

Mathematics 2, Part 4, Homework 1

I. NELDER-MEAD IMPLEMENTATION

2-D implementation

Firstly we implemented the two dimensional version of the Nelder-Mead method and tested it on a simple function:

$$f(x, y) = x^2 + y^2$$

On Figure 1 we can see the convergence of the best points using the 2-d implementation of the method.

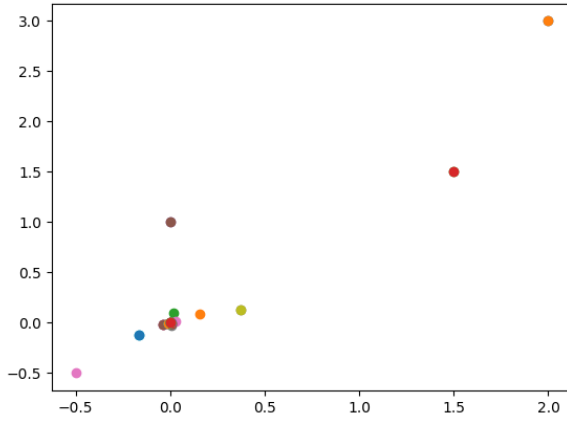


Figure 1. Convergence of the best points on a simple function for a 2-d implementation of the Nelder-Mead method

Implementation for arbitrary dimension

Next, we implemented Nelder-Mead for arbitrary dimensions and tested it on the same function. On Figure 2 we can see that, when using the same starting points, we achieve the same convergence as for the previous implementation

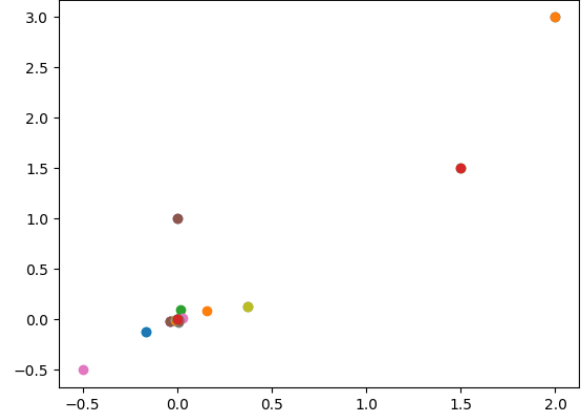


Figure 2. Convergence of the best points on a simple function for the arbitrary dimensional implementation of the Nelder-Mead method

II. COMPARISON OF NELDER-MEAD WITH DESCENT METHODS

We compared the implemented method with the previously implemented descent methods on 3 different functions.

Function 1

The first function is given as:

$$f_1(x) = (x_0 - x_2)^2 + (2x_1 + x_2)^2 + (4x_0 - 2x_1 + x_2)^2 + x_0 + x_1$$

Function 2

Function 3