Reviewers	0:xiii
List of Authors	0:xv

ICDT 2016 Test of Time Award

The ICDT 2016 Test of Time Award Announcement <i>Foto N. Afrati, Claire David, and Georg Gottlob</i>	1:1–1:2
---	---------

Invited Talks

Scale Independence: Using Small Data to Answer Queries on Big Data <i>Floris Geerts</i>	2:1–2:2
Top-k Indexes Made Small and Sweet <i>Yufei Tao</i>	3:1–3:1
New Algorithms for Heavy Hitters in Data Streams <i>David P. Woodruff</i>	4:1–4:12

Awards Session

Beyond Well-designed SPARQL <i>Mark Kaminski and Egor V. Kostylev</i>	5:1–5:18
A Framework for Estimating Stream Expression Cardinalities <i>Anirban Dasgupta, Kevin J. Lang, Lee Rhodes, and Justin Thaler</i> <i>(Regular Paper)</i>	6:1–6:17
Declarative Probabilistic Programming with Datalog <i>Vince Barany, Balder ten Cate, Benny Kimelfeld, Dan Olteanu, and Zografoula Vagena</i>	7:1–7:19

Distribution and Paralellism

Worst-Case Optimal Algorithms for Parallel Query Processing <i>Paraschos Koutris, Paul Beame, and Dan Suciu</i>	8:1–8:18
Parallel-Correctness and Containment for Conjunctive Queries with Union and Negation <i>Gaetano Geck, Bas Ketsman, Frank Neven, and Thomas Schwentick</i>	9:1–9:17

19th International Conference on Database Theory (ICDT 2016).

Editors: Wim Martens and Thomas Zeume



Leibniz International Proceedings in Informatics
Schloss Dagstuhl – Leibniz-Zentrum für Informatik, Dagstuhl Publishing, Germany

A Formal Study of Collaborative Access Control in Distributed Datalog <i>Serge Abiteboul, Pierre Bourhis, and Victor Vianu</i>	10:1–10:17
---	------------

Optimization

It's All a Matter of Degree: Using Degree Information to Optimize Multiway Joins <i>Manas R. Joglekar and Christopher M. Ré</i>	11:1–11:17
Filtering With the Crowd: CrowdScreen Revisited <i>Benoît Groz, Ezra Levin, Isaac Meilijson, and Tova Milo</i>	12:1–12:18
Streaming Partitioning of Sequences and Trees <i>Christian Konrad</i>	13:1–13:18

Evolving Data

Dynamic Graph Queries <i>Pablo Muñoz, Nils Vortmeier, and Thomas Zeume</i>	14:1–14:18
Verification of Evolving Graph-structured Data under Expressive Path Constraints <i>Diego Calvanese, Magdalena Ortiz, and Mantas Šimkus</i>	15:1–15:19
Query Stability in Monotonic Data-Aware Business Processes <i>Ognjen Savković, Elisa Marengo, and Werner Nutt</i>	16:1–16:18

Data Extraction and Analytics

Document Spanners: From Expressive Power to Decision Problems <i>Dominik D. Freydenberger and Mario Holldack</i>	17:1–17:17
Algorithms for Provisioning Queries and Analytics <i>Sepehr Assadi, Sanjeev Khanna, Yang Li, and Val Tannen</i>	18:1–18:18

Schemas and Consistency

Limits of Schema Mappings <i>Phokion G. Kolaitis, Reinhard Pichler, Emanuel Sallinger, and Vadim Savenkov</i> .	19:1–19:17
Reasoning About Integrity Constraints for Tree-structured Data <i>Wojciech Czerwiński, Claire David, Filip Murlak, and Paweł Parys</i>	20:1–20:18
Complexity of Repair Checking and Consistent Query Answering <i>Sebastian Arming, Reinhard Pichler, and Emanuel Sallinger</i>	21:1–21:18

SPARQL and Graphs

On the Complexity of Enumerating the Answers to Well-designed Pattern Trees <i>Markus Kröll, Reinhard Pichler, and Sebastian Skritek</i>	22:1–22:18
---	------------

A Practically Efficient Algorithm for Generating Answers to Keyword Search
Over Data Graphs

Konstantin Golenberg and Yehoshua Sagiv 23:1–23:17

■ Preface

The 19th International Conference on Database Theory (ICDT 2016) was held in Bordeaux, France, March 15–18, 2016. Originally biennial, the ICDT conference has been held annually and jointly with EDBT (“Extending Database Technology”) since 2009.

The proceedings of ICDT 2016 include an overview of a keynote by Floris Geerts (University of Antwerp), an overview of a keynote by Yufei Tao (University of Queensland), a paper by David P. Woodruff (IBM Almaden) based on his invited lecture, a laudation concerning the ICDT 2016 Test of Time Award, and 19 research papers that were selected by the Program Committee from 41 submissions.

