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Base Change for Fisher Metrics: Case of the q-Gaussian Inverse Distribution

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Abstract : It is known that the Riemannian manifold determined by the family of inverse Gaussian distributions endowed with the Fisher metric has negative constant curvature $\kappa = -1/2$, as does the family of usual Gaussian distributions. In the present paper, firstly, we arrive at this result by following a different path, much simpler than the previous ones. We first put the family in exponential form, thus endowing the family with a new set of parameters, or coordinates, θ_1, θ_2; then we determine the matrix of the Fisher metric in terms of these parameters; and finally we compute this matrix in the original parameters. Secondly, we define the inverse q-Gaussian distribution family ($q < 3$) as the family obtained by replacing the usual exponential function with the Tsallis q-exponential function in the expression for the inverse Gaussian distribution and observe that it supports two possible geometries, the Fisher and the q-Fisher geometry. And finally, we apply our strategy to obtain results about the Fisher and q-Fisher geometry of the inverse q-Gaussian distribution family, similar to the ones obtained in the case of the inverse Gaussian distribution family.

Keywords : base of changes, information geometry, inverse Gaussian distribution, inverse q-Gaussian distribution, statistical manifolds
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