# 18.330 Final Project: Radial basis functions

Due: December 13 2017

Radial basis functions are often used as an alternative to polynomials in interpolation problems. One special case are multiquadric radial basis functions which involve the evaluation of sums of the form

$$s(x) = \sum_{j=1}^{N} d_j \phi(x - x_j)$$

where $x_j = jh$, $h = 1/N$, $\phi(x) = \sqrt{x^2 + h^2}$, and $d_j$ some real numbers. In this project, you will develop an algorithm to evaluate this sum fast. You should

1. write a computer program to evaluate the sum brute force for some values of $d_j$,
2. analyze your algorithm and determine its complexity with respect to $N$,
3. verify the complexity using your brute force code,
4. read and understand the attached paper up until the end of section 2.1,
5. briefly summarize the concept and its complexity analysis,
6. write a computer code that implements the approach outlined in the paper,
7. verify the proposed complexity of the new approach using your code and the example you chose in 1.