



Vienna Center for  
Logic and Algorithms



Annual Report 2014/2015

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**Image credits:** Nadja Meister (unless stated otherwise)

# Contents

4	About VCLA
5	Organization
6	Activities
6	Cooperation: Logical Methods in Computer Science
7	Cooperation: Vienna Science Ball
8	New Initiative: Informatik_Austria
10	Conference: PhDs in Logic VII
11	Distinction: VCLA International Student Awards
12	LogicLounge: Dana S. Scott and Irene Schreier Scott
14	Symposium: New Frontiers in Knowledge Compilation
15	Workshop: Logical Dialogue Games
16	Invited Speakers and Visitors
18	Media Coverage
20	VCLA Chairs
21	Participants of VCLA Events

# About VCLA



Vienna Center for Logic and Algorithms

The Vienna Center for Logic and Algorithms (VCLA) is a globally unique competence center in the field of logic and algorithm research. It was founded in September 2011 and officially opened in January 2012 in the presence of the rector of the Technische Universität Wien (TU Wien) Sabine Seidler and Turing Award laureate Edmund M. Clarke.

The Center is led by its two founders, Stefan Szeider and Helmut Veith.

The VCLA scientific program 2011-2015 focused on

- Constraint Satisfaction
- Verification of Hardware and Software, and
- Knowledge Representation



The VCLA was funded by TU Wien for its first four-year period and will continue to be funded for another four years as a part of the Doctoral College Logical Methods in Computer Science (LogiCS).

The Center aims to promote international scientific collaboration in logic and algorithms and to communicate Austria's excellence in these two areas of computer science research, using a variety of channels.

These objectives are realized through activities such as

- the VCLA Workshop Series
- the VCLA Schools, a series of winter and summer schools
- the VCLA Visitor Program
- the hosting of talks by renowned international speakers, and
- the co-organisation of events

# Organization

The VCLA is managed by a local board in collaboration with an international advisory board. The local board is responsible for day-to-day management and consults with the advisory board about strategic decisions.

Board	Advisory Board
Thomas Eiter	Matthias Baaz (TU Wien)
Georg Gottlob	Roderick Bloem (TU Graz)
Alexander Leitsch	Agata Ciabattoni (TU Wien)
Reinhard Pichler	Nadia Creignou (Université d'Aix-Marseille)
Stefan Szeider (co-chair)	Anuj Dawar (University of Cambridge)
Helmut Veith (co-chair)	Fedor Fomin (University of Bergen)
	Laura Kovács (TU Wien)
	Miroslaw Truszczynski (University of Kentucky)
	Moshe Y. Vardi (Rice University)

Public Relations and Project Management
Katarina Singer

## Collaborations

The VCLA frequently collaborates with the following institutions, all of which also provide co-financing for various events and activities:

- Institute of Discrete Mathematics and Geometry at TU Wien
- Kurt Gödel Society (KGS)
- Austrian Rigorous Systems Engineering (ARiSE)
- Wolfgang Pauli Institute (WPI)
- Institute of Science and Technology Austria (IST Austria)

## Logic and Algorithms Groups

The Center is hosted by five research groups at the Faculty of Informatics:

- AC - Algorithms and Complexity Group
- DBAI - Database and Artificial Intelligence Group
- FORSYTE - Formal Methods in Systems Engineering Group
- KR - Knowledge-Based Systems Group
- Theory and Logic Group

# Activities

## Cooperation: Logical Methods in Computer Science

The Doctoral College Logical Methods in Computer Science (LogiCS) was established in March 2014 and is led by Helmut Veith and Stefan Szeider.

LogiCS is a PhD degree program funded by the Austrian Science Fund FWF and run jointly by three Austrian universities (TU Wien, Graz University of Technology and Johannes Kepler University Linz). Its faculty comprises fifteen renowned researchers with strong records in research, teaching and advising, complemented by twelve associated members.



The program is aimed at highly motivated students who want to work in one of three fundamental fields of computer science: Databases and Artificial Intelligence, Verification, and Computational Logic.

The first year of the program was very successful: It attracted excellent students from fifteen countries, and fifty percent of the fully funded students are female.

<http://logic-cs.at/phd>



Several of  
the LogiCS  
students

© Sara Meister

# Activities

## Cooperation: Vienna Science Ball

The very first Vienna Science Ball took place on January 31, 2015 and was met with great interest from national and international audiences. Nearly 2000 people filled the ball rooms of the Vienna City Hall to their maximum capacity, rendering the first edition of this ball a large success.

