

## **Towards Handling Many Objectives: Initial Results Using NSGA-III**

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### **Abstract:**

Over the past two decades, multi-objective optimization has been increasingly used in practice simply due to their ability to provide a clear picture of the extent and nature of trade-off that different objectives allow. Evolutionary multi-objective optimization (EMO) methods provided a computationally fast way to find a set of trade-off near optimal solutions in a single simulation. Commercial softwares, such as ModeFrontier, had been crucial in the overall growth and popularity of EMO methods in practice. However, with an increase in their use, researchers realized the need of handling more than two or three objectives, probably extending their scope to problems having 10+ objectives. Since the existing EMO methodologies had a number of algorithmic and practical difficulties in handling more than three objectives, researchers had been trying to come up with ways of handling these so-called many-objective optimization problems in a computationally tractable manner. In this talk, we shall provide an overview of some past efforts and introduce an extension of the popular NSGA-II algorithm (we called NSGA-III) for solving many-objective optimization problems. Initial results on a number of unconstrained and constrained test problems having up to 15 objectives amply demonstrate that NSGA-III is ready to be applied to real-world many-objective optimization problems.

### **Bio-Sketch:**

Kalyanmoy Deb is Koenig Endowed Chair Professor at the Department of Electrical and Computer Engineering in Michigan State University (MSU), East Lansing, USA. He also holds a professor position at Department of Computer Science and Engineering, and Department of Mechanical Engineering at the same university. Prof. Deb's main research interests are in genetic and evolutionary optimization algorithms and their application in optimization, modeling, and machine learning. He is largely known for his seminal research in developing and applying Evolutionary Multi-Criterion Optimization. He was awarded the prestigious 'Infosys Prize' in 2012, 'TWAS Prize' in Engineering Sciences in 2012, 'CajAstur Mamdani Prize' in 2011, 'JC Bose National Fellowship' in 2011, 'Distinguished Alumni Award' from IIT Kharagpur in 2011, 'Edgeworth-Pareto' award in 2008, Shanti Swarup Bhatnagar Prize in Engineering Sciences in 2005, 'Thomson Citation Laureate Award' from Thompson Reuters. Recently, he has been awarded a Honorary Doctorate from University of Jyväskylä, Finland. His 2002 IEEE-TEC NSGA-II paper is judged as the Most Highly Cited paper and a Current Classic by Thomson Reuters having more than 4,200+ citations. He is a fellow of IEEE, Indian National Science Academy (INSA), Indian National Academy of Engineering (INAE), Indian Academy of Sciences (IASc), and International Society of Genetic and Evolutionary Computation (ISGEC). He has written two text books on optimization and more than 350 international journal and conference research papers with a total Google Scholar citation of 54,694 with h-index of 77. He is in the editorial board on 18 major international journals. More information about his research can be found from <http://www.egr.msu.edu/~kdeb>.

