

Lecture Notes in Computer Science

1154

Edited by G. Goos, J. Hartmanis and J. van Leeuwen

Advisory Board: W. Brauer D. Gries J. Stoer

Dino Pedreschi Carlo Zaniolo (Eds.)

Logic in Databases

International Workshop LID '96
San Miniato, Italy, July 1-2, 1996
Proceedings



Springer

Series Editors

Gerhard Goos, Karlsruhe University, Germany

Juris Hartmanis, Cornell University, NY, USA

Jan van Leeuwen, Utrecht University, The Netherlands

Volume Editors

Dino Pedreschi

Dipartimento di Informatica, Università degli Studi di Pisa

Corso Italia 40, I-56125 Pisa, Italy

E-mail: pedre@di.unipi.it

Carlo Zaniolo

Department of Computer Science, University of California at Los Angeles

Los Angeles, CA 90024, USA

E-mail: zaniolo@cs.ucla.edu

Cataloging-in-Publication data applied for

Die Deutsche Bibliothek - CIP-Einheitsaufnahme

Logic in databases : proceedings / International Workshop LID '96, San Miniato, Italy, July 1 - 2, 1996. Dino Pedreschi ; Carlo Zaniolo (ed.). - Berlin ; Heidelberg ; New York ; Barcelona ; Budapest ; Hong Kong ; London ; Milan ; Paris ; Santa Clara ; Singapore ; Tokyo : Springer, 1996

(Lecture notes in computer science ; Vol. 1154)

ISBN 3-540-61814-7

NE: Pedreschi, Dino [Hrsg.]; LID <1996, San Miniato>; GT

CR Subject Classification (1991): H.2, H.3.3, F.4.1, I.2.3

ISSN 0302-9743

ISBN 3-540-61814-7 Springer-Verlag Berlin Heidelberg New York

This work is subject to copyright. All rights are reserved, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, re-use of illustrations, recitation, broadcasting, reproduction on microfilms or in any other way, and storage in data banks. Duplication of this publication or parts thereof is permitted only under the provisions of the German Copyright Law of September 9, 1965, in its current version, and permission for use must always be obtained from Springer-Verlag. Violations are liable for prosecution under the German Copyright Law.

© Springer-Verlag Berlin Heidelberg 1996
Printed in Germany

Typesetting: Camera-ready by author
SPIN 10525557 06/3142 - 5 4 3 2 1 0 Printed on acid-free paper

Foreword

This volume contains the papers presented at the International Workshop on *Logic in Databases*, LID'96, held at San Miniato, Italy, July 1-2, 1996. The aim of the workshop is to identify and promote logic-based methods and techniques most relevant to the design and development of the next generation of information systems. In the call for papers, contributions were solicited that stress the usability, simplicity, and efficiency of logic-based solutions to relevant problems in the area of databases and information systems.

In response to the call for papers, 49 manuscripts were submitted. While the quality of submissions was generally high, only 21 papers could be accepted for presentation within the limited time allowed by the workshop format.

In addition to the contributed papers, this volume contains the papers by Jack Minker (Univ. of Maryland), who delivered the keynote lecture, and by Robert A. Kowalski (Imperial College), and Shalom Tsur (Argonne Nat. Lab.), who presented invited lectures.

Finally, the volume contains position statements for the panel discussion on "Deductive Databases: Challenges, Opportunities and Future Directions."

The LID'96 workshop is the result of the efforts of many, whom we would like to recognize and thank. In addition to authors of invited papers and contributed papers, the success of LID'96 must be credited to the distinguished program committee. A very special acknowledgment is also owed to the organizing committee. Besides the members of the program and organizing committees, the following researchers served as reviewers, and their effort is gratefully acknowledged:

A. Brogi
N. Heintze
K. Shim
D. Seipel
P. Breche
N. Shiri
A. Raffaetà
D. Boulanger
P. Mancarella
K.S. Candan
J. Simeon
F. Buccafurri
M. Stumptner
S. Adali
D. Aquilino

M. Gabbrielli
S. Greco
A. Siebes
V. Vassalos
Z. Lacroix
T. Eiter
F. Gire
H.M. Jamil
U. Straccia
B. Adelberg
M. Fugini
W. Slany
G. Ghelli
L. Palopoli
I.N. Subramanian

The workshop was made possible by the financial support of the Commission of the European Communities under the EC-US Cooperative Activity ECUS033—*Non-Determinism in Deductive Databases*. LID'96 is in fact the final workshop of this project.

We also acknowledge support from the NSF IRI program, Consiglio Nazionale delle Ricerche (CNR), Gruppo Nazionale per l'Informatica Matematica (GNIM) of CNR, Università di Pisa, CNUCE-Institute of CNR, Area di Ricerca di Pisa del CNR, Area “Logic-Based Databases” of Compulog-Net. We owe special thanks to Cassa di Risparmio di San Miniato, who provided the “Centro Studi I Cappuccini” where the workshop was held.

The paper by A. Bonner and M. Kifer, *Concurrency and Communication in Transaction Logic*, is not included in this volume since it is already published elsewhere.

