

How to Make Multilevel RBF Collocation More Efficient

Patricio Farrell¹

Radial basis functions allow to interpolate or numerically solve differential equations without the expensive generation of a mesh. The matrix of the corresponding linear system has the fantastic property that it is guaranteed to be symmetric and positive definite. However, larger data sets lead to ill-conditioned matrices. These matrices can be improved by combining compactly supported RBFs with a multilevel strategy. For interpolation, multilevel matrices with constant bandwidth still ensure the convergence of the multilevel algorithm. Unfortunately, this is no longer true for collocation: The bandwidth must necessarily grow for multilevel RBF collocation to converge, leading to increasing condition numbers. In this talk, we discuss three ways to improve the conditioning of multilevel RBF collocation: An intrinsic preconditioning approach, regularisation as well as traditional preconditioning techniques.

¹Hamburg University of Technology, Germany (patricio.farrell@tuhh.de)