Near-consistent robust estimations of moments for unimodal distributions

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A. Invariant Moments. All popular robust location estimators, such as the trimmed mean, Winsorized mean, Hodges-Lehmann estimator, Huber M-estimator, and median of means, are symmetric. A γ-weighted Hodges-Lehmann mean ($\mathrm{WHLM}_{k,\epsilon,\gamma}$) can achieve consistency for the population mean in any γ-symmetric distribution with a finite mean. However, it falls considerably short of effectively handling a broad spectrum of other common distributions.