Pisa, August 1996

Dino Pedreschi, Pisa, Italy
Carlo Zaniolo, Los Angeles, USA

Program Committee

- | | |
|--------------------------------------|-----------------------------------|
| P. Asirelli (IEI-CNR, Italy) | D. Saccà (U. Calabria, Italy) |
| M. Boehlen (Aalborg U., Denmark) | F. Sadri (Imperial College, UK) |
| A. Bonner (U. Toronto, CA) | F. Sadri (U. North Carolina, USA) |
| J. Chomicki (Monmouth U., USA) | O. Shmueli (Technion, Israel) |
| H. Decker (Siemens, Germany) | S. Sripada (ECRC, Germany) |
| U. Geske (GMD, Germany) | D. Srivastava (AT&T Bell L., USA) |
| M. Gelfond (UTEP, USA) | V.S. Subrahmanian (U. MD, USA) |
| F. Giannotti (CNUCE-CNR, Italy) | L. Tanca (U. Verona, Italy) |
| G. Gottlob (TU Wien, Austria) | S. Tsur (Argonne Nat. Labs, USA) |
| S. Grumbach (INRIA, France) | F. Turini (U. Pisa, Italy) |
| R. Kowalski (Imperial College, UK) | J. Ullman (Stanford U., USA) |
| L.V.S. Lakshmanan (Concordia U., CA) | V. Vianu (UCSD, USA) |
| I.S. Mumick (AT&T Research, USA) | J. Widom (Stanford U., USA) |
| K. Ross (Columbia U., USA) | |

Organizing Committee

- | | |
|---------------------------------|---------------------------------|
| M. Carboni (CNUCE-CNR, Italy) | C. Renso (Univ. Pisa, Italy) |
| S. Contiero (Univ. Pisa, Italy) | E. Ricciardi (IEI-CNR, Italy) |
| G. Manco (CNUCE-CNR, Italy) | S. Ruggieri (Univ. Pisa, Italy) |

Table of Contents

Keynote Lecture	1
<i>Logic and Databases: A 20 Year Retrospective</i>	3
J. Minker	
Uncertainty	59
<i>A Parametric Approach to Deductive Databases with Uncertainty</i>	61
L.V.S. Lakshmanan, N. Shiri	
<i>A Deductive Database Approach to Planning in Uncertain Environments</i> .	83
V. S. Subrahmanian, C. Ward	
Temporal and Spatial Reasoning	99
<i>Termination Properties of Spatial Datalog Programs</i>	101
B. Kuijpers, J. Paredaens, M. Smits, J. Van den Bussche	
<i>Applying Transition Rules to Bitemporal Deductive Databases for Integrity</i>	
<i>Constraint Checking</i>	117
C. Martín, J. Sistac	
Invited Lecture	135
<i>Towards a Unified Agent Architecture that Combines Rationality with</i>	
<i>Reactivity</i>	137
R. Kowalski, F. Sadri	
Updates	151
<i>Learning Query Rules for Optimizing Databases with Update Rules</i>	153
D. Laurent, C. Vrain	
Active Databases	173
<i>Formal Characterization of Active Databases</i>	175
C. Baral, J. Lobo	
<i>Nested Transactions in a Logical Language for Active Rules</i>	197
B. Ludäscher, W. May, G. Lausen	
Panel Discussion	223
<i>Deductive Databases: Challenges, Opportunities and Future Directions</i> . .	225
with the participation of A. Siebes, S. Tsur, J. Ullman, L. Vielle, C. Zaniolo	
Semantics	231
<i>R-Stable Models for Logic Programs</i>	233
H. Jakobovits, D. Vermeir	

<i>The Expressive Power of Partial Models in Disjunctive Deductive Databases</i>	245
T. Eiter, N. Leone, D. Sacca	
<i>Stable Model Checking for Disjunctive Logic Programs</i>	265
N. Leone, P. Rullo, F. Scarcello	
Advanced Applications	279
<i>Analysis of Logic-Based Systems</i>	281
D. Boulanger	
<i>An Axiomatic Interpretation of Confidentiality Demands in Logic-Based Relational Databases</i>	303
A. Spalka, A.B. Cremers,	
Query Evaluation	321
<i>Database Query Evaluation with the STARBASE Method</i>	323
E. Pulido	
<i>The Limits of Fixed-Order Computation</i>	343
K. Sagonas, T. Swift, D.S. Warren	
Invited Lecture	365
<i>The IQ System: A Deductive Database Information Lens for Reasoning about Textual Information</i>	367
B. Kero, S. Tsur	
Language Extensions	387
<i>Arithmetic and Aggregate Operators in Deductive Object-Oriented Databases</i>	389
G. Dobbie, R. Topor	
<i>Sequence Datalog: Declarative String Manipulation in Databases</i>	399
A. Bonner, G. Mecca	
<i>Language Extensions for Semantic Integration of Deductive Databases</i>	415
P. Asirelli, C. Renso, F. Turini	
<i>Unification of Bounded Simple Set Terms in Deductive Databases</i>	435
S. Greco, C. Mateis, E. Spadafora	
Logic Constructs and Expressive Power	455
<i>Expressiveness of Semipositive Logic Programs with Value Invention</i>	457
L. Cabibbo	
<i>A More Expressive Deterministic Query Language with Efficient Symmetry-Based Choice Construct</i>	475
F. Gire, H.K. Hoang	
<i>Author Index</i>	497