

# FUNDAMENTAL EQUATIONS FOR STATISTICAL SUBMANIFOLDS WITH APPLICATIONS TO THE BARTLETT CORRECTION

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**Abstract.** Many applications of Amari's dual geometries involve one or more submanifolds imbedded in a supermanifold. In the differential geometry literature, there is a set of equations that describe relationships between invariant quantities on the submanifold and supermanifold when the Riemannian connection is used. We extend these equations to statistical manifolds, manifolds on which a pair of dual connections is defined. The invariant quantities found in these equations include the mean curvature and the statistical curvature which are used in statistical calculations involving such topics as information loss and efficiency. As an application of one of these equations, the Bartlett correction is interpreted in terms of curvatures and other invariant quantities.

*Key words and phrases:* Dual geometries, statistical manifolds, submanifolds, exponential families, curvatures, imbedding curvature tensor, Bartlett correction, likelihood ratio statistic.