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Large deviations for M-estimators

Abstract We study the large deviation principle for M-estimators (and maximum likelihood estimators in particular). We obtain the rate function of the large deviation principle for M-estimators. For exponential families, this rate function agrees with the Kullback–Leibler information number. However, for location or scale families this rate function is smaller than the Kullback–Leibler information number. We apply our results to obtain confidence regions of minimum size whose coverage probability converges to one exponentially. In the case of full exponential families, the constructed confidence regions agree with the ones obtained by inverting the likelihood ratio test with a simple null hypothesis.

Keywords M-estimators · Maximum likelihood estimators · Large deviations · Empirical processes · Kullback–Leibler information