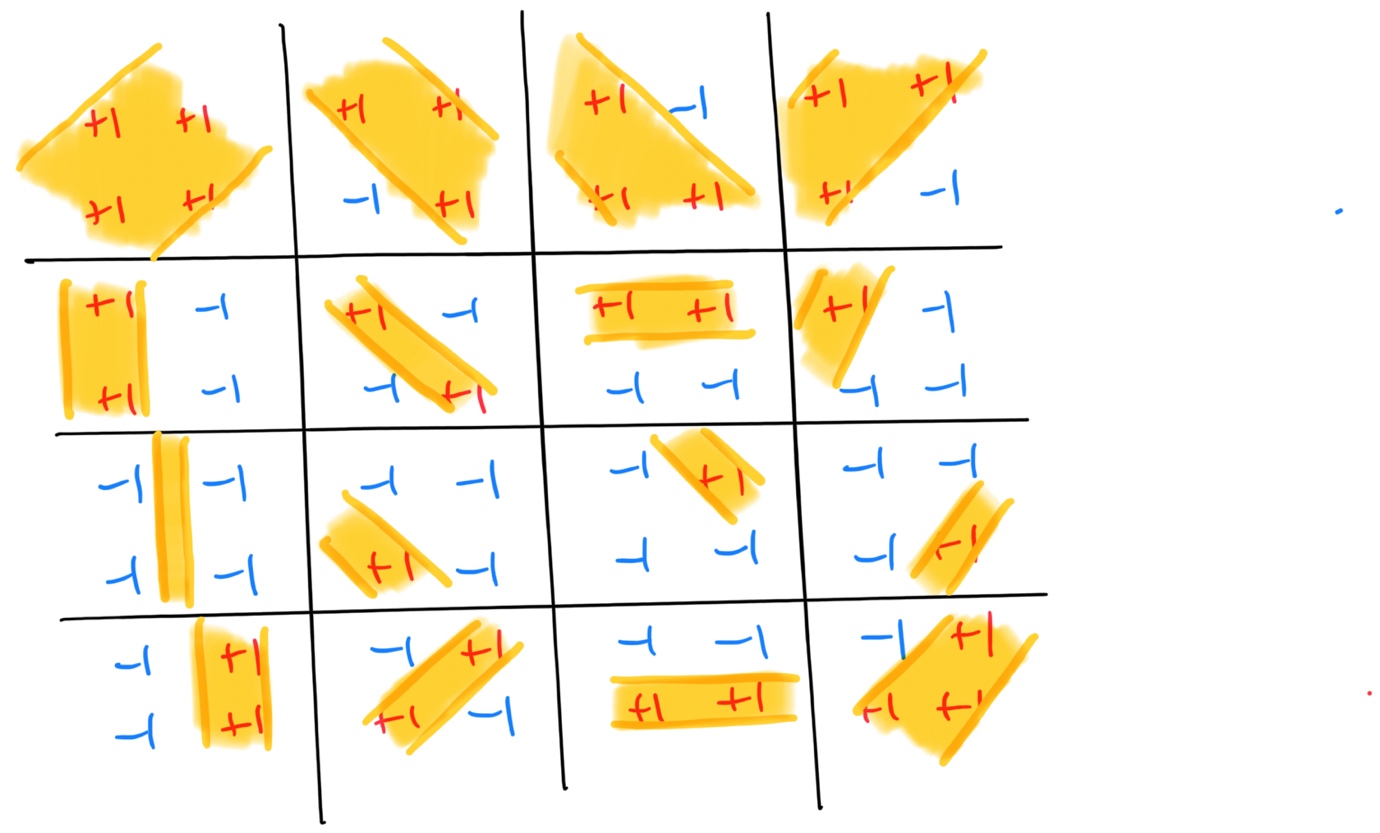