As one of the partners of the Vienna Science Ball, the VCLA contributed to the event in several ways. Helmut Veith participated in the midnight interlude, which is a traditional element of Viennese balls, and wrote an article for the ball magazine. Katarina Singer served



## Wiener Ball der Wissenschaften

as assistant to the ball organizer, Oliver Lehmann.

In order to promote the topic of logic during the Vienna Science Ball, a postcard with a ball-related riddle (seating arrangement with several constraints) was produced. Together with VCLA-branded pencils, the card was distributed among the ball guests, sparking their interest and competitive streak.

<http://www.wissenschaftsball.at>

### Loge am Ball der Logiker heiß umkämpft!

Es gibt Schwierigkeiten bei der Sitzordnung, da alte Feindschaften gepflegt werden. Jeder Ehrengast hat eine Liste an Personen, neben welchen er/sie nicht sitzen möchte. Können Sie den Logikern bei der Lösung dieses praktischen sozialen Problems helfen?

**Gästeliste**  
Dan, Ed, Ida, Kay, Lee, Mel, Pat, Ron, Sam, Val

Dieses Dilemma ist eines der berühmtesten NP-vollständigen Probleme der theoretischen Informatik. Dem/der Erfinder/in eines effizienten Lösungsverfahrens für große Tische winkt ein Preis von **\$1.000.000** (mehr unter [www.vcla.at/np/](http://www.vcla.at/np/)). Kleine Probleme wie dieses können von einem herkömmlichen PC in Sekundenbruchteilen gelöst werden.

Gast	sitzt nicht direkt neben
Dan	Ed, Pat, Sam
Ed	Ida, Mel, Sam
Ida	Dan, Pat, Ron, Sam, Val
Kay	Ed, Ida, Lee, Sam, Val
Mel	Dan, Kay, Lee, Pat, Ron, Val
Ron	Dan, Ed, Sam, Val

The logic puzzle belongs to the class of np-complete problems.

© Anna Petukhova

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[www.vcla.at](http://www.vcla.at)

# Activities

## New Initiative: Informatik\_Austria

The platform Informatik\_Austria was initiated in autumn 2014 by representatives of computer science departments at several Austrian universities and the Institute of Science and Technology Austria.

VCLA co-chair Helmut Veith is one of the founding members of this initiative and VCLA manager Katarina Singer provides support in organizational and administrative matters.

The official kick-off was held in late March 2015, with an accompanying media seminar and an instance of the successful LogicLounge series which had been established a few months



Oliver Lehmann (co-creator of the LogicLounge)



Gerhard Widmer, Elke Ziegler, Peter Norvig



Launch of the initiative at Cafe Heuer am Karlsplatz

# Activities

before in connection with the Vienna Summer of Logic 2014.

In the media seminar, journalists were introduced to several highlights of Austrian computer science research, covering areas such as Software Engineering

& Verification, and Visual Computing.

The evening program included the LogicLounge with Peter Norvig (Google, Inc.), Elke Ziegler (Ö1 radio) and Gerhard Widmer (JKU Linz), the official introduction of Informatik\_Austria to the public and a networking phase after the LogicLounge.

A two-day workshop with representatives from all participating institutions was organized in June 2015 to plan future activities of the initiative. These activities will focus on strengthening the visibility of Austrian computer science among members of the public and the academic community.

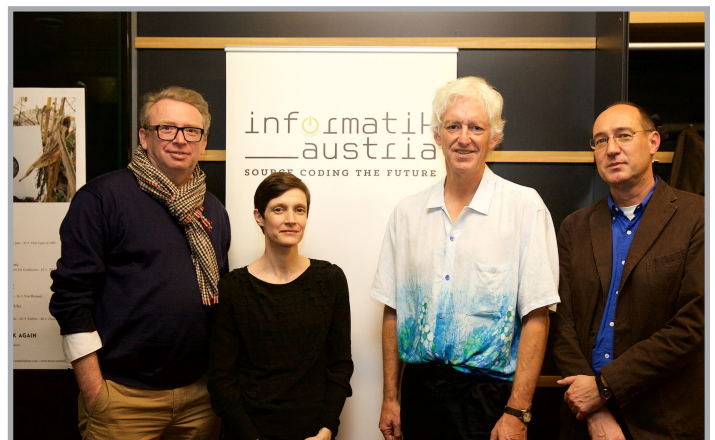
<http://www.informatikaustria.at>



The LogicLounge was attended by more than 60 people



Cafe Heuer at Karlsplatz, LogicLounge venue



O. Lehmann, E. Ziegler, P. Norvig, G. Widmer

# Activities

## Conference: PhDs in Logic VII

The seventh edition of the PhDs in Logic conference took place at TU Wien from May 14 to 16, 2015. It was supported by the VCLA and the Doctoral College Logical Methods in Computer Science. More than 60 people attended this conference.

