

# Preface

High-performance computing (HPC) or supercomputing has become an essential tool for modern science and technology. In addition to basic science and experimentation, HPC has become an essential tool for advancing our understanding of nature, for the analysis of society's behavior, and for technological advancement.

Today, current research in many branches in science and engineering relies more and more on supercomputing, allowing us to expand basic research and experimentation. Supercomputing has proven to be equally essential for developing and understanding a wide range of advanced science and technology topics that are directly related to our daily lives. HPC enables the design of models and running computer simulations of phenomena before passing through an experimental phase, with great economic savings, but more importantly allowing us to provide results within days or weeks when months or even years were required in the past.

The Latin American High-Performance Computing Conference, CARLA (<http://www.ccarla.org>), is a joint conference of the High-Performance Computing Latin America Community – HPCLATAM – and the Conferencia Latino Americana de Computación de Alto Rendimiento – CLCAR. In 2016 both major HPC Latin-American workshops came together again at CARLA 2016, and were held in the recently created Abacus Laboratorio de Matemática Aplicada y Cómputo de Alto Rendimiento (Laboratory for Applied Mathematics and High Performance Computing) of CINVESTAV that since early 2015 has been hosting one of the largest supercomputers in Latin America, where scientists and engineers in Mexico and other countries are able to develop computational projects that require very large HPC facilities. Furthermore, with the Abacus-CINVESTAV supercomputer, Mexico returned in 2016 to the Top 500 list of the 500 most powerful supercomputers in the world.

HPCLATAM (<http://hpclatam.org>) gathers a young but growing community of scientists and practitioners in the HPC area in Latin America. Past events proved that the HPC community in the region is steadily growing. HPCLATAM aims to bring together researchers, developers, and users of HPC to discuss new ideas, experiences, and problems. The main goal of HPCLATAM is to provide a regional forum fostering the growth of the HPC community in Latin America through the exchange and dissemination of new ideas, techniques, and research in HPC.

The CLCAR (<http://www.cenat.ac.cr/>) conference has been held since 2007 and is driven by a group of researchers from universities and research centers in Latin America that seek to promote a space for discussion of new knowledge and trends in the area. A further aim is to coordinate initiatives and efforts toward the development of technologies for HPC that can contribute to solving common problems of social and economic relevance to the region. CLCAR is an event for students and scientists and is dedicated to the areas of HPC, parallel and distributed systems, e-science and its applications to real-life problems, but especially focused on Latin American researchers.

The CARLA 2016 symposium featured invited talks from academia and industry speakers, with short- and full-paper sessions presenting both mature work and new ideas in research and industrial applications in HPC.

This book contains the best papers from CARLA 2016, which is organized in three parts. In Part I the contributions are related to supercomputer infrastructure and applications, Part II includes works on algorithms and applications, and finally in Part III you can find interesting papers on HPC applications and simulations applied to various fields of science and engineering.

The book is aimed at scientists in the fields of computer science, mathematics, physics, engineering, chemistry, biology and many other fields that have an interest in HPC, infrastructure, algorithms, and a variety of applications. It is also aimed at senior and graduate students who are in some way involved in HPC. The material includes recent advances in HPC and is suitable for both teaching and research.

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Selected Papers

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