Stochastic Optimization of Multiple Objectives and Supervised Machine Learningy

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Optimization of conflicting functions is of paramount importance in decision making, and real world applications frequently involve data that is uncertain or unknown, resulting in multi-objective optimization (MOO) problems of stochastic type.

In this talk we will first give a brief description of the main goals in Data Analysis and Learning, with an emphasis on the type of optimization problems needed to be solved. Then we will review the classical stochastic gradient method for (single-objective) stochastic optimization.

We will then analyze the stochastic multi-gradient (SMG) method, seen as a natural extension of the classical stochastic gradient method from single to multi-objective optimization. We will focus on the estimation of multi-gradients and the analysis developed for convergence rates.

The SMG method is then framed into a Pareto-front type algorithm for the computation of the entire Pareto front. One can apply it to any stochastic MOO problem arising from supervised machine learning, and we report results for logistic binary classification where multiple objectives correspond to distinct-sources data groups.