

CSE521

Programming Project I (Due 4/8/2022)

In this programming assignment, you will implement **Fourier Motzkin Elimination** (FME) in two steps, as follows:

- (a) You will implement a baseline FME module, which takes as input a system of inequalities, $\mathbf{Ax} \leq \mathbf{b}$, where \mathbf{A} is a constant matrix of $m \times n$ (m : number of inequalities and n : number of unknowns), \mathbf{b} is an m -entry constant vector and \mathbf{x} is an n -entry vector of unknowns. In this version, \mathbf{A} and \mathbf{b} have integer entries but \mathbf{x} can have non-integer (real) entries. In other words, in this part, you will solve the general (non-integer) FME problem. Your implementation will output whether the system of inequalities have any solution or not.
- (b) You will implement an integer version of FME. You can reuse as much of the code base from (a) as possible, but you need to modify it so that *no* division operation is performed during the solution process. As a result, \mathbf{x} will have only integer entries (as before, \mathbf{A} and \mathbf{b} have integer entries). Your implementation will print out a loop nest which, when executed, prints *all* points in the solution space. In addition, your code should indicate whether the projection (reduction) you employed at each step of the solution process was *exact* or *inexact*.

To implement (a) and (b), you can use any programming language and compiler you like. You will be given later sample inputs to test your implementation, and instructions for submission. Make sure to engineer your implementation well since you will be using it in the second project as well.