

Homework Assignment 10 is due Friday April 23

Exercise 1: Square in general position: Show that the VC-dimension of (not necessarily axes-parallel) squares in the plane is 5. This problem may be hard to prove that no set of size 6 can be shattered. Just do your best.

Exercise 2: What is the VC-dimension for a corner? I.e. all points (x,y) such that either

$$(1) \quad (x - x_0, y - y_0) \geq (0, 0),$$

$$(2) \quad (x_0 - x, y - y_0) \geq (0, 0),$$

$$(3) \quad (x_0 - x, y_0 - y) \geq (0, 0), \text{ or}$$

$$(4) \quad (x - x_0, y_0 - y) \geq (0, 0)$$

for some (x_0, y_0) .

Exercise 3: For large n , how should you place n points on the plane so that the maximum number of subsets of the n points are defined by half spaces? How many subsets of size two, three, etc can you achieve? On this problem you may not be able to prove you have the maximum. Just do as well as you can.

Exercise 4: Define the most general form of a set system of VC-dimension one. Give an example of such a set system that can generate n subsets of an n element set.

Exercise 5: Show that the three axioms: unanimity, independence of irrelevant alternatives, and non dictator are independent.