

Biostatistics 615/815

Problem Set 9

Due Friday, December 3, 2004

Consider the vector norm function:

$$f(\mathbf{x}) = |\mathbf{x}| = \sqrt{\sum_i x_i^2}$$

The function has minimum 0 when $\mathbf{x} = \mathbf{0}$.

We will use this function to examine the efficacy of the Nelder-Mead algorithm for function minimization. For $k = 1$ to 20 dimensions, generate random starting vectors of k random elements, where each element varies between value between -100 and 100. With these vectors as starting points, use the Nelder-Mead algorithm to find the minimum of the vector norm function above (use 10^{-7} as the relative accuracy threshold). Then graph:

- a) The total number of function evaluations carried out for each k .
- b) The norm evaluated at the minimum point identified by the Nelder-Mead routine.
- c) Repeat part a) using the vector $\mathbf{0}$ (in k dimensions) as the starting point for the minimization routine.