



THEORY OF COMPUTATION

DESCRIPTION

The Department's research in this area covers a rich variety of topics, including: automated reasoning, computability, concurrency, cryptographic protocols, design and analysis of algorithms, equational logic and rewriting, graph algorithms, logic and verification, modal and temporal logics, pattern matching, probabilistic computation, program analysis, program semantics, proof theory, quantum computation theory, rewrite systems, string algorithms, verification by model checking.

A thesis co-advised by Prof. Romeo Rizzi won the Prize for the Best Italian Master Thesis in Theoretical Computer Science 2016, awarded by the EATCS. (Massimo Cairo "New Bounds for Approximating Extremal Distances in Undirected Graphs", co-advised by Prof. Roberto Grossi, U. di Pisa, and Prof. Romeo Rizzi, U. di Verona).

PROJECTS (2012-2016)

- **Rich-model toolkit:** an infrastructure for reliable computer systems - COST, European Concerted Research Action (IC0901), 10/2009 - 10/2013. web: <http://richmodels.epfl.ch/>
The project aims at making automated reasoning (a) applicable to a wider range of problems, and (b) easier to use by researchers, software developers, hardware designers, and information system users and developers. Main topics of interest are: standardization of expressive languages; decision procedures; transition system analysis, and high-level synthesis.
- **SIRS:** The project will develop a new representation for data collected through semantic tools, such as queries in SPARQL and OWL languages. Moreover, it will develop software for mobile and newer devices, for the presentation and navigation of such data (7/2015 - 7/2017).

SELECTED PUBLICATIONS (2012-2016)

- S. Baratella, A. Masini: A natural deduction system for bundled branching time logic. *Journal of Applied Non-Classical Logics* 23(3): 268-283 (2013).
- M.P. Bonacina, D.A. Plaisted: Semantically-guided goal-sensitive reasoning: model representation. *Journal of Automated Reasoning*, 56(2):113-141 (2016).
- P. Burcsi, G. Fici, Zs. Lipták, F. Ruskey, J. Sawada: On prefix normal words and prefix normal forms. *Theor. Comput. Sci.* 659: 1-13 (2017).
- M. Cairo, R. Rizzi: The Complexity of Simulation and Matrix Multiplication. *28th Annual ACM-SIAM Symp. on Discrete Algorithms (SODA 2017)*: 2203-2214 (2017).
- M. Cairo, G. Farina, R. Rizzi: Decoding Hidden Markov Models Faster Than Viterbi Via Online Matrix-Vector (max,+)-Multiplication. *30th AAAI Conference on Artificial Intelligence (AAAI 2016)*: 1484-1490 (2016).
- A. Cerone, M. Hennessy, M. Merro: Modelling MAC-Layer Communications in Wireless Systems. *Logical Methods in Computer Science* 1(1): 1-59 (2015).
- C. Comin, R. Posenato, R. Rizzi: Hyper temporal networks - A tractable generalization of simple temporal networks and its relation to mean payoff games. *Constraints* 22(2): 152-190 (2017)2.
- M. Dalla Preda, R. Giacobazzi, A. Lakhotia, I. Mastroeni: Abstract Symbolic Automata: Mixed syntactic/semantic similarity analysis of executables. *42nd ACM Symp. on Principles of Programming Languages (POPL 2015)*: 329-341 (2015).
- A. Di Pierro, H. Wiklicky: Probabilistic Abstract Interpretation: From Trace Semantics to DTMC's and Linear Regression. *Semantics, Logics, and Calculi 2016*: 111-139 (2016).
- R. Giacobazzi, I. Mastroeni: Making abstract models complete. *Mathematical Structures in Computer Science* 26(4):658-701(2016).
- I. Mastroeni, R. Giacobazzi: Weakening residuation in adjoining closures. *Order* 33(3):503-516 (2016).
- D. Nikolic, F. Spoto: Inferring complete initialization of arrays. *Theor. Comput. Sci.* 484: 16-40 (2013).

PEOPLE (2017)



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