PhDs in Logic is a graduate conference organized by local graduate students. Its aim is to bring together graduate students and researchers as well as to foster contact between the students.

Previous editions took place in Ghent (2009, 2012), Tilburg (2010), Brussels (2011), Munich (2013) and Utrecht (2014).



The participants attended the famous summer night concert in the Schönbrunn Park  
© VCLA

## Tutorial Speakers

- Thomas Eiter (TU Wien)
- Michael Moortgat (U. Utrecht)
- Revantha Ramanayake (TU Wien)
- Uli Sattler (U. Manchester)
- Torsten Schaub (U. Potsdam)

## Scientific Committee

- Agata Ciabattoni (TU Wien)
- Jan van Eijck (CWI, Amsterdam)
- Chris Fermüller (TU Wien)
- Nina Gierasimczuk (U. Amsterdam)
- Martin Goldstern (TU Wien)
- Thomas Icard (Stanford U.)
- Eric Pacuit (U. Maryland)
- Jakub Szymanik (U. Amsterdam)
- Anna Zamansky (U. Haifa)

## Advisory Board

- Stefan Szeider (TU Wien)
- Helmut Veith (TU Wien)

## Organizing Committee

- Ronald de Haan (TU Wien)
- Martin Kronegger (TU Wien)

<http://phdsinlogic.logic-cs.at>

# Activities

## Distinction: VCLA International Student Awards

The highly successful first edition of the VCLA International Student Awards was concluded in May 2015 with the celebration of four winners in two award categories.

Out of thirty submissions in total, three were ranked equal for the Outstanding Master Thesis Award and one was selected for the Outstanding Undergraduate Research Award by a committee consisting of twelve internationally recognized researchers.

The award ceremony took place as part of the conference PhDs in Logic VII.

The VCLA chairs Stefan Szeider and Helmut Veith congratulated the following award recipients:

### Outstanding Master Thesis Award

**Kuldeep S. Meel** (Thesis: Sampling Techniques for Boolean Satisfiability)

**Luke Schaeffer** (Thesis: Deciding Properties of Automatic Sequences)

**Sophie Spirkl** (Thesis: Boolean Circuit Optimization)

### Outstanding Undergraduate Research Award

**Pablo Muñoz** (Thesis: New Complexity Bounds for Evaluating CRPQs with Path Comparisons)

The VCLA International Student Awards are given to authors of outstanding scientific works in the field of Logic and Computer Science.

<http://logic-cs.at/award>



From left: Helmut Veith, Pablo Muñoz, Kuldeep S. Meel, Luke Schaeffer, Sophie Spirkl, Magdalena Ortiz, Stefan Szeider

Photography © VCLA

# Activities

## LogicLounge: Dana S. Scott and Irene Schreier Scott

In June 2015, the VCLA welcomed two honoured guests - Turing Award winner Dana S. Scott and his wife, Irene Schreier Scott. Both agreed to participate in an instalment of the successful LogicLounge series which had begun during the Vienna Summer of Logic 2014.

The setting for this instance of the LogicLounge were the halls of the exhibition “The Vienna Circle - Exact Thinking in Demented Times”, curated by Karl Sigmund and Friedrich Stadler, professors at the University of Vienna. Tanja Traxler (Der Standard) moderated the discussion.



Before the discussion, the participants enjoyed a special guided tour through the exhibition, led by Karl Sigmund.

