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# LINEAR PROGRAMMING PROJECT

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GROUP 2 REPORT FOR OPTIMIZATION F24 COURSE

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## 1 Introduction

Initial problem is formulated as following:

$$\begin{aligned} \min_{x' \in \mathbb{R}^p} \|Ax' - y'\|_1 \\ \text{s.t. } 0 \leq x' \leq 1 \end{aligned} \tag{1}$$

where  $A \in \mathbb{R}^{m \times p}$  with  $m \geq p$  — message encoding matrix,  $y'$  — received encoded (noisy) message,  $x'$  — encoded initial message to be find.

## 2 Q1: Linear problem formulation

Initial problem eq. (1) is not linear as cost function  $\|Ax' - y'\|_1 = \sum_{i=1}^m |(Ax')_i - y'_i|$ , where  $(\cdot)_i$  — i-th component of vector, is not linear. However, this objective function is piecewise linear convex function. Therefore