

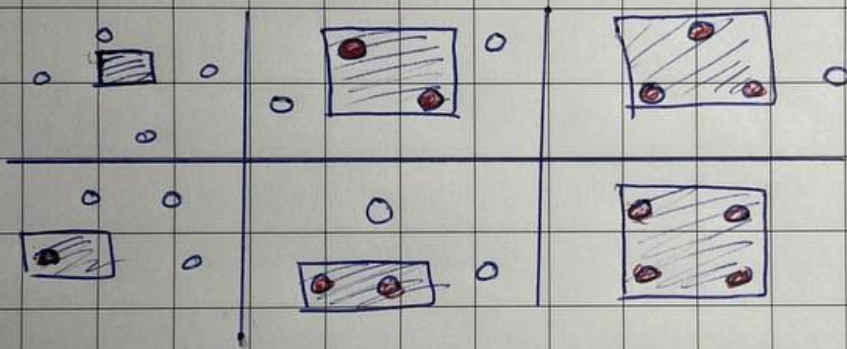
Calculate VC-dim for Axis-aligned rectangles:

**First**: Show the VC-dim is at least 4 by showing that there exists a 4-point set shattered by the concept set (we only need one 4-point set to make the statement)

**Then**: Show that there is no 5-point set that can be shattered

**Proof**

1) an example of 4-point set is shown with all typical labelings & the corresponding realization so  $VC\text{-dim} \geq 4$



2) For any 5-point set we can construct a data assignment as follows:

Pick topmost, bottommost, leftmost & rightmost points & give them label  $\oplus$   
 $\Rightarrow$  at least one point left  $\Rightarrow$  we assign it  $\ominus$   $\Rightarrow$  any rectangle that contains all the  $\oplus$  points must contain the  $\ominus$  point  $\rightarrow$  which is ~~the~~ a case where shattering is not possible  $\Rightarrow VC\text{-dim} < 5$

$$\Rightarrow 4 \leq VC\text{-dim} < 5 \Rightarrow VC\text{-dim}(\text{Axis-aligned rectangles}) = 4$$