Fluctuation geometry: A counterpart approach of inference geometry

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Starting from an axiomatic perspective, \emph{fluctuation geometry} is developed as a counterpart approach of inference geometry. This approach is inspired on the existence of a notable analogy between the general theorems of \emph{inference theory} and the the \emph{general fluctuation theorems} associated with a parametric family of distribution functions $dp(I|\theta)=\rho(I|\theta)dI$, which describes the behavior of a set of \emph{continuous stochastic variables} driven by a set of control parameters θ. In this approach, statistical properties are rephrased as purely geometric notions derived from the \emph{Riemannian structure} on the manifold $\mathcal{M}_{\theta}$ of stochastic variables I. Consequently, this theory arises as an alternative framework for applying the powerful methods of differential geometry for the statistical analysis. Fluctuation geometry has direct implications on statistics and physics. This geometric approach inspires a Riemannian reformulation of Einstein fluctuation theory as well as a geometric redefinition of the information entropy for a continuous distribution.

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