<http://www.univie.ac.at/Ausstellung-WienerKreis>



Tanja Traxler, Dana S. Scott, Irene Schreier Scott



Exhibition hall at the University of Vienna

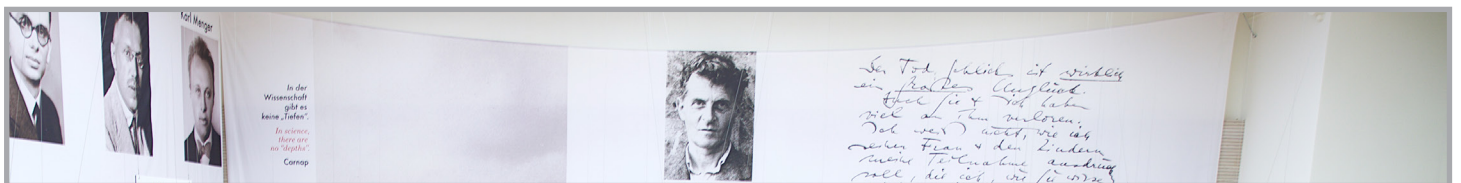
# Activities



Vienna Circle exhibition



Vienna Circle exhibition



Thomas Eiter at the Vienna Circle exhibition



Logicomix at the Vienna Circle exhibition

# Activities

## Symposium: New Frontiers in Knowledge Compilation

This symposium was jointly funded by the VCLA and the Wolfgang Pauli Institute and took place from June 4 to 6, 2015. It was chaired by Pierre Marquis (CRIL-CNRS/Université d'Artois, France) and Stefan Szeider. Thirty-two participants from Europe and North America attended the symposium.

The aim of this symposium was to bring together researchers who work on knowledge compilation from various angles (including knowledge representation, constraints, theory of algorithms, complexity, machine learning, and databases) as well as researchers from related areas.



### Invited speakers

- Simone Bova (TU Wien)
- Guy Van den Broeck (U. California Los Angeles)
- Hubie Chen (U. País Vasco and Ikerbasque)
- Adnan Darwiche (U. California Los Angeles)
- Hélène Fargier (IRIT-CNRS, U. Paul Sabatier)
- Frédéric Koriche (CRIL-CNRS, U. d'Artois)
- Stefan Kratsch (U. Bonn)
- João Marques-Silva (IST/INESC-ID and UC Dublin)
- Igor Razgon (Birkbeck U. London)
- Dan Suciú (U. Washington)

<http://www.vcla.at/kc2015>



Symposium Chairs Pierre Marquis and Stefan Szeider

© VCLA

# Activities

## Workshop: Logical Dialogue Games

This VCLA-sponsored workshop took place on September 28-29, 2015 and brought together the latest research in dialogical logic.

Formal logic can be viewed through the lens of game theory as witnessed by Lorenzen's dialogue game for intuitionistic logic. By connecting proofs on the one hand to winning strategies on the other hand one may strive for a deeper understanding of logical concepts like validity, (in)dependence, or possibility. Vice versa, one may investigate how certain properties of these games are reflected in the resulting logics.

### Invited Speakers

Erik C.W. Krabbe (U. Groningen)

Helge Rückert (U. Mannheim)

### Organizers

Chris Fermüller (TU Wien)

Christoph Roschger (TU Wien)

### Participants

- Paola Baldi (TU Wien)
- Stefano Berardi (U. Torino)
- Esther Corsi (TU Wien)
- Chris Fermüller (TU Wien)
- Rohan French (U. Groningen)
- Matthias Hofer (TU Wien)
- Erik C.W. Krabbe (U. Groningen)
- Michael Mendler (U. Bamberg)
- Nika Pona (TU Wien)
- Christoph Roschger (TU Wien)
- Helge Rückert (U. Mannheim)
- Marin Sticht (U. Bamberg)

<http://www.logic.at/staff/roschger/workshop>

# Invited Speakers and Visitors

More than thirty talks by speakers from countries across the world have been hosted by the VCLA during the past year. An online listing with abstracts is available at <http://www.vcla.at/category/talks/>

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**Piero Bonatti (Università di Napoli Federico II):**  $DL^N$ : a utilitarian nonmonotonic description logic

**Alexey Ignatiev (INESC ID Lisboa):** Efficient Model Based Diagnosis with Maximum Satisfiability

**Caterina Urban (ENS Paris):** Abstract Interpretation as Automated Deduction

**Sarah Kirchner (RWTH Aachen):** Appointment scheduling in hospitals - sequencing and scheduling using time aggregation

**Stephan Holzer (Massachusetts Institute of Technology):** New Algorithms and Lower Bounds in Distributed Computing

**Alexandru Popa (Masaryk University Brno):** Algorithmic and Hardness Results for the Colorful Components Problems

**Paolo Papotti (Università degli Studi Roma Tre):** Beyond declarative data cleaning

**Dana S. Scott (Carnegie Mellon University):** Can Modalities Save Naive Set Theory?

**Peter Stadler (Universität Leipzig):** Dynamic Programming for Lazy Bastards

**Wolfgang Gatterbauer (Carnegie Mellon University):** The Linearization of Pairwise Markov Random Fields

**Tomáš Vojnar (Brno University of Technology):** From Pointers to List Containers

**András Vörös (Budapest University of Technology and Economics):** Saturation-based incremental LTL model checking with inductive proofs

