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# Reasoning Web

## Semantic Interoperability on the Web


13th International Summer School 2017  
London, UK, July 7–11, 2017  
Tutorial Lectures

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# Preface

This volume contains tutorial papers prepared for the 13th Reasoning Web Summer School (RW 2017), held during July 7–11, 2017, in London, United Kingdom.

The Reasoning Web series of annual summer schools was initiated in 2005 by the European Network of Excellence REWERSE. Since 2005, the school has become the prime educational event in the field of reasoning techniques on the Web, attracting both young and established researchers. Previous editions of the school were held in Malta (2005), Lisbon (2006), Dresden (2007 and 2010), Venice (2008), Bressanone-Brixen (2009), Galway (2011), Vienna (2012), Mannheim (2013), Athens (2014), Berlin (2015), and Aberdeen (2016). For each edition, a volume has been published containing the school lecture notes, which are today considered fundamental bibliographic references in the Semantic Web and Knowledge Representation areas.

Since 2011 the school has been co-located with the International Conference on Web Reasoning and Rule Systems (RR), and in 2015 it was also co-located with the International Web Rule Symposium (RuleML). Following this tradition, the 2017 edition of the school was held together with RuleML+RR, a conference that joined the RuleML and RR event series. In addition, it was also co-located with DecisionCAMP 2017 and the 11th International Rule Challenge. RW 2017 was hosted by Birkbeck, University of London, and was organized by University of Calabria and by Sapienza, University of Rome.

In 2017, the theme of the school was “Semantic Interoperability on the Web,” which encompasses subjects such as data integration, open data management, reasoning over linked data, database to ontology mapping, query answering over ontologies, hybrid reasoning with rules and ontologies, and ontology-based dynamic systems. The RW 2017 lectures were focused on these topics and also addressed foundational reasoning techniques used in answer set programming and ontologies. This volume contains the following tutorial papers, each accompanying a school lecture:

- “Challenges for Semantic Data Integration on the Web of Open Data”, in which Axel Polleres (presenter), Sebastian Neumaier, Jürgen Umbrich, and Simon Steyskal discuss main challenges related to the integration of open data over the Web (data formats, license and usage issues, data quality problems, etc.);
- “Ontological Query Answering over Semantic Data,” in which Giorgos Stamou (presenter) and Alexandros Chortaras study data access mediated by an ontology, and present methods for data integration, query rewriting, and query answering when ontologies are specified in both tractable and expressive Description Logics;
- “Ontology Querying: Datalog Strikes Back,” where Andrea Cali faces query answering over Datalog+/-, a family of ontology languages allowing for Datalog rules enriched with existential quantification in the head;
- “Integrating Relational Databases with the Semantic Web,” in which Juan Sequeda surveys methods and standards to realize RDF access to relational databases and reviews how these standards can be used in practice for data integration;

- “Datalog Revisited for Reasoning in Linked Data,” in which Marie-Christine Rousset describes a unifying Datalog-based framework for RDF ontologies and databases, and discusses modeling and reasoning over Linked Data within this framework;
- “A Tutorial on Hybrid Answer Set Solving,” in which Torsten Schaub (presenter), Roland Kaminski, and Philipp Wanko introduce Answer Set Programming and show its usage in complex software environments and interaction with complementary forms of reasoning;
- “Answer Set Programming with External Source Access,” in which Thomas Eiter (presenter), Tobias Kaminski, Christoph Redl, Peter Schüller, and Antonius Weinzierl continue the investigation on hybrid systems, and describe how ASP can interact with external resources in the DLVHEX system;
- “Uncertainty Reasoning for the Semantic Web,” in which Thomas Lukasiewicz provides an overview of formalisms for handling uncertainty and/or vagueness in the Semantic Web;
- “Ontology-Based Data Access for Log Extraction in Process Mining,” in which Marco Montali (presenter), Diego Calvanese, Tahir Emre Kalayci, and Ario Santoso show how semantic technologies, and in particular ontology-based data access, provide a viable solution for data preparation and log extraction for the task of process mining.

The tutorial papers are either in-depth surveys or shorter papers containing references to existing work. These papers have been written as accompanying material for the students of the summer school, in order to deepen their understanding and to serve as a reference for further detailed study.

We would like to thank everybody who contributed to the realization of this event. First and foremost, the school lecturers and their co-authors. We also want to thank the institutions of the school lecturers, which sponsored the school by covering the travel costs of the speakers. Furthermore, we would like to thank the general chairs of the RuleML+RR conference, Roman Kontchakov and Fariba Sadri, for their help in the logistic organization of the event, the sponsorship chair, Nick Bassiliades, and the Web chair, William Van Woensel, for taking care of the school website.

May 2017

Giovambattista Ianni  
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# Contents

Data Integration for Open Data on the Web . . . . .	1
<i>Sebastian Neumaier, Axel Polleres, Simon Steyskal, and Jürgen Umbrich</i>	
Ontological Query Answering over Semantic Data . . . . .	29
<i>Giorgos Stamou and Alexandros Chortaras</i>	
Ontology Querying: Datalog Strikes Back . . . . .	64
<i>Andrea Cali</i>	
Integrating Relational Databases with the Semantic Web: A Reflection . . . . .	68
<i>Juan F. Sequeda</i>	
Datalog Revisited for Reasoning in Linked Data . . . . .	121
<i>Marie-Christine Rousset, Manuel Atencia, Jerome David, Fabrice Jouanot, Olivier Palombi, and Federico Ulliana</i>	
A Tutorial on Hybrid Answer Set Solving with <i>clingo</i> . . . . .	167
<i>Roland Kaminski, Torsten Schaub, and Philipp Wanko</i>	
Answer Set Programming with External Source Access . . . . .	204
<i>Thomas Eiter, Tobias Kaminski, Christoph Redl, Peter Schüller, and Antonius Weinzierl</i>	
Uncertainty Reasoning for the Semantic Web . . . . .	276
<i>Thomas Lukasiewicz</i>	
OBDA for Log Extraction in Process Mining . . . . .	292
<i>Diego Calvanese, Tahir Emre Kalayci, Marco Montali, and Ario Santoso</i>	
<b>Author Index</b> . . . . .	347