

**PROCEEDINGS OF  
THE 2013 INTERNATIONAL CONFERENCE ON  
FOUNDATIONS OF COMPUTER SCIENCE**

**FCS 2013**

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***WORLD COMP'13***

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# Foreword

It gives us great pleasure to introduce this collection of papers to be presented at the 2013 International Conference on Foundations of Computer Science (FCS'13), July 22 through 25, 2013, at The New Tropicana Hotel, Las Vegas, USA.

An important mission of the World Congress in Computer Science, Computer Engineering, and Applied Computing (a federated congress to which this conference is affiliated with) includes *"Providing a unique platform for a diverse community of constituents composed of scholars, researchers, developers, educators, and practitioners. The Congress makes concerted effort to reach out to participants affiliated with diverse entities (such as: universities, institutions, corporations, government agencies, and research centers/labs) from all over the world. The congress also attempts to connect participants from institutions that have **teaching** as their main mission with those who are affiliated with institutions that have **research** as their main mission. The congress uses a quota system to achieve its institution and geography diversity objectives."* By any definition of diversity, this congress is among the most diverse scientific meeting in USA. We are proud to report that this federated congress has authors and participants from 82 different nations representing variety of personal and scientific experiences that arise from differences in culture and values. As can be seen (see below), the program committee of this conference as well as the program committee of all other tracks of the federated congress are as diverse as its authors and participants.

The program committee would like to thank all those who submitted papers for consideration. About 65% of the submissions were from outside the United States. Each submitted paper was peer-reviewed by two experts in the field for originality, significance, clarity, impact, and soundness. In cases of contradictory recommendations, a member of the conference program committee was charged to make the final decision; often, this involved seeking help from additional referees. In addition, papers whose authors included a member of the conference program committee were evaluated using the double-blinded review process. One exception to the above evaluation process was for papers that were submitted directly to chairs/organizers of pre-approved sessions/workshops; in these cases, the chairs/organizers were responsible for the evaluation of such submissions. The overall paper acceptance rate for regular papers was 25%; 7% of the remaining papers were accepted as poster papers (at the time of this writing, we had not yet received the acceptance rate for a few individual tracks.)

We are very grateful to the many colleagues who offered their services in organizing the conference. In particular, we would like to thank the members of the Program Committee of FCS'13, members of the congress Steering Committee, and members of the committees of federated congress tracks that have topics within the scope of FCS. Many individuals listed below, will be requested after the conference to provide their expertise and services for selecting papers for publication (extended versions) in journal special issues as well as for publication in a set of research books (to be prepared for publishers including: Springer, Elsevier, BMC, and others).

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As Sponsors-at-large, partners, and/or organizers each of the followings (separated by semicolons) provided help for at least one track of the World Congress: Aldebaran Robotics Inc., USA (<http://www.aldebaran-robotics.com>); Altera Corporation, USA (<http://www.altera.com/>); Computer Science Research, Education, and Applications Press (CSREA); Impulse Accelerated Technologies, Inc., USA (<http://www.impulseaccelerated.com/>); NVIDIA Corporation, USA (<http://www.nvidia.com/object/about-nvidia.html>); Parallella Community, Supercomputing for Everyone, USA (<http://forums.parallella.org/>); Pico Computing, Inc., USA (<http://picocomputing.com/>); SemiWiki.com, The Semiconductor Wiki Project, USA (<http://www.semiwiki.com/>); Solarflare Communications, Inc., USA (<http://www.solarflare.com/>); Stream Computing, Performance Engineers, The Netherlands (<http://streamcomputing.eu/>); Taylor & Francis, UK (<http://www.taylorandfrancis.com/>); US Chapter of World Academy of Science (<http://www.world-academy-of-science.org/>); and WEBestSOL & Webest Solutions Ltd, UK (<http://webestsol.com/>). In addition, a number of university faculty members and their staff (names appear on the cover of the set of proceedings), several publishers of computer science and computer engineering books and journals, chapters and/or task forces of computer science associations/organizations from 5 countries, and developers of high-performance machines and systems provided significant help in organizing the conference as well as providing some resources. We are grateful to them all.

We express our gratitude to keynote, invited, and individual conference/tracks and tutorial speakers - the list of speakers appears on the conference web site. We would also like to thank the followings: UCMSS (Universal Conference Management Systems & Support, California, USA) for managing all aspects of the conference; Dr. Tim Field of APC for managing the printing of the proceedings; and the staff of the New Tropicana Hotel in Las Vegas for the professional service they provided. Last but not least, we would like to thank the Co-Editors of FCS'13: Prof. Hamid R. Arabnia, Prof. George A. Gravvanis, Prof. George Jandieri, Ashu M. G. Solo, and Prof. Fernando G. Tinetti.

We present the proceedings of FCS'13.

***Steering Committee, 2013***  
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