

## MINIMIZING $L_1$ -DISTANCE BETWEEN DISTRIBUTION FUNCTIONS

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*Abstract:* The problem addressed is that of finding the closest distribution function  $G$  in a class of distributions  $\mathcal{G}$  to a given theoretical or empirical distribution function  $F$  in the  $L_1$ -norm. Applications considered are those of estimating the center of symmetry  $\theta$  in the one-sample problem and in estimating the shift  $\theta$  in the two-sample problem by minimizing the  $L_1$ -distance between suitably chosen empirical distribution functions. In both cases, the minimizing  $\hat{\theta}$  is shown to be Galton's estimator. The closest symmetric distribution function to the empirical in  $L_1$ -norm is identified as the average of the empirical distribution function and the empirical distribution function of the data reflected about Galton's estimator. The minimizing techniques employed can be used to give new proofs of the corresponding results for the  $L_2$ -norm where the minimizing  $\hat{\theta}$  is the Hodges-Lehmann estimator.

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