



ZAHM Olivier  
INRIA

Abstract

**Detecting and exploiting the low-effective dimension of multivariate problems using gradient information**

Approximation of multivariate functions is a difficult task when the number of input variables is large. Identifying the directions where the function does not vary significantly is a key preprocessing step to reduce the complexity of the approximation algorithms. We propose a gradient-based method that permits to detect such a low-dimensional structure of a function. The methodology consists in minimizing an upper-bound of the approximation error obtained using Poincaré-type inequalities. This generalizes the active subspace method to vector-valued functions. We also show the connection with standard screening techniques used in Global Sensitivity Analysis. Finally, the method naturally extends to non-linear dimension reduction, e.g. when the function is not only constant along a subspace but along a low-dimensional manifold.