Numerical Differentiation From Noisy Multivariate Data

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The recently developed multiscale kernel is applied to approximate numerical derivatives. The proposed method is truly mesh-free and can handle unstructured data with noise in any dimension. The method of Tikhonov and the method of L-curve are employed for regularization; no information about the noise level is required. An error analysis is provided in a general setting for all dimensions. Numerical comparisons are given in two dimensions which show competitive results with recently published thin plate spline methods.