Editorial

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Biographical notes: Atulya K. Nagar is the Foundation Professor of Computer and Mathematical Sciences and Head of the Department of Computer Science at Liverpool Hope University. He received the prestigious Commonwealth Fellowship for pursuing his Doctorate in Applied Non-Linear Mathematics, which he received from the University of York in 1996. He holds BSc (Hons.), MSc and MPhil (distinction) in Mathematical Sciences from the MDS University of Ajmer, India. Prior to joining Liverpool Hope University, he worked for several years as a Senior Research Scientist at Brunel University. His multi-disciplinary research interests include bio-inspired systems and natural computing, intelligent systems, non-linear differential equations, systems engineering, computational optimisation and relativistic cosmology.

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Non-convex Optimisation is a multi-disciplinary research field that deals with the characterisation and computation of local/global minima/maxima of non-linear, non-convex, non-smooth, discrete and continuous functions. Non-convex Optimisation problems are frequently encountered in modelling complex real-world systems for a very broad range of applications including engineering, mathematical economics,

management science, biological and physical sciences, financial engineering and social science, etc.

The aim of this special issue of the *International Journal of Computing Science and Mathematics* (*IJCSM*) has been to bring together emerging concepts, theoretical developments and applications. As this is a very active area of research, we are looking for theoretical and applied papers, which contribute to the state-of-the-art in the field.

We attracted a wide spectrum of very interesting papers on the theme of this special issue. After a careful review phase, 7 out of the 33 submitted papers were selected. These reflect different aspects and track advances in Non-convex Optimisation and their applications. In Alberti, a framework for the resolution of a particular class of Games is proposed for the analysis of conflicting situations in which the contenders share a finite series of measurable information besides the rationality principle that are of decisive influence on strategic choices. Arora and Arora present an interesting algorithm to solve a tri-level Integer Programming problem where the objective function for the first level is indefinite quadratic, the second one is linear and the third one is linear fractional. They obtain estimates for the feasible space of the decision variable such that it is reduced at each level until a satisfactory point estimate is obtained at the last level. They show that the higher-level decision-maker reduces the feasible space for the lower-level decision-maker to search for his optimum. Stochastic Programming is an important and powerful paradigm for decision-making in the presence of uncertainty. A comprehensive survey of key methods in stochastic programming scenario generation is presented by Mitra and Di Domenica. They introduce main concepts behind scenario generation highlighting quality measures and explaining the functions and purposes behind scenario generation, which are not simply discrete approximations of the randomness. Samal et al. address the issues of parameter selection in a Particle Swarm Optimisation by a thorough stability analysis of the swarm dynamics, i.e., the dynamic behaviour of the local best position of a given particle. They obtain interesting results from an application to certain engineering problems. Another interesting application from the power engineering area is presented by Rajathy et al. where the authors propose a new algorithm using Differential Evolution for estimating Capacity Benefit Margin (CBM), which is an important factor in the calculation of Available Transfer Capability (ATC) in a competitive electric power market. Duality concepts are known to play an important role to study the existence of solution of Non-linear Programming problems. Second-order duality is significant owing to the computational advantage over first-order dual, as it provides tighter bounds for the value of the objective function when approximations are used. In a theoretical development, Jaiswal and Panda introduce a class of first- and second-order differentiable generalised semi-*E*-invex functions and obtain duality results for a non-linear programming problem under second-order generalised *E*-invexity. Last, though not the least, a novel application of quadratic interpolation, in conjugation with pseudorandom numbers to generate initial population for Differential Evolution, is proposed by Ali et al. The proposed algorithm, Quadratic Interpolation Initialised Differential Evolution (QIDE), is validated on a set of 20 benchmark problems, with box constraints, taken from literature, and the numerical results are compared with results obtained by traditional DE and Opposition-based DE (ODE) showing encouraging improvements.

On the whole, this special issue attempts to provide a wide spectrum of interesting research papers on various aspects of Non-convex Optimisation approaches with a diverse range of applications, theories and techniques within the domain. We much hope

that this volume will become an important reference source to many students, researchers and academics in their educational, research, and professional activities in this field.

The authors must be commended for their valuable contributions. The referees of these papers have done justice to the entire review process and have helped in improving the quality and clarity of presentation of the papers. Thanks are also due to Professor Yong Zhou, Editor-in-Chief of IJCSM, for creating an opportunity for further exploring the topic of this special issue.