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Cellular Automata

13th International Conference on Cellular Automata
for Research and Industry, ACRI 2018
Como, Italy, September 17–21, 2018
Proceedings

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Preface

This volume contains a collection of original papers covering both applications and theoretical results on cellular automata, that were selected for presentation at the 13th International Conference on Cellular Automata for Research and Industry, ACRI 2018, held in Como, Italy, during September 17–21, 2018. The event was organized by the Department of Informatics, Systems, and Communication of the University of Milano-Bicocca.

The primary goal of the conference was to bring together researchers coming from many different scientific fields in order to foster international collaborations on cellular automata and to spread scientific knowledge among the experts in several scientific areas: computer science, pure and applied mathematics, physics, biology, and systems theory.

Cellular automata are a powerful computational model that can be applied to the study of complex phenomena characterized by the presence of many simple local interactions. Cellular automata are a discrete model (in both time and space) that have been successfully applied as a simplified representation of complex non-linear dynamics and as a general model of complexity. Starting from their discovery in the middle of the 20th century, cellular automata have generated more and more interest in both the theoretical aspects and the practical applications.

The ACRI conference series was first organized in Italy, namely, ACRI 1994 in Rende, ACRI 1996 in Milan, ACRI 1998 in Trieste and followed by ACRI 2000 in Karlsruhe (Germany), ACRI 2002 in Geneva (Switzerland), ACRI 2004 in Amsterdam (The Netherlands), ACRI 2006 in Perpignan (France), ACRI 2008 in Yokohama (Japan), ACRI 2010 in Ascoli Piceno (Italy), ACRI 2012 on Santorini (Greece), ACRI 2014 in Kraków (Poland), and ACRI 2016 in Fez (Morocco).

This 13th edition of ACRI aimed at expanding the classic topics to include other areas related to or extending cellular automata. This allowed a larger community to have the opportunity to discuss their work in various related fields like, for example, complex networks, bio-inspired computing, cryptography, biological network modelling, multiagent models, etc.

This volume contains the accepted papers from the main track and from the three organized workshops. We would first like to take this opportunity to express our sincere thanks to the invited speakers, Raul Rechtman and Andreas Deutsch, who kindly accepted our invitation to give plenary lectures at ACRI 2018. The whole book is divided into eight parts:

The part “Biological Systems Modeling” contains papers that deal directly with biological problems by using cellular automata. It is followed by the part “Simulation and Other Applications of CA,” where cellular automata are applied in the study of other real-world phenomena.

The part “Multi-agent Systems” contains papers dealing more with the multi-agent view of cellular automata and, in the part “Pedestrian and Traffic Dynamics” this view is further explored in the specific cases of traffic and pedestrian dynamics.

The more theoretical papers are collected in the two parts “Synchronization and Control” and “Theory and Cryptography,” where the results vary from the classic theory of control, to the solution of classic problems in cellular automata, like the firing squad synchronization problem, to the study of the dynamical properties of cellular automata, and to their application to cryptography.

The part titled “Asynchronous Cellular Automata” collects the papers accepted the workshop Asynchronous Cellular Automata (ACA). We want to thank the chairs of the workshop’s Program Committee, Alberto Dennunzio and Enrico Formenti, together with all the members of the workshop’s Program Committee for their work in selecting the papers.

The part “Crowds, Traffic, and Cellular Automata” contains the papers accepted for the workshops Crowds and Cellular Automata (C&CA) and Traffic and Cellular Automata (T&CA). We want to thank the Program Committee chairs of the two workshops: Giuseppe Vizzari, Jarosław Waś, Katsuhiro Nishinari, and Andreas Schadschneider together with the members of the Program Committees for their work in selecting the papers.

We are grateful to the Program Committee and all the additional reviewers for their invaluable help in selecting the papers. We extend our thanks to the remaining members of the local Organizing Committee, Stefania Bandini and Luca Mariot. We are also grateful for the support by the Department of Informatics, Systems and Communication and the University of Milano-Bicocca. Finally, we acknowledge the excellent cooperation from the Lecture Notes in Computer Science team of Springer for their help in producing this volume in time for the conference.

July 2018

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