The attainment-function approach to stochastic multiobjective optimiser assessment and comparison

Carlos M. Fonseca[1] and Viviane Grunert da Fonseca[1,2]

[1] Centre for Intelligent Systems, Faculty of Science and Technology, University of Algarve, Portugal
cmfonsec@ualg.pt,
[2] Instituto Superior D. Afonso III, Portugal.
vgrunert@csi.fct.ualg.pt

Abstract. Since the (random) outcomes of stochastic multiobjective optimisers, such as multiobjective evolutionary algorithms, are sets of non-dominated solutions, analysing their statistical performance is challenging in that it involves studying the distribution of those sets. The attainment function, so named because it indicates the probability of an algorithm attaining arbitrary goals in objective space, has been related to results from random closed-set theory which cast it as a mean-like, first-order moment measure of the distribution of the optimisation outcomes, and also suggest suitable definitions of higher order attainment functions. This talk will overview the use of attainment function techniques in the experimental assessment of multiobjective optimisers, from performance characterization to comparison. In addition, ways in which other approaches to multiobjective optimiser assessment may be related to the attainment function will be suggested. Finally, the attainment function will be shown to support a more general, multiobjective view of optimiser performance, in which runtime plays the role of an additional objective to be minimised.