Multiobjective Optimization Using Metaheuristics

Overview

Multi-objective optimization (also known as multicriteria optimization, vector optimization and multi-objective programming) is an area within Operations Research that is concerned with the solution of problems having two or more (normally conflicting) objective functions that need to be optimized simultaneously. Multi-objective optimization has tremendous practical importance, since almost all real-world optimization problems are ideally suited to be modeled using multiple conflicting objectives, as evidenced by an important number of applications currently available in engineering, science and economics. The classical means of solving multi-objective optimization problems were primarily focused on aggregating multiple objectives into a single scalar value. However, the advent of digital computers eventually gave rise to new numerical methods to deal with many complex problems, including those involving multiple objectives, which can now be handled in their original vector form. Metaheuristics on the other hand are high-level search procedures that apply some form of rule or set of rules based on some source of knowledge in order to explore the search space in a more efficient way. Metaheuristics cannot guarantee (in general) convergence to the global optimum, but normally provide reasonably good approximations of it in a reasonable CPU time. Because of their flexibility, generality and ease of use, metaheuristics have become increasingly popular in the last 30 years as optimizers of complex problems. One particular class of metaheuristics that has become quite popular in the last few years is that inspired on biological concepts such as evolution, ants' movements, birds' flight patterns, etc. These approaches are collectively known as bio-inspired metaheuristics. From them, evolutionary algorithms (e.g., genetic algorithms, evolutionary programming and evolution strategies) have been the most popular choice for designing new optimizers. Multi-objective evolutionary algorithms have become increasingly popular in the last 18 years, mainly because of their generality (e.g., they require little specific domain information and are less susceptible to the specific features of the problem to be solved than mathematical programming techniques), their ease of use (the source code of many of them is available in the public domain) and their advantages (e.g., they normally operate with a set of solutions, which makes possible to generate several trade-off solutions with a single algorithmic execution, as opposed to mathematical programming techniques, which normally operate with one solution at a time).

Necessary Details

Dates	**03-March-2018 to 07-March-2018**
Modules	**1: Basic concepts of Multi-objective evolutionary algorithms: 3rd March 2018** **2: Multi-objective evolutionary algorithms and techniques to maintain diversity: 4th March 2018** **3: Analysis of multi-objective test problem, Performance indicators: 5th March 2018** **4: Performance Indicators considering Hybrid approaches: 6th March 2018** **5: Other bio-inspired meta-heuristics: 7th March 2018** **Number of participants for the course will be limited to approximately sixty (60).**
You Should Attend If…	▪ You are (i) post graduate & doctoral students who is academically oriented, (ii) faculty members who is well trained in his/her subject areas and (iii) industry experts who has the domain experience, such that all of them may utilize the concepts in the areas related to multiobjective optimization, mathematical programming, different metaheuristics, etc., for better analysis and decision making. ▪ You come from fields as diverse as Social Science, Quantitative and Operations Research, Data Sciences, Engineering, Public Policy makers, Government Official, etc., and are keen to utilize the advanced topics of multiobjective optimization and metaheuristics (with their applications) to further your knowledge in your respective

	academic and professional fields. ▪ Are a professional from government organization, private sectors, related industries, and who is dynamic and is willing to pick up the nuances in the fields of public decision making using variety of such multiobjecive optimization tools along with a repertoire of metaheuristics methods. ▪ You are in academia and industry (e.g., health, logistics, social networking, government organization, airline, computing, ICT firms, etc.,) or someone who is keen to gain expertise in areas related to concepts of multiobjective optimization and metaheuristics such that the concepts learned can be successfully used in their respective sphere of functioning in order to contribute more fruitfully.
Fees	The participation fees for taking the course is as follows: **Participants from abroad US $500** **Industry/ Research Organizations: 35000** **Academic Institutions (Faculty, etc.): 20000** **Academic Institutions (Students): Full sponsorship may be available or a token amount will be requested** The above fee include all instructional materials, computer use for tutorials and assignments, laboratory equipment usage charges, 24 hr free internet facility. The participants will be provided with accommodation on payment basis.

The Faculty

	Carlos A. Coello Coello is currently full professor with distinction (Investigador Cinvestav 3F) at CINVESTAV-IPN in Mexico City, Mexico. Dr. Coello has done pioneering research work in an area which is now known as "evolutionary multi-objective optimization", mainly related to the development of new algorithms. He has published over 450 papers in international peer-reviewed journals, book chapters, and conferences. He received the 2007 National Research Award, TWAS Prize 2016, IEEE Kiyo Tomiyasu Award 2013, National Medal of Science and Arts 2012, etc.	**Course Co-ordinator** **Prof. Raghu Nandan Sengupta** **Phone: +91-512-259-6607 (O)** **Cell: +91-99843-86557** **E-mail: raghus@iitk.ac.in** **http://home.iitk.ac.in/~raghus/GIAN_MOUM/**
	Raghu Nandan Sengupta is a faculty in the IME department, IIT Kanpur. His research interests are in Sequential Analysis, Statistical & Mathematical Reliability, Optimization and its use in Finance. His research work has been published in Metrika, EJOR, Sequential Analysis, CSDA, Communications in Statistics: Simulation & Computation, Quantitative Finance, FCDS. He has been awarded IUSSTF Fellowship 2008, EMEA-ERASMUS MUNDUS Fellowship 2011, EU-NAMASTE-ERASMUS MUNDUS Fellowship 2014 and DAAD Research Fellowship 2015 & 2017.	