

# An overview of basic and advanced statistic techniques for calibrating and comparing algorithms

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**Abstract.** Compared to other disciplines, like for example life or social sciences, sound and detailed statistical experimentation is not a widespread technique in the field of metaheuristics. Among other issues, there are three main aspects to consider when working with metaheuristics. First, we have the design and calibration, i.e., how to choose different operators and/or techniques and how to set them in order to improve performance. Second, there is the analysis or the ability to explain performance differences as a function of the different parameters or operators used. Lastly, we have the algorithm comparison or how to effectively claim which algorithm is best. All these issues have to be dealt within an environment that includes stochasticity, a big deal of variability and many, many other lurking potential problems. In this talk we will overview some advanced statistic techniques that can be very helpful when dealing with these problems. We will talk about design of experiments, from complete factorials to mixed level fractional factorial designs, unfolding, confounding as well as insaturated Taguchi designs. Some other topics that we will cover will be non-parametric statistical designs, advanced decision trees and CHAID techniques that are useful when dealing with categorical response variables.