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Joong Hoon Kim · Kusum Deep ·
Zong Woo Geem · Ali Sadollah · Anupam Yadav
Editors

Proceedings of 7th International Conference on Harmony Search, Soft Computing and Applications

ICHSA 2022

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Preface

The International Conference on Harmony Search, Soft Computing and Applications (ICHSA) is the flagship conference and forum of harmony search and soft computing for researchers and practitioners in the highly active fields of theoretical fundamentals and large-scale applications. It has a glorious history; the earlier events of the conference were held in South Korea, Spain, India, China, and Turkey. After the successful 6th ICHSA held in Istanbul, Turkey, in July 2020, it was decided to host it back at Korea University in South Korea online during February 23–24, 2022.

The 7th ICHSA (ICHSA 2022) consists of eight themes which include from advances in harmony search and soft computing to artificial intelligence and various engineering applications. This book is the outcome of the research papers presented at ICHSA 2022. It contains a varied range of chapters, and these chapters throw light on the state-of-the-art status of research in the areas of harmony search, soft computing technique, and their applications in engineering and science.

Seoul, Korea (Republic of) — Joong Hoon Kim
Roorkee, India — Kusum Deep
Seongnam, Korea (Republic of) — Zong Woo Geem
Tehran, Iran — Ali Sadollah
Jalandhar, India — Anupam Yadav

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About the Editors

Prof. Joong Hoon Kim dean of Engineering College of Korea University, obtained his Ph.D. degree from the University of Texas at Austin in 1992 with the thesis title "Optimal replacement/rehabilitation model for water distribution systems". Professor Kim's major areas of interest include: optimal design and management of water distribution systems, application of optimization techniques to various engineering problems, and development and application of evolutionary algorithms. He has been the faculty of School of Civil, Environmental and Architectural Engineering at Korea University since 1993 and is now serving as the dean of Engineering College. He has hosted international conferences including APHW 2013, ICHSA 2014 and 2015, and HIC 2016 and has given keynote speeches at many international conferences including AOGS 2013, GCIS 2013, SocPros 2014 and 2015, SWGIC 2017, and RTORS 2017. He is a member of National Academy of Engineering of Korea since 2017.

Dr. Kusum Deep is a full Professor (HAG), with the Department of Mathematics as well as Joint Faculty at the Centre for Artificial Intelligence and Data Science at the Indian Institute of Technology Roorkee, India. Also, she is a visiting professor, Liverpool Hope University, UK, University of Technology Sydney, Australia, and University of Wollongong, Australia. With B.Sc. Hons and M.Sc. Hons. School from Centre for Advanced Studies, Panjab University, Chandigarh, she is an M.Phil. Gold Medalist. She earned her Ph.D. from UOR (now IIT Roorkee) in 1988. She has been a national scholarship holder and a postdoctoral from Loughborough University, UK, assisted by International Bursary funded by Commission of European Communities, Brussels. She has won numerous awards like Khosla Research Award, UGC Career Award, Starred Performer of IITR Faculty, best paper awards by Railway Bulletin of Indian Railways, special facilitation in memory of late Prof. M. C. Puri, AIAP Excellence Award. Recently, she was one of the four women from IIT Roorkee to feature in the ebook "Women in STEM-2021" celebrating the contributions made by 50 Indian women in STEM published by Confederation of Indian Industries. She has authored two books, supervised 20 Ph.Ds. and published 125 research papers. She is a Senior Member of ORSI, CSI, IMS, and ISIM. She is the executive editor of

International Journal of Swarm Intelligence, *Inderscience*. She is associate editor of *Swarm and Evolutionary Algorithms*, Elsevier, and is on the editorial board of many journals. She is the founder president of Soft Computing Research Society, India. She is the general chair of series of International Conference on Soft Computing for Problems Solving (SocProS). She has a vast teaching experience in Mathematics, Operations Research, Numerical and Analytical Optimization, Parallel Computing, Computer Programming, Numerical Methods, etc. Her research interests are nature-inspired optimization techniques, particularly Evolutionary Algorithms, and Swarm Intelligence Techniques and their applications to solve real-life problems.

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