

# VISUALIZATION IN MULTIOBJECTIVE OPTIMIZATION

*Bogdan Filipič, Tea Tušar*

Multiobjective optimization algorithms usually produce a set of trade-off solutions approximating the Pareto front where no solution from the set is better than any other in all objectives (this is called an approximation set). While there exist many measures to assess the quality of approximation sets, no measure is as effective as visualization, especially if the Pareto front is known and can be visualized as well. Visualization in evolutionary multiobjective optimization is relevant in many aspects, such as estimating the location, range, and shape of the Pareto front, assessing conflicts and trade-offs between objectives, selecting preferred solutions, monitoring the progress or convergence of an optimization run, and assessing the relative performance of different algorithms. This tutorial will provide a comprehensive overview of methods used in multiobjective optimization for visualizing either individual approximation sets or the probabilistic distribution of multiple approximation sets through the empirical attainment function (EAF).

The tutorial will build on the well-attended 2016 tutorial edition and extend it with a taxonomy of visualization methods and ten additional visualization methods not presented last year: aggregation trees, distance-based and dominance-based mappings, level diagrams with asymmetric norm, moGrams, polar plots, tetrahedron coordinates model, trade-off region maps, treemaps, visualization following Shneiderman mantra, and 3D-RadVis. We will demonstrate how each of the introduced methods visualizes the benchmark approximation sets. In addition, animations will be used where possible to show the additional capabilities of the visualization methods. Tutorial attendees will become aware of the many ways of visualizing approximation sets and the EAF, and learn about the advantages and limitations of each method.