1125-41-2748   **Joel A Rosenfeld*** (`joelar@ufl.edu`), **Spencer A Rosenfeld** and **Warren E Dixon**. *A Mesh-free Approach to Estimating the Fractional Laplacian via Radial Basis Functions.*

This paper investigates the use of radial basis function (RBF) interpolants to estimate a function's fractional Laplacian of a given order. The mesh-free approach yields an algorithm that can be implemented in high dimensional settings without adjustment. Moreover, the fractional Laplacian is defined in terms of the Fourier transform, and the symmetry of RBFs can be exploited to simplify the estimation problem. Convergence results are established for compactly supported RBFs when the function itself is compactly supported. Further results demonstrate convergence when a function is in the native space for a Wendland RBF (i.e. a Sobolev space) and satisfies a certain L^1 condition. Numerical experiments demonstrate the developed method by estimating the fractional Laplacian of several functions and by numerically solving a fractional Poisson equation with extended Dirichlet condition. (Received September 20, 2016)