

IE 310 – Programming Assignment 3

Due on April 7, 2020, 23:59

In this assignment, you are going to write a program which a given LP using simplex algorithm. Remember that a typical LP can be given as

$$\begin{aligned} & \max \sum_{j=1}^n c_j x_j \\ \text{s.t. } & \sum_{j=1}^n a_{ij} x_j \leq b_i, i = 1 \dots m \\ & x_j \geq 0, j = 1 \dots n \end{aligned}$$

or equivalently as

$$\begin{aligned} & \max c^T x \\ \text{s.t. } & Ax \leq b \\ & x \geq 0 \end{aligned}$$

You should write a computer program in C, C++ or Python which correctly implements simplex algorithm using the matrix form i.e. you should carry out a number of matrix multiplications in each iteration. You can use the inversion operator that you have already developed in the second assignment. Assume that the objective is maximization, variables are non-negative, constraints are less than or equal to type with non-negative right-hand sides and simplex algorithm converges to a solution.

You need to test your code with three problem instances attached. The first number in .txt files gives the number of constraints m and second number gives the number of variables n . Then, there is a $1 \times n$ matrix which gives the cost vector c . Finally, there is an $m \times (n + 1)$ matrix which represents the augmented matrix $[A|b]$. You can safely assume that the data is given correctly. Do not change the input format.

You need to hand in a report which contains your description of the method and output of the problem each instance (you may include screenshots in your report or write your output in a text file.) Check below for output format. Please name your folder as “Name-Surname-ID-Assignment3”. Submit your folders via Moodle page until due time.

Note: You should write all the code on your own, i.e. do not use any linear algebra libraries available.

Output format

$[x_1, x_2, \dots]$ (Optimal variable vector)
 $z = c^T x$ (Optimal result)