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Computation and Logic in the Real World: CiE 2007

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The seventeen papers in this special issue arose from the conference CiE 2007: Computation and Logic in the Real World, held at the University of Siena in June, 2007. CiE 2007 was the third of a new series of conferences associated with the interdisciplinary network *Computability in Europe*.

Computability in Europe (CiE) is an informal network of European scientists working on computability theory, including its foundations, technical development,

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and applications. Among the aims of the network is to advance our theoretical understanding of what can and cannot be computed, by *any* means of computation. Its scientific vision is broad: computations may be performed with discrete or continuous data by all kinds of algorithms, programs, and machines. Computations may be made by experimenting with any sort of physical system obeying the laws of a physical theory such as Newtonian mechanics, quantum theory or relativity. Computations may be very general, depending upon the foundations of set theory; or very specific, using the combinatorics of finite structures. CiE also works on subjects intimately related to computation, especially theories of data and information, and methods for formal reasoning about computations. The sources of new ideas and methods include practical developments in areas such as neural networks, quantum computation, natural computation, molecular computation, and computational learning. Applications are everywhere, especially, in algebra, analysis and geometry, or data types and programming.

The conferences CiE 2005 in Amsterdam, CiE 2006 in Swansea and CiE 2007 in Siena consolidate a new and influential conference series CiE-CS that will reconvene 2008 in Athens, 2009 in Heidelberg and 2010 in Ponta Delgada (Açores). CiE 2012 will be held at Cambridge University, as part of the Alan Turing Centenary Year festivities.

CiE 2007 set out to address various aspects of the ways computability and theoretical computer science enable scientists and philosophers to deal with mathematical and real world issues, ranging through problems related to logic, mathematics, physical processes, real computation and learning theory. At the same time it focused on different ways in which computability emerges from the real world, and how this affects our way of thinking about everyday computational issues.

Like the two previous CiE conferences, CiE 2007 again provided a unique interdisciplinary venue for researchers from computer science and mathematics to exchange ideas, approaches and techniques in their respective work, thereby generating a wider community for work on new computational paradigms—allowing uniform approaches to diverse areas, the transformation of theoretical ideas into applicable projects, and stimulating a general cross-fertilization transcending disciplinary borders. CiE 2007 was a broad meeting even by CiE standards, attracting nearly 300 participants from an exceptionally wide spectrum of computability-related research.

CiE 2007 had a regular pre-proceedings volume published in the Lecture Notes in Computer Science:

> S. Barry Cooper, Benedikt Löwe, and Andrea Sorbi (*eds.*), Computation and Logic in the Real World, Third Conference on Computability in Europe, CiE 2007, Siena, Italy, June 2007, Proceedings, Berlin, Heidelberg 2007 [Lecture Notes in Computer Science 4497].

As a follow-up to the conference, the organizers of CiE 2007 have also prepared post-conference publications. Four themed special issues of journals are being edited with journal versions of talks and presentations at CiE 2007.

This special issue of **Theory of Computing Systems** emphasises computational learning, computational complexity and its interaction with logic and theoretical computer science. Six of the articles involve speakers from the CiE special sessions,

including three speakers (John Case, Frank Stephan, and Osamu Watanabe) from the session *Approaches to Computational Learning* (organized by Marco Gori and Franco Montagna), two (Eric Allender and Michal Koucký) from *Complexity of Algorithms and Proofs* (organized by Elvira Mayordomo and Jan Johannsen), and one (Jiří Wiedermann) from that on *Computability and Mathematical Structure* (organized by Serikzhan Badaev and Marat Arslanov). Pieter Adriaans contribution is based on his tutorial on *Learning as Data Compression*. The remaining ten papers are full versions of contributed talks.

We would like to thank all our referees for their help in producing this special issue, including the members of the CiE 2007 Programme Committee. The conference was sponsored by the *European Association for Theoretical Computer Science* (EATCS), the *Association for Symbolic Logic* (ASL), the *European Association for Computer Science Logic* (EACSL), the *Gruppo Nazionale per le Strutture Algebriche, Geometriche e le loro Applicazioni* (GNSAGA), the *Italian Association of Logic and Applications* (AILA), the *Association of Logic, Language and Information* (FoLLI), the *CRA Committee on the Status of Women in Computing research* (CRA-W), and the *Fondazione Monte dei Paschi di Siena*.

For the most current information about the conference series CiE-CS, we refer the reader to our webpage: http://www.illc.uva.nl/CiE/.