Mathematics > Probability

Parametric Stein operators and variance bounds

Christophe Ley, Yvik Swan

(Submitted on 22 May 2013)

Stein operators are differential operators which arise within the so-called Stein's method for stochastic approximation. We propose a new mechanism for constructing such operators for arbitrary (continuous or discrete) parametric distributions with continuous dependence on the parameter. We provide explicit general expressions for location, scale and skewness families. We also provide a general expression for discrete distributions. For specific choices of target distributions (including the Gaussian, Gamma and Poisson) we compare the operators hereby obtained with those provided by the classical approaches from the literature on Stein's method. We use properties of our operators to provide upper and lower variance bounds (only lower bounds in the discrete case) on functionals $h(X)$ of random variables X following parametric distributions. These bounds are expressed in terms of the first two moments of the derivatives (or differences) of h. We provide general variance bounds for location, scale and skewness families and apply our bounds to specific examples (namely the Gaussian, exponential, Gamma and Poisson distributions). The results obtained via our techniques are systematically competitive with, and sometimes improve on, the best bounds available in the literature.

Subjects: **Probability (math.PR)**; Statistics Theory (math.ST)
Cite as: **arXiv:1305.5067 [math.PR]**
(or **arXiv:1305.5067v1 [math.PR]** for this version)

Submission history

From: Christophe Ley [view email]
[v1] Wed, 22 May 2013 09:51:49 GMT (24kb)

Which authors of this paper are endorsers?