

# Numerical optimization for large scale problems

## Unconstrained optimization

### Assignment 3: Inexact Newton method

Consider the following problem:

$$\min_{x \in \mathbb{R}^n} f(x)$$

where

$$f(x) = \sum_{i=1}^n x_i^2 - \sum_{i=1}^{n-1} x_i x_{i+1}$$

Use your own implementation of the Inexact Newton method with line-search to solve the problem with  $n = 10^4$  and  $n = 10^6$ . Use the method with several choices of the forcing terms  $\eta_k$ , testing choices which guarantee linear, superlinear and quadratic convergence. Compare the behavior in the three cases, comparing it to the behavior of the pure Newton method. The comparison should be made, for example, in terms of number of outer iterations, inner iterations and computing time.

Write a report summarizing the results with tables and/or figures, commenting the results obtained.