Math Colloquium Series

Thursday, December 6, 2012

ENG 247

12:30pm-1:30pm

(refreshments at 12:15pm)

Presented by:
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Nelder-Mead Method and Applications

Abstract: The Nelder-Mead method is a popular derivative-free optimization method in n-dimensions, introduced in 1965. The algorithm iteratively creates a simplex of n + 1 points and attempts to improve the worst vertex by expanding, contracting, or reflecting it through the centroid of the simplex. If none of these new locations improves the vertex, then all vertices except the best are contracted toward the centroid. An implementation is demonstrated on the Rosenbrock "banana" function and Matlab's "peaks" function. The "peaks" function shows that the method may converge to a local, but not global minimizer. We describe an interesting application of the Nelder-Mead method: identifying best-fit parameters in a differential equations model where the computation of the gradients needs to be avoided. A second, more elaborate application of the Nelder-Mead method is presented: finding best-fit parameters for a heart rate model of seven coupled differential equations, illustrating the method's use in contemporary mathematical modeling. Finally, we address a few issues related to the convergence of the Nelder-Mead method