

ABSTRACTS OF THE EATCS DISTINGUISHED DISSERTATIONS 2015

LUCA ACETO

ICE-TCS, SCHOOL OF COMPUTER SCIENCE

REYKJAVIK UNIVERSITY

In 2015, the EATCS established the Distinguished Dissertation Award to promote and recognize outstanding dissertations in the field of Theoretical Computer Science. Each of the selected dissertations receives a prize of 1000 Euro and the award receiving dissertations are published on the EATCS web site, where all the EATCS Distinguished Dissertations are collected at <http://eatcs.org/index.php/dissertation-award>.

The 2015 EATCS Distinguished Dissertation Award committee consisted of Javier Esparza, Michal Feldman, Fedor Fomin, Luke Ong and Giuseppe Persiano (chair). The committee selected the following three dissertations for the award from a collection of outstanding theses:

- Radu Curticapean. *The Simple, Little and Slow Things Count: On Parameterized Counting Complexity*. Department of Computer Science at Saarland University, Saarbrücken, Germany. Supervisor: Markus Bläser.
- Heng Guo. *Complexity Classification of Exact and Approximate Counting Problems*. Department of Computer Sciences, University of Wisconsin-Madison. Advisor: Jin-Yi Cai.
- Georg Zetsche. *Monoids as storage mechanisms*. Department of Computer Science at the University of Kaiserslautern. Supervisor: Roland Meyer.

The committee's laudatio for Radu Curticapean's thesis reads as follows:

The thesis is in the field of parameterized complexity for counting problems. It concentrates on the classical problem of counting perfect matchings and gives a polynomial time algorithm for the problem on all graphs that exclude a minor that can be drawn in the plane with at most one crossing. The thesis also considers the problem of counting the number of subgraphs of a graph G that are isomorphic to a given graph H . Here the size of H is considered a parameter. The main contribution is an almost tight hardness proof. Finally, the thesis presents also conditional lower bounds for counting problems under the exponential time hypothesis and its counting version.

The results presented in the dissertation significantly advance our understanding of various aspects of counting problems and solve open questions asked earlier by other researchers.

The citation for Heng Guo's dissertation states:

The thesis considers the Holant problems and proves that each Holant problem is either P-time solvable or P-time solvable on planar graphs and #P-hard on general graphs or #P-hard for planar graphs. Moreover, the thesis presents an FPTAS for the anti-ferromagnetic 2-spin system up to the tree uniqueness threshold. This is tight as beyond this threshold the existence of such an algorithm would imply NP=RP. These results comprise a fraction of the thesis but are noteworthy because they stand by themselves as results that are fundamental, and which will be remembered.

Last, but by no means least, here is what the committee wrote about Georg Zetsche's thesis work:

This thesis is a systematic study of the languages of finite automata extended with storage mechanisms, using the framework of valence automata. The stores, which are modeled by graph monoids, can capture mechanisms ranging from counters and stacks to blind and partially blind counters. Consequently the work deals in a unified way with such diverse models as pushdown automata and Petri nets. Impressive in breadth and depth, the thesis contains answers to a number of notable problems. Among many other results, Zetsche's work characterizes the monoids that yield automata whose languages properly contain the regular languages; it also characterizes those whose languages have a semi-linear Parikh image. It provides, for several classes of automata, the first algorithms to compute the downward closure of their languages. These results have clear and compelling applications to the theory of formal verification.

The recipients of the 2015 EATCS Distinguished Dissertation Award have contributed a summary of the work presented in their theses to this issue of the Bulletin of the EATCS. I trust that their surveys will be of interest to readers of the Bulletin, regardless of their main research interests. Enjoy them!