

# Homework 11

CS 331

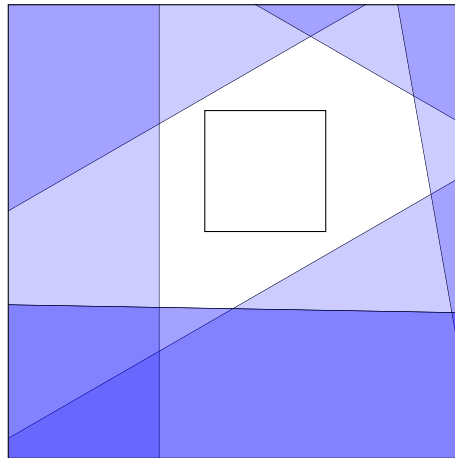
Due Thursday, April 18

1. Work through the Jupyter notebook on the class website.
2. Suppose we are given a sequence of  $n$  linear inequalities of the form

$$a_i x + b_i y \leq c_i.$$

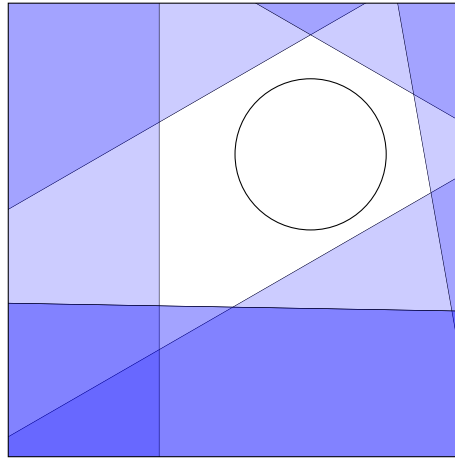
Collectively, these  $n$  inequalities describe a convex polygon  $P$  in the plane.

- (a) Describe a linear program whose solution describes the largest axis-aligned square that lies entirely inside  $P$ . (“Axis-aligned” means that the edges are horizontal and vertical.)



- (b) Describe a linear program whose solution describes the maximum-perimeter axis-aligned rectangle that lies entirely inside  $P$ .

- (c) Describe a linear program whose solution describes the largest circle that lies entirely inside  $P$ .



- (d) Describe a polynomial-time algorithm to compute two interior-disjoint axis-aligned squares with maximum total perimeter that lie entirely inside  $P$ . [Hint: There are exactly two interesting cases to consider; for each case, formulate a corresponding linear program.]