**Wolfgang Dvorak (Universität Wien):** Welfare Maximization with Friends-of-Friends Network Externalities

**Hubie Chen (Universidad del País Vasco):** The Logic of Counting Query Answers: A Study via Existential Positive Queries

**Yoram Moses (Technion):** Principles of Coordination in Multi-agent Systems

**Neng-Fa Zhou (City University New York):** The Picat Language and System

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**Andrej Bauer (University of Ljubljana):** An Introduction to Algebraic Effects and Handlers

**James Anderson (Oxford University):** Graph Decomposition for Large-Scale Dynamical System Analysis

**Hannes Strass (Universität Leipzig):** Abstract Argumentation and Approximation Fixpoint Theory

**Roopsha Samanta (IST Austria):** Succinct Representation of Concurrent Trace Sets

**Iyad Kanj (DePaul University):** On Bounded-Degree Plane Geometric Spanners

**Helmut Seidl (Technische Universität München):** Parametric Strategy Iteration

**Gordon Cichon (Ludwig-Maximilians-Universität München):** Formal Semantics of Synchronous Transfer Architecture

**Christian Scheideler (Universität Paderborn):** Towards a rigorous base for the design of P2P systems

**Pavithra Prabhakar (University of Illinois at Urbana Champaign):** Algorithmic Verification of Stability of Hybrid Systems

**Lenore D. Zuck (University of Illinois at Chicago):** Parameterized Verification: Theory and Practice

**Nathan Wasser (Technische Universität Darmstadt):** Abstraction On-Demand: Automatically Generating Invariants for Loops and Recursive Method Calls

**Vinay K. Chaudhri (Stanford Research International):** An Architecture for Intelligence Using Prototypes, Composition and Analogy

**Stefan Mengel (Laboratoire d'Informatique de l'École Polytechnique):** Understanding model counting for beta-acyclic CNF-formulas

**Johann A. Makowsky (Technion):** Sets and Logic for CS: How to teach what is useful

**Marco Maratea (University of Genova):** Multi-Engine Answer Set Programming

# Media Coverage

During the course of this reporting period, the VCLA was present in the media through the initiatives supported by its members.

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## **Informatik\_Austria**

June 2015

24-page “Heureka” supplement to *Falter* magazine 27/15 (German)

New platform: Informatik\_Austria

<https://www.falter.at/heureka/ausgabe/informatik-austria-315>

March 31, 2015

Article on *Derstandard.at* (German)

The universal science of the 21st century

<http://derstandard.at/2000013709371/Die-Universalwissenschaft-des-21-Jahrhunderts>

March 27, 2015

Article on *Derstandard.at* (German)

Source coding the future: new platform founded by computer science departments

<http://derstandard.at/2000013558057/Quellcode-der-Zukunft-Informatik-Institute-gruenden-Plattform>

Article on *futurezone.at* (German)

New platform founded by university computer science departments

<http://futurezone.at/science/informatik-institute-der-unis-gruenden-eigene-plattform/121.829.691>

Article on *WienerZeitung.at* (German)

The “source code of the future”

[http://www.wienerzeitung.at/themen\\_channel/wz\\_digital/digital\\_news/743050\\_Der-Quellcode-der-Zukunft.html](http://www.wienerzeitung.at/themen_channel/wz_digital/digital_news/743050_Der-Quellcode-der-Zukunft.html)

# Media Coverage

During the course of this reporting period, the VCLA was present in the media through the initiatives supported by its members.

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March 24, 2015

Article on *science.orf.at* (German)

“Good” machines are more important than “intelligent” ones

<http://science.orf.at/stories/1755882>

Article on *futurezone.at* (German)

Google Director of Research: search engines are getting more talkative

<http://futurezone.at/digital-life/google-forschungschef-suchmaschinen-werden-gespraechiger/121.241.443>

Article on *Tiroler Tageszeitung Online* (German)

Google Director of Research: AI as a reliable “engineering discipline”

<http://www.tt.com/home/9804154-91/google-forschungschef-2-ki-als-verl%C3%A4ssliche-engineering-disziplin.csp>

Article on *Südtirolnews* (German)

