

# MULTI-OBJECTIVE OPTIMIZATION

## Overview

Multi-objective optimization (also known as multi-criteria optimization, vector optimization and multi-objective programming) is an area within Operation 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 a 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.

The course will cover the fundamental concepts related to multi-objective optimization, as well as different approaches to solve these problems and also a number of standard techniques that are used throughout to solve optimization problems and to assess performance of multi-objective metaheuristics. Although the course will emphasize the research work done on multi-objective evolutionary algorithms, it will also put light on other bio-inspired meta-heuristics (e.g., Particle swarm optimizers, tabu search, scatter search, artificial immune systems, differential evolution and cultural algorithms, among others). Course participants will learn these topics through lectures and hands-on experiments. Also case studies and assignments will be shared to stimulate research motivation of participants.

<b>Modules</b>	<b>Course Duration: December 15-22, 2016</b> <b>This course will cover following topics:</b>  <b>1 : Basic concepts (Pareto optimality, ideal vector, nadir point, utopian point, etc.).</b> <b>2 : Multi-Objective Evolutionary Algorithms (Pareto-based, aggregating functions, decomposition methods, indicator-based, other)</b> <b>3 : Techniques to maintain diversity (fitness sharing, clustering, adaptive grids, etc.)</b> <b>4 : Test problems (ZDT, DTLZ, WFG, Okabe's test problems, etc.)</b> <b>5 : Performance indicators (unary and binary indicators)</b> <b>6 : Other bio-inspired meta-heuristics (Particle swarm optimizers, tabu search, scatter search, artificial immune systems, differential evolution).</b> <b>7: Incorporation of user's preferences in multiobjective optimization</b> <b>8 : Open research problems</b>
<b>You Should Attend If...</b>	<ul style="list-style-type: none"><li>▪ You are an executive/ engineer/ researcher from manufacturing, service and government organizations including R&amp;D laboratories.</li><li>▪ You are a student at all levels (BTech/MSc/MTech/PhD) or Faculty from reputed academic institutions and technical institutions.</li></ul>
<b>Fees</b>	The participation fees for taking the course is as follows: <b>Not-for-profit R&amp;D and Educational Institutions: Rs. 10000/-</b> <b>Industry/ Research Organizations: Rs. 30000/-</b> <b>Academic Institutions (Full time students): Rs. 1000/-</b>  <b>Note: The course fee will be made half for SC/ST students.</b>  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 and food on payment basis.

## The Faculty



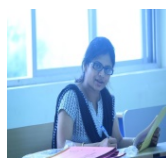
**Prof. Carlos Artemio Coello Coello** received a PhD in Computer Science from Tulane University (USA) in 1996. He is currently full professor with distinction (Investigador Cinvestav 3F) at CINVESTAV-IPN in Mexico City, Mexico. Dr. Coello has done pioneering research work in an area which is now known as "evolutionary multi-objective optimization", mainly related to the development of new algorithms. He is an IEEE Fellow for "contributions to multi-objective optimization and constraint-handling techniques." He is also the recipient of the prestigious 2013 IEEE Kiyoo Tomiyasu Award and of the 2012 National Medal of Science and Arts in the area of Physical, Mathematical and Natural Sciences. His publications currently report over 29,000 citations, according to Google Scholar (his h-index is 67). He is an IEEE Fellow for "contributions to multi-objective optimization and constraint-handling techniques."



**Prof. Pushpak Bhattacharyya** is a Professor of Computer Science and Engineering at IIT Bombay. He is currently the Professor and Director of IIT Patna. He was a Visiting research fellow in Massachusetts Institute of Technology in 1990. He is well known for his contributions to natural language processing and has several distinctions in that field. Prof. Bhattacharyya specializes in Natural Language Processing (NLP), Machine Learning, Machine Translation, Cross Lingual IR and Information Extraction. A highly recognized researcher, Prof. Bhattacharyya is a member of National Knowledge Commission. For his outstanding contribution to computer science, he has received many accolades including IBM Innovation award (2007), Yahoo Faculty Award (2011), P. K. Patwardhan Award for Technology Development (2008), and VNMM Award of IIT Roorkee (2014).



**Dr. Asif Ekbal** is currently a faculty member of the department of Computer Science and Engineering, Indian Institute of Technology Patna, India. His current research interests include Natural Language Processing, Data Mining and Machine Learning Applications, Information Extraction, Bio-text Mining and Machine Learning in Social Networks. His h-index is 20 and total citation count of his papers is 1100 (according to Google scholar). He is the recipient of the *Best Innovative Project Award* from the INAE, best paper award in ICACCI 2012 etc.



**Dr. Sriparna Saha** is currently a Faculty Member of the Department of Computer Science and Engineering, Indian Institute of Technology Patna, India. She is the author of a book published by Springer-Verlag. Her current research interests include pattern recognition, multiobjective optimization and biomedical information extraction. Her h-index is 15 and total citation count of her papers is 1336 (according to Google scholar). She is the recipient of the Lt Rashi Roy Memorial Gold Medal from ISI Kolkata, Google India Women in Engineering Award, 2008, Junior Humboldt Research Fellowship etc.

## Course co-ordinators

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