TikTak: an efficient Global Optimizer

Research by **?** compares an array of local and global optimizers, which are given the task of finding the global optimum of non well-behaved functions. They find that a multistart algorithm that they propose, called TikTak, outperforms the others regarding in terms of time required to reach the solution and the probability that the algorithm actually find the right point. TikTak is implemented following the following steps:

1. Determine bounds for each parameter, then draw and evaluate N Sobol points.

2. Sort the N Sobol points $(s_1$,..., $s_N)$, with $f(s_1) \leq \cdots \leq f(s_N)$ and keep the first N^* with $N^* < N$. Note that $f()$ is the objective function. We set those numbers such that $N^*/N = 0.15$.

3. Then run local searches $(\hat{s}_1$,..., $\hat{s}_N)$. Call z_j^* the point resulting from the local minimization[1] starting from $\hat{s}_j$. Then, the next starting point will be a convex combination between $\hat{s}_{j+1}$ and the most fit point computed so far through local minimizations Z_j^*, defined as $Z_j^* = \min\{z_1^*, ..., z_j^*\}$. Formally:

$$\hat{s}_{j+1} = (1 - \theta_j)s_{j+1} + \theta_j Z_j^*,$$

   where

$$\theta_j = \min\left[\max[0, 1, (j/N^*)^{\frac{1}{2}}], 0.995\right].$$

4. The global minimum is $Z_{N^*}^*$.

[1] We use the local minimization algorithm provided by **?**, which is a derivative-free optimization (DFO) for nonlinear Least-Squares (LS) problems. This algorithm is robust to noise, which might arise because of the errors coming from the approximation of continuous problems on a discrete grid.