ROBUST SHAPE INFERENCE FROM A SPARSE APPROXIMATION OF THE GAUSSIAN TRIMMED LOGLIKELIHOOD

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**Key words**: Geometric inference, Robustness, Support estimation

**Abstract**: Given a noisy sample of points lying around some shape $M$, with possibly outliers or clutter noise, we focus on the question of recovering $M$. Often, such inference is based on the sublevel sets of distance-like functions such as the function distance to $M$, the distance-to-measure (DTM) or the $k$-witnessed distance.

A sparse approximation of the DTM, the $m$-power-distance-to-measure ($m$-PDTM) is introduced and studied. Its sublevel sets are unions of $m$ balls, with $m$ possibly much smaller than the sample size. By miming the construction of the $m$-PDTM from the DTM, we propose an approximation of the trimmed log-likelihood associated to the family of Gaussian distributions on $\mathbb{R}^d$. Its sublevel sets are unions of $m$ ellipsoids.

We provide Lloyd-type algorithms to compute the centers of the balls and ellipsoids. Trimmed versions of these algorithms allow to wipe out clutter noise and to recover the homology of $M$, from noisy data ; this requiring the storage of only $m$ points and covariance matrices.