Gradient modeling for multivariate quantitative data

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Abstract   We propose a new parametric model for continuous data, a "g-model", on the basis of gradient maps of convex functions. It is known that any multivariate probability density on the Euclidean space is uniquely transformed to any other density by using the gradient map of a convex function. Therefore the statistical modeling for quantitative data is equivalent to design of the gradient maps. The explicit expression for the gradient map enables us the exact sampling from the corresponding probability distribution. We define the g-model as a convex subset of the space of all gradient maps. It is shown that the g-model has many desirable properties such as the concavity of the log-likelihood function. An application to detect the three-dimensional interaction of data is investigated.

Keywords   Convex function · Exact sampling · g-Model · Gradient representation · Three-dimensional interaction