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Computational Intelligence Techniques for Comparative Genomics

Dedicated to Prof. Allam Appa Rao on the Occasion of His 65th Birthday

Springer

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To Prof. Allam Appa Rao on the occasion of his 65th birthday

Foreword

This book is an enthusiastic contribution of the best research work in the field of transdisciplinary research and allied to the proceedings of International Conference on Computational Intelligence: Health and Disease (CIHD 2014) to be held at Visakhapatnam, India during December 27–28, 2014. The main objective of this conference is to create an environment for (1) cross-disseminating state-of-the-art knowledge to CI researchers, doctors and computational biologists; (2) creating a common substrate of knowledge that both CI people, doctors and computational biologists can understand; (3) stimulating the development of specialized CI techniques, keeping in mind the application to computational biology; (4) fostering new collaborations among scientists having similar or complementary backgrounds and sowed the seeds of transdisciplinary research for which Prof. Allam Appa Rao has spent more than 2 decades and brought these parts of India to the notice of transdisciplinarians of the world.

Yet another element is provided by many interesting historical data on diabetes and an abundance of colorful illustrations. On top of that, there are innumerable historical vignettes that interweave computer science and biology in a very appealing way.

Although the emphasis of this work is on diabetes and other diseases, it contains much that will be of interest to those outside this field and to students of Biotechnology, Bioinformatics, Chemistry, and Computer Science—indeed to anyone with a fascination for the world of molecules. The authors have selected a good number of prominent molecules as the key subject of their essays. Although these represent only a small sample of the world of biologically-related molecules and their impact on our health, they amply illustrate the importance of this field of science to mankind and the way in which the field has evolved.

We think the contributors can be confident that there will be many grateful readers who will have gained a broader perspective of the disciplines of diabetes and their remedies as a result of their efforts.

Hyderabad, India

Naresh Babu Muppalaneni
Vinit Kumar Gunjan

Prof. Allam Appa Rao, Ph.D. (Engg), SDPS Fellow

Preface

This volume appears on the occasion of Prof. Allam Appa Rao's 65th birthday. Close scientific companions, who have worked with Allam for many years, contributed to this volume. Dr. Allam Appa Rao was the first ever to receive a Ph.D. from Andhra University in Computer Engineering, then part of Electrical Engineering, in the year 1984. During his more than four decades of professional experience, such as Head of the University Computer Centre, Head of the Department of Computer Science and Systems Engineering, Chairman Faculty of Engineering, Principal of College of Engineering, Vice Chancellor JNTU Kakinada, and Director CRRao AIMSCS, he shared his wisdom with fellow engineers and scientists across the globe through his innumerable research papers published in international journals and international conference proceedings.

41 scholars were awarded Ph.D. degrees under his guidance, 4 are in process of adjudication, and another 11 are in progress. "Best Academician Award" and "Best Researcher Award" were bestowed on him by Andhra University. Andhra Pradesh Government accorded him "Best Teacher" award. International Accreditation Council for Quality Education and Research (IACQER) bestowed on him Distinguished Fellow Award. Indian Science Congress Association (ISCA) conferred him with "Srinivas Ramanujan Birth Centenary Award" Gold medal for his significant and life-time contribution to the development of Science and Technology in the country specifically in the area of Computational Biology, Software Engineering, and Network Security. Dr. Allam is a strict disciplinarian. Government of India, NCC wing rightfully conferred on him the Honorary Colonel of the regiment position on him.

Prof. Allam's research contributions in Computer Engineering are vital, varied, and vast. He believes that CE is the "third pillar" that supports research, along with the pillars of theory and experimentation. He firmly believes that CE is an essential component to implement and strengthen any country's technological, economical, and social goals. According to him, Information Technology (IT) is a symbiosis between CE and other disciplines and mediates new interactions among the technologies, in multiple levels and scales.

Prof. Allam believes that the recent human genome breakthrough is the result of the work of multi-disciplinary teams where cooperation from computer experts was a fundamental ingredient. He stresses that the cells and cellular systems require viewing them as information processing systems, as evidenced by the fundamental similarity between molecular machines of the living cell and computational automata, and by the natural fit between computer process algebras and biological signaling and between computational logical circuits and regulatory systems in the cell.