Google Director of Research on the search engine of the future

<http://www.suedtirolnews.it/d/artikel/2015/03/24/google-forschungschef-ueber-die-suchmaschine-der-zukunft.html>

## Vienna Science Ball

February 6, 2015

News in *Science Magazine*, 6 February, 2015, Vol. 347, Issue 6222

“Science has a ball”

[www.sciencemag.org/content/347/6222/590.full.pdf](http://www.sciencemag.org/content/347/6222/590.full.pdf)

# VCLA Chairs



Helmut Veith and Stefan Szeider, founders and co-chairs of the VCLA

© Nadja Meister / Anna Petukhova

Stefan Szeider and Helmut Veith are co-chairs of the Vienna Center for Logic and Algorithms. They founded the VCLA in 2011, assuming the strategic leadership over its activities.

Stefan Szeider is a full professor at TU Wien and head of the Algorithms and Complexity Group at the Faculty of Informatics. He is also the deputy speaker of the Doctoral Program Logical Methods in Computer Science, and scientific co-organizer of the Vienna Gödel Lectures.

In his research, Szeider combines algorithmic and logic-based methods for the efficient solution of hard problems that arise in Artificial Intelligence, Automated Reasoning, and Combinatorial Optimization, complemented by complexity-theoretic methods for establishing theoretical limits and lower bounds.

Helmut Veith is a full professor at TU Wien and head of the Formal Methods in Systems Engineering Group at the Faculty of Informatics. He is also an adjunct professor at Carnegie Mellon University and the speaker of the Doctoral Program Logical Methods in Computer Science.

In his research, Helmut Veith applies formal and logical methods to problems in software technology and engineering. His current work is focusing on model checking, software verification and testing, embedded software and computer security.

# Participants of VCLA Events

## PhDs in Logic

Shqiponja Ahmetaj	Michael Moortgat
Alina Aleksandrova	Pablo Munoz
Labintot Bajraktari	Magdalena Ortiz
Ásgeir Berg Matthíasson	Maria Otworowska
Annemarie Borg	Matteo Pascucci
Simone Bova	Sopo Pkhakadze
Gergely Buday	Sylwia Polberg
Esther Anna Corsi	Florian Pollak
Theresa Csar	Anna Prianichnikova
Ronald de Haan	Revantha Ramanayake
Martin Diller	Raine Rönnholm
Eduard Eiben	Antonia Rothmayr
Thomas Eiter	Zeynep Saribatur
Johannes Fichte	Uli Sattler
Wolfgang Fischl	Luke Schaeffer
Francesco Antonio Genco	Torsten Schaub
Krystyna Grabski	Ilina Stoilkovska
Daniel Günzel	Christof Spanring
Jesse Heyninck	Sophie Spirkl
Julia Ilin	Francesco Sportelli
Marlene Koelbing	Florian Steinberg
Michael Kompatscher	Daria Stepanova
Daniel Körnlein	Stefan Szeider
Angeliki Koutsoukou-Argraki	Anda Ramona Tanasie
Markus Kröll	Apostolos Tzimoulis
Martin Kronegger	Sara Ugolini
Roman Kuznets	Marvin Uhlmann
Marijana Lazic	Iris van de Pol
Michael Lettmann	Helmut Veith
Thomas Linsbichler	Przemysław Wałęga
Neha Lodha	Gregory Wilsenach
Kuldeep Meel	Stefan Woltran
Diana Carolina Montoya Amaya	Zhiguang Zhao

## Symposium on New Frontiers in Knowledge Compilation

Gilles Audemard  
Simone Bova  
Florent Capelli  
Ondrej Cepek  
Hubie Chen  
Adnan Darwiche  
Jessica Davies  
Ronald de Haan  
Eduard Eiben  
Hélène Fargier  
Johannes Fichte  
Frédéric Koriche  
Stefan Kratsch  
Oliver Kullmann  
Jean-Marie Lagniez  
Neha Lodha  
Joao Marques-Silva  
Pierre Marquis  
Stefan Mengel  
Alexandre Niveau  
Jakob Nordström  
Dan Olteanu  
Sebastian Ordyniak  
Umut Oztok  
Igor Razgon  
Zeynep Saribatur  
Marco Schaerf  
Laurent Simon  
Friedrich Slivovsky  
Dan Suciu  
Stefan Szeider  
Guy Van den Broeck



Vienna Center for  
Logic and Algorithms



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FÜR INFORMATIK

Faculty of Informatics

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