

Preface

CiE 2016: Pursuit of the Universal
Paris, France, June 27 – July 1, 2016



This year Computability in Europe (CiE) honored the 80th anniversary of A. Turing's paper introducing the Universal Turing Machine. In this context the conference sought better understanding of universal computational frameworks ranging from mathematics, computer science, through various natural sciences such as physics and biology. CiE provides a forum for exchanging ideas on broad aspects of "computability" striving to understand the essence of computation through studies of theoretical models of new paradigms, information processing, encryption, philosophy and history of computing as well as computability in natural and biological systems. This year's CiE conference was held in Paris and through a sequence of tutorials, plenary lectures, and special sessions allowed in-depth discussions and novel approaches in pursuit of the nature of computability. Similarly to previous CiE conferences in this series, CiE 2016 had a broad scope promoting the development of computability-related science.

The conference series is organized under auspices of the Association CiE. The association promotes the development of all areas of mathematics, computer science, as well as natural and engineering sciences that study the notion of "computability," including its philosophical and historical developments. The conference series is a venue where researchers in the field meet and exchange the most novel features of their findings.

CiE 2016 was organized jointly by Université Paris 13 and Université Paris 7, chaired by Paulin de Naurois at Université Paris 13. The previous CiE conferences were held in Amsterdam (The Netherlands) in 2005, Swansea (Wales) in 2006, Siena (Italy) in 2007, Athens (Greece) in 2008, Heidelberg (Germany) in 2009, Ponta Delgada (Portugal) in 2010, Sofia (Bulgaria) in 2011, Cambridge (UK) in 2012, Milan (Italy) in 2013, Budapest (Hungary) in 2014, and Bucharest (Romania) in 2015. The proceedings containing the best submitted papers as well as extended abstracts of invited speakers for all these meetings are published in the Springer series *Lecture*

Notes in Computer Science. The annual CiE conference has risen to be the largest international meeting focused on computability theory issues. CiE 2017 will be held in Turku, Finland. The leadership of the conference series recognizes that there is under-representation of female researchers in the field of computability and therefore incorporates a special session of Women in Computability (WiC) in every CiE conference. WiC was initiated in 2007, and was first funded by the Elsevier Foundation, later taken over by the publisher Elsevier. This year's program, organized by Liesbeth De Mol, besides the regular workshop also provided travel grants for junior female researchers and a mentorship program.

The 39-member Program Committee of CiE 2016 was chaired by Laurent Bienvenu (IRIF, CNRS, and Université Paris 7, France), and Nataša Jonoska (University of South Florida, Tampa, USA). The committee selected the plenary speakers and the special session organizers, and ran the reviewing process of all the regular contributions submitted. We received 40 non-invited contributed paper submissions. Each paper received at least three reviews by the Program Committee and additional reviewers. About 45 % of the submitted papers were accepted for publication in this volume. In addition, this volume contains 19 extended abstracts/papers contributed by plenary speakers and speakers of the invited sessions. The production of the volume would have been impossible without the diligent work of all of the Program Committee members and our expert reviewers. We are very grateful to all the Program Committee members and the reviewers for their excellent work.

All authors who contributed to this conference were encouraged to submit significantly extended versions of their papers with unpublished research content to *Computability*, the journal of the Association CiE.

This year the conference started with a special session honoring the memory of Barry Cooper, one of the initiators and founders of the conference as well as a driving force behind the organization of CiE, including the presidency of the association. The session was organized by Mariya Soskova and the contributors were Theodore Slaman (University of California Berkeley), Andrea Sorbi (University of Siena), Dag Norman (University of Oslo), and Ann Copestake (Cambridge University).

Two tutorials were given by Bernard Chazelle from Princeton University, USA, and Mikolaj Bojanczyk from University of Warsaw, Poland. In addition, the Program Committee invited seven speakers to give plenary lectures: Natasha Alechina (University of Nottingham, UK), Vasco Brattka (Universität der Bundeswehr München, Germany), Delaram Kahrobaei (The City University of New York, USA), Steffen Lempp (University of Wisconsin, USA), André Nies (University of Auckland, New Zealand), Dominique Perrin (Université Paris-Est Marne-la-Vallée, France), and Reed Solomon (University of Connecticut, USA).

Springer generously funded two awards this year, the Best Student Paper Award and Best Paper Award. The winner of the Best Student Paper Award this year was Mikhail Andreev for his contribution "Busy Beavers and Kolmogorov Complexity." The Best Paper Award was given to Olivier Bournez, Nachum Dershowitz and Pierre Neron for their contribution "An Axiomatization of Analog Algorithms."

CiE 2016 has six special sessions: two sessions, Cryptography and Information Theory and Symbolic Dynamics, were organized for the first time in the conference series. The other four special sessions covered new developments in areas previously covered by the conference series: Computable and Constructive Analysis, Computation in Biological Systems, Weak Arithmetic, and History and Philosophy of Computing. Speakers in these special sessions were selected by the special session organizers and were invited to contribute a paper to this volume.

Computable and Constructive Analysis

Organizers. Daniel Graça and Elvira Mayordomo.

Speakers. Mathieu Hoyrup (Inria and University of Lorraine), Arno Pauly (University of Cambridge), Vela Velupillai (New School for Social Research in New York City and University of Trento), Martin Ziegler (KAIST, Daejeon).

Computation in Biological Systems

Organizers. Alessandra Carbone and Ion Petre.

Speakers. Daniela Besozzi (University of Milan-Bicocca), Eugen Czeizler (Åbo Akademi University), Vincent Moulton (University of East Anglia), Eric Tannier (Inria and University of Lyon).

Cryptography and Information Theory

Organizers. Danilo Gligoroski, and Carles Padro.

Speakers. Ludovic Perret (Université Pierre et Marie Curie, France), Ignacio Cascudo (Aarhus University in Denmark), Oriol Farras (Universitat Rovira i Virgili, Spain), Danilo Gligoroski (Norwegian University of Science and Technology - Trondheim).

History and Philosophy of Computing

Organizers. Alberto Naibo and Ksenia Tatarchenko

Speakers. Maël Pégny (IHPST, Paris), Pierre Mounier-Khun (CNRS), Simone Martini (University of Bologna), Walter Dean (University of Warwick).

Symbolic Dynamics

Organizers. Jarkko Kari and Reem Yassawi.

Speakers. Valérie Berthé (University of Paris 7), Emmanuel Jeandel (University of Lorraine), Irène Marcovici (University of Lorraine), Ronnie Pavlov (Denver University).

Weak Arithmetic

Organizers. Lev Beklemishev and Stanislav Speranski.

Speakers. Pavel Pudlák (Academy of Sciences of the Czech Republic), Alexis Bès (University of Paris 12), Leszek Kołodziejczyk (University of Warsaw), Albert Visser (University of Utrecht).

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