

Evolutionary Multi-Criterion Optimization: An Emerging Computational Problem-Solving Tool

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Abstract

Most problems in science, engineering and commerce involve more than one conflicting criteria to be simultaneously optimized. Despite the vast literature on scalarizing multiple criteria into one, evolutionary optimization methods of treating them as truly multi-criterion problems in a Pareto sense produce a number of additional benefits to the users. Their ability to find and maintain multiple trade-off solutions with a flexible and customizable framework provides vital knowledge about the problem in addition to the optimal solutions themselves. In this lecture, we shall present a few popular and state-of-the-art algorithms, demonstrate their advantages on a number of real-world practical problems from engineering and society, and introduce some recent research topics. Additionally, the use of machine learning algorithms and human knowledge in enhancing their performance, and the use of multi-criterion algorithms in enhancing performance of machine learning methods will be discussed.

Bio-sketch: Kalyanmoy Deb is University Distinguished Professor and Koenig Endowed Chair Professor at Department of Electrical and Computer Engineering in Michigan State University, USA. Prof. Deb's research interests are in evolutionary optimization and their application in multi-criterion optimization, modeling, and machine learning. He is and has been a visiting professor at various universities across the world including University of Skövde in Sweden, Aalto University in Finland, Nanyang Technological University in Singapore, and IITs in India. He was awarded IEEE EvolutionaryComputation Pioneer Award for his sustained work in multi-objective optimization, Infosys Prize, TWAS Prize in Engineering Sciences, CajAstur Mamdani Prize, Distinguished Alumni Award from IIT Kharagpur, Edgeworth-Pareto award, Bhatnagar Prize in Engineering Sciences, and Bessel Research award from Germany. He is fellow of ACM, IEEE, and ASME. He has published over 600 research papers with Google Scholar citation of almost 180,000 with h-index 131. More information about his research contribution can be found from <https://www.coin-lab.org>.