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Electrostatic Views of Stein-type Estimation of Location Vectors

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Abstract: Stein-type estimation of location vectors is discussed with the aid of the theory of electrostatics. We consider a class of estimating functions and assess the superiority of an estimating equation by its mean squared norm. The Coulomb potential function leads to a Pythagorean relationship with respect to this norm. By making full use of the Pythagorean relationship, we improve upon the likelihood estimating function. A further improvement is shown to be feasible under a certain condition which is described. We pursue possible strong relationships between the superiority over the likelihood estimating function and physical quantities appearing in the theory of electrostatics.

Key words: Coulomb potential function, electrostatics, estimating function, Green's formula, James-Stein estimator, James-Stein positive-part estimator, Pythagorean relationship

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