Nonparametric Measure-Transportation-Based Multiple-Output Center-Outward Quantile Regression

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Abstract

Exploiting novel measure-transportation-based concepts of multivariate quantiles (Hallin et al., *Annals of Statistics* 49, 1139–1165 (2021)), we are considering the problem of nonparametric multiple-output quantile regression. Our approach defines nested *conditional center-outward quantile regression contours* and *regions* with given conditional probability content irrespective of the underlying distribution; their graphs constitute nested *center-outward quantile regression tubes*. Empirical counterparts of these concepts are constructed, yielding interpretable empirical regions and contours which are shown to consistently reconstruct their population versions in the Pompeiu-Hausdorff topology. Our method is entirely non-parametric and performs well in simulations including heteroskedasticity and nonlinear trends; its potential as a data-analytic tool is illustrated on some real datasets.