

**Numerical optimization for large scale problems**  
**Constrained optimization**

**Assignment 1: Interior Point Method applied to linear programming problems**

Consider the following problem:

$$\begin{array}{ll}\min & c^T x \\ \text{s.t.} & \sum_{i=1}^n x_i = 1 \\ & x_i \geq 0 \quad \forall i\end{array}$$

where  $x, c \in \mathbb{R}^n$  and  $c$  is defined by

$$c_i = \begin{cases} a & \text{if } i \text{ is odd} \\ 1 & \text{otherwise} \end{cases}$$

being  $a$  a positive parameter. Use your own implementation of the Predictor-Corrector Interior Point Method (see sketch of the LAIB lessons for details about the method) to solve the problem with  $n = 10^4$  and  $n = 10^6$  and with  $a = 2, 20, 200, 2000$ . Compare the behavior of the method in the several test cases. The comparison should be made, for example, in terms of number of iterations and computing time.

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