CERTIFIED GRADIENT-BASED DIMENSION REDUCTION OF MULTIVARIATE VECTOR-VALUED FUNCTIONS

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Approximation of multivariate functions is a difficult task when the number of input parameters is large. Identifying the directions where the function does not significantly vary is a key preprocessing step to reduce the complexity of the approximation algorithms. In [1] we propose a gradient-based method that permits to detect such a low-dimensional structure of a function. Our methodology consists in minimizing an upper-bound of the approximation error obtained using Poincaré-type inequalities, and it generalizes the Active Subspace method [2]. Numerical examples reveal the importance of the choice of the metric to measure errors and compare it with the commonly used truncated Karhunen–Loève decomposition.

References