



# Advances in Metaheuristics: Applications in Engineering Systems

By Timothy Ganesan, Pandian Vasant, Iraivan Elamvazuthi

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*Advances in Metaheuristics: Applications in Engineering Systems* provides details on current approaches utilized in engineering optimization. It gives a comprehensive background on metaheuristic applications, focusing on main engineering sectors such as energy, process, and materials. It discusses topics such as algorithmic enhancements and performance measurement approaches, and provides insights into the implementation of metaheuristic strategies to multi-objective optimization problems. With this book, readers can learn to solve real-world engineering optimization problems effectively using the appropriate techniques from emerging fields including evolutionary and swarm intelligence, mathematical programming, and multi-objective optimization.

The ten chapters of this book are divided into three parts. The first part discusses three industrial applications in the energy sector. The second focusses on process optimization and considers three engineering applications: optimization of a three-phase separator, process plant, and a pre-treatment process. The third and final part of this book covers industrial applications in material engineering, with a particular focus on sand mould-systems. It also includes discussions on the potential improvement of algorithmic characteristics via strategic algorithmic enhancements.

This book helps fill the existing gap in literature on the implementation of metaheuristics in engineering applications and real-world engineering systems. It will be an important resource for engineers and decision-makers selecting and implementing metaheuristics to solve specific engineering problems.

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### **Review**

"I am always looking for wonderful material in order to provide the undergraduate and graduate students the sufficient training of cutting-edge computation and optimization techniques to solve the complicated engineering problems. Compared with the other books, this book has a good combination of the theory introduction of metaheuristics algorithm and hands-on engineering projects. The selected demonstration problems are the hot topics in the engineering field. Therefore, it will become a good textbook for the engineering classes."

? *Tianxing Cai, Lamar University, Texas, USA*

"This book provides details on current approaches utilized in engineering optimization. It gives a comprehensive background on metaheuristic applications, focusing on main engineering sectors such as energy, process, and materials. It discusses topics such as algorithmic enhancements and performance measurement approaches, and provides insights into the implementation of metaheuristic strategies to multi-objective optimization problems. With this book, readers can learn to solve real-world engineering optimization problems effectively using the appropriate techniques from emerging fields including evolutionary and swarm intelligence, mathematical programming, and multi-objective optimization. This book helps fill the existing gap in literature on the implementation of metaheuristics in engineering applications and real-world engineering systems. It will be an important resource for engineers and decision-makers selecting and implementing metaheuristics to solve specific engineering problems."

? *Zentralblatt MATH, Germany*

### **About the Author**

**Timothy Ganesan** is affiliated with the School of Chemical Engineering, The University of Adelaide, Australia. He holds a Bachelor's Degree in Chemical Engineering (Hons.) and a Master of Science in Computational Fluid Dynamics. Completing a doctorate in Process Optimization his work focuses on multi-objective optimization, process systems engineering and computational intelligence.

**Pandian Vasant** is a senior lecturer at the Department of Fundamental and Applied Sciences, Faculty of Science and Information Technology, Universiti Teknologi PETRONAS in Malaysia. He holds a PhD in computational intelligence, an MSc in engineering mathematics, and a BSc (Hons) in mathematics. His research interests include soft computing, hybrid optimization, holistic optimization, innovative computing and applications. He has authored or coauthored research papers and articles in national and international journals and conference proceedings and papers. He has served as lead guest editor for three special issues of journals, edited books and conference proceedings, written book chapters and conference abstracts, and he gave the keynote lecture for the 2nd EAI International Conference on Nature of Computation and Communication, March 17–18, 2016, Rach Gia, Vietnam. The journal, *Applied Soft Computing* (Elsevier), recognized Dr. Vasant as its top reviewer in 2009 and as an outstanding reviewer in 2015. He has 25 years of working experience at various universities from 1989–2016. Currently he is editor-in-chief of *International Journal of Computing & Optimization, Industrial Engineering & Management, International Journal of Swarm Intelligence and Evolutionary Computation, International Journal of Energy Optimization &*

*Engineering*, and managing editor of the *Global Journal of Technology and Optimization*.

**Irraivan Elamvazuthi** obtained his PhD from Department of Automatic Control & Systems Engineering, University of Sheffield, UK in 2002. He is currently an Associate Professor at the Department of Electrical and Electronic Engineering, Universiti Teknologi PETRONAS (UTP), Malaysia. His research interests include Control, Robotics, Mechatronics, Power Systems and Bio-medical Applications.

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