The problem can be submitted until May 3, 12 :00 noon, either at the exercise session or into the box in front of MA C1 563.

Student(s) [1] :

Question 1 :   *The question is worth 5 points.*

☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5   *Reserved for the corrector*

Given $c \in \mathbb{R}_+^n$, $a \in \mathbb{R}_+^n$ and $\gamma \in \mathbb{R}_+$, design an algorithm which, in $O(n \log n)$ operations, computes the optimal solution x^* to the following linear program :

$$
\begin{aligned}
\max \quad & c^T x \\
\text{s.t.} \quad & a^T x \le \gamma, \\
& 0 \le x_i \le 1, \quad \forall i \in [n].
\end{aligned}
$$

You may assume that a set of n real numbers can be sorted in time $O(n \log n)$ and that each arithmetic operation takes constant time. It is important to prove that the solution returned by the designed algorithm is optimal.

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1. You are allowed to submit your solutions in groups of at most three students.