Out of the 19 accepted papers, the Program Committee selected the paper *Beyond Well-Designed SPARQL* by Mark Kaminski and Egor V. Kostylev for the ICDT 2016 Best Paper Award. Furthermore, the Program Committee selected the paper *A Framework for Estimating Stream Expression Cardinalities* by Anirban Dasgupta, Kevin Lang, Lee Rhodes, and Justin Thaler for the ICDT 2016 Best Newcomer Award. The Test of Time Award for ICDT 2016 is given to the paper *Conjunctive Query Containment Revisited* by Chandra Chekuri and Anand Rajaraman, which originally appeared in the proceedings of ICDT 1997. Warmest congratulations to the authors of these award winning papers!

I thank all authors who submitted papers to ICDT 2016. I would also like to thank all members of the Program Committee, and the external reviewers, for the enormous amount of work they have done. The Program Committee carried out extensive discussions during the electronic PC meetings, before and after rebuttal. I am very grateful to Foto Afrati, Claire David, and Georg Gottlob for their efforts and expertise in selecting the paper for the Test of Time Award. I thank Andrei Voronkov for his EasyChair system, which made it easy to manage and coordinate the discussion.

I thank the ICDT Council members for their help in selecting the Program Committee and in particular the Council Chair Thomas Schwentick for his continuous advice on a wide variety of matters concerning ICDT. Special thanks also go to Thomas Zeume, the Proceedings Chair of ICDT 2016. I thank last year’s PC Chair Marcelo Arenas and last year’s Proceedings Chair Martín Ugarte for sharing their knowledge and experience which substantially helped us in producing the proceedings. Finally, I thank many colleagues involved in the organisation of the conference for fruitful collaboration, in particular, Sofian Maabout (EDBT/ICDT 2016 Conference Chair).

Wim Martens
January 2016



■ Organization

Conference Chair

Sofian Maabout (U. of Bordeaux)

Program Chair

Wim Martens (U. of Bayreuth)

Program Committee

Yael Amsterdamer (Tel Aviv U.)
Pablo Barceló (U. de Chile)
Hubie Chen (U. del Pais Vasco and Ikerbasque)
Sara Cohen (Hebrew U. of Jerusalem)
Graham Cormode (U. of Warwick)
Wenfei Fan (U. of Edinburgh)
Amélie Gheerbrant (LIAFA, U. Paris Diderot)
Giorgio Ghelli (U. di Pisa)
Benny Kimelfeld (Technion)
Markus Krötzsch (TU Dresden)
Carsten Lutz (U. Bremen)
Wim Martens (U. of Bayreuth)
Anca Muscholl (LaBRI)
Jeffrey Naughton (U. of Wisconsin)
Dan Olteanu (U. of Oxford)
Juan Reutter (PUC Chile)
Luc Segoufin (INRIA)
Dan Suciu (U. of Washington)
Dirk Van Gucht (Indiana U.)
Ke Yi (Hong Kong U. of Science and Technology)

Proceedings Chair

Thomas Zeume (TU Dortmund U.)



■ External Reviewers

Pierre Bourhis
Simone Bova
Florent Capelli
Nicolas de Rugy-Altherre
André Hernich
Markus Latte
Stefan Mengel
Sebastian Siebertz
Francesco Silvestri
Domagoj Vrgoč
Haitao Wang
Adam Witkowski
Qirun Zhang



■ List of Authors

Serge Abiteboul
Sebastian Arming
Sepehr Assadi
Vince Barany
Paul Beame
Pierre Bourhis
Diego Calvanese
Wojciech Czerwiński
Anirban Dasgupta
Claire David
Dominik D. Freydenberger
Gaetano Geck
Floris Geerts
Konstantin Golenberg
Benoît Groz
Mario Holldack
Manas R. Joglekar
Mark Kaminski
Bas Ketsman
Sanjeev Khanna
Benny Kimelfeld
Phokion G. Kolaitis
Christian Konrad
Egor V. Kostylev
Paraschos Koutris
Markus Kröll
Kevin Lang
Ezra Levin
Yang Li
Elisa Marengo
Isaac Meilijson
Tova Milo
Pablo Muñoz
Filip Murlak
Frank Neven
Werner Nutt
Dan Olteanu
Magdalena Ortiz
Paweł Parys
Reinhard Pichler
Christopher M. Ré
Lee Rhodes
Yehoshua Sagiv
Emanuel Sallinger
Vadim Savenkov
Ognjen Savković
Thomas Schwentick
Mantas Šimkus
Sebastian Skritek
Dan Suciu
Val Tannen
Balder ten Cate
Yufei Tao
Justin Thaler
Zografoula Vagena
Victor Vianu
Nils Vortmeier
David P. Woodruff
Thomas Zeume



