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Discussion of "Hypotheses testing by convex optimization"*

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We congratulate the authors on a stimulating paper on a very intuitive and general approach to construct hypotheses tests. Restricting the considered class of tests to simple ones determined by a detector function ϕ, it seems most natural to minimize over ϕ and maximize over the pair $(x, y) \in X \times Y$ where X is the hypothesis and Y the alternative. Particularly, this guarantees that the corresponding test minimizes the worst case error which might happen under the given pair of hypothesis and alternative. It is evident that the resulting test is just the likelihood-ratio test for the worst-case hypothesis x^* against the worst-case alternative y^* with corresponding risk ε_*.

The used approach naturally leads to some restrictions yielding solvability of the resulting saddle point problem, including that X and Y need to be compact and convex. The authors propose an aggregation scheme to overcome this restriction, which is of independent interest from our point of view. Even though it is limited to X and Y being convex hulls of finitely many convex and compact subsets, the construction might be very helpful in many cases.

In the following we will comment on the impact of the proposed methodology to the problem of change point detection. Suppose m observations of the form

$$Y_i = \mu_m\left(\frac{i}{m}\right) + \sigma\varepsilon_i, \qquad 1 \leq i \leq m \tag{1}$$

are given, where $\varepsilon_i \overset{\text{i.i.d.}}{\sim} \mathcal{N}(0,1)$ and μ is a bump function of the form $\mu_m(x) = \Delta_m 1_{I_m}$ with a subinterval $I_m \subset [0,1]$. We want to test the hypothesis $\mu = 0$

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