We consider the problem of sequential quickest change-point detection, which is concerned with designing the fastest way to detect a change in distribution, subject to a tolerable rate of false alarms. In a certain formulation of this problem, the Shiryaev-Roberts-Pollak (SRP) detection procedure – a variant of the famous Shiryaev-Roberts (SR) rule – has been shown (Pollak, 1985) to be asymptotically best (in the sense of almost minimizing the maximal average detection delay, subject to a lower bound of the expected number of observations until a false alarm is sounded, when no change is ever in effect, and the lower bound tends to infinity). It was widely conjectured that the SRP procedure was best not only in the asymptotic sense, but also in the exact sense. We provide a counterexample showing otherwise. Specifically, we propose a lower bound on the maximal average detection delay, and, in a special case, offer a modification of the SR rule that attains this lower bound, thus showing that it is optimal. Direct comparison against the optimum then shows Pollak’s 1985 rule to be inferior (in this special case).

Remark. This is joint work with Alexander G. Tartakovsky, Department of Mathematics and Center for Applied Mathematical Sciences, University of Southern California.