Prof. Allam's current research work is influenced by his fascination for the mysteries that remain in the catalog of human genes. He believes that a systematic approach to the acquisition, management, and analysis of information available in human genes and their study can greatly enhance the quality and efficiency of medicines.

Dr. Allam proposed new computing methods, and showed the way to better treatments of disease and better understanding of healthy life. Prof. Allam has published more than 100 papers in peer-reviewed international journals.

Prof. Allam along with Dr. U.N. Das holds one US Patent, number: 8,153,392 Filing date: 28 Mar 2008 Issue date: 10 Apr 2012.

Prof. Allam is hailed by his innumerable student friends across the globe as a man of unfathomable knowledge and by his friends as a wonderful human being.

This volume contains a selection of the best contributions delivered at the International Conference on Computational Intelligence: Health and Disease (CIHD 2014) held at Visakhapatnam, India during December, 27–28, 2014. This conference is organized by Institute of Bioinformatics and Computational Biology (IBCB), Visakhapatnam, India jointly with Andhra University and JNTU Kakinada.

CIHD 2014 is aimed to bring together Computer Professionals, Doctors, Academicians, and researchers to share their experience and expertise in Computational Intelligence. The goal of the conference is to provide Computer Science Professionals, Engineers, Medical Doctors, Bioinformatics researchers, and other interdisciplinary researchers a common platform to explore research opportunities.

A rigorous peer-review selection process was applied to ultimately select the papers included in the program of the conference. This volume collects the best contributions presented at the conference.

The success of this conference is credited to the contribution of many people. In the first place, we would like to thank Prof. Allam Appa Rao, Director, C.R. Rao AIMSCS who motivated and guided us in making this conference a grand success. Our sincere thanks to Dr. Amit Kumar, Editor for Springer Briefs in Applied Sciences and Technology, who helped us in bringing this series. Moreover, special thanks are due to the Program Committee members and reviewers for their commitment to the task of providing high-quality reviews.

We would like to thank **Prof. B.M. Hegde** (Padma Bhushan Awardee, Cardiologist & Former Vice Chancellor, Manipal University) who delivered the keynote address. Last, but not least, we would like to thank the speakers **Grady Hanrahan** (California Lutheran University, USA), **Jayaram B.** (Coordinator, Supercomputing Facility for Bioinformatics and Computational Biology,

IIT Delhi), **Jeyakanthan J.** (Professor and Head, Structural Biology and Biocomputing Lab, Alagappa University), **Madhavi K. Ganapathiraju** (Pittsburgh University, USA), **Nita Parekh** (International Institute of Information Technology Hyderabad (IIIT-H), Hyderabad, India), **Pinnamaneni Bhanu Prasad** (Advisor, Kelenn Technology, France), **Rajasekaran E.** (Dhanalakshmi-Srinivasan Institute of Technology, Tiruchirappalli), **Sridhar G.R.** (Endocrine and Diabetes Centre, Krishnanagar Visakhapatnam, India).

December 2014

Naresh Babu Muppalaneni
Vinit Kumar Gunjan

Prime Minister of India Dr. Manmohan Singh conferring the Shri Srinivasa Ramanujan Birth Centenary Gold Medal Award (a life-time achievement award for the contributions made in the field of Computational Biology, Network Security, and Software Engineering) to Dr. Allam Appa Rao at the 98th Indian Science Congress held in Chennai, India on January 3, 2011

Prof. Allam Appa Rao being conferred the rank of Honorary Colonel Commandant by NCC

Committees

International Conference on Computational Intelligence: Health and Disease (CIHD 2014)

27–28 December 2014
Visakhapatnam, India

The International Conference on Computational Intelligence: Health and Disease (CIHD 2014) held at Visakhapatnam, India during December 27–28, 2014 is organized by the Institute of Bioinformatics and Computational Biology (IBCB), Visakhapatnam, India jointly with Andhra University and JNTU Kakinada.

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