Multiple Change-Point Detection via a Screening and Ranking Algorithm

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Abstract: Let \( Y_1, \ldots, Y_n \) be a sequence whose underlying mean is a step function with an unknown number of the steps and unknown change points. The detection of the change points, namely the positions where the mean changes, is an important problem in many fields including engineering, economics, climatology and bioscience. This problem has attracted a lot of attention in statistics, and a variety of solutions have been proposed and implemented. However, there is scant literature to understand the theoretical properties of those algorithms. Here, we investigate a recently developed algorithm called Screening and Ranking Algorithm (SaRa). We characterize the theoretical properties of SaRa and show its superiority over other commonly used algorithms. In particular, we develop a false discovery rate approach to the multiple change-point problem and show a strong sure coverage property for the SaRa.

Key words and phrases: Change-point detection, copy number variation, false discovery rate, high dimensional data, screening and ranking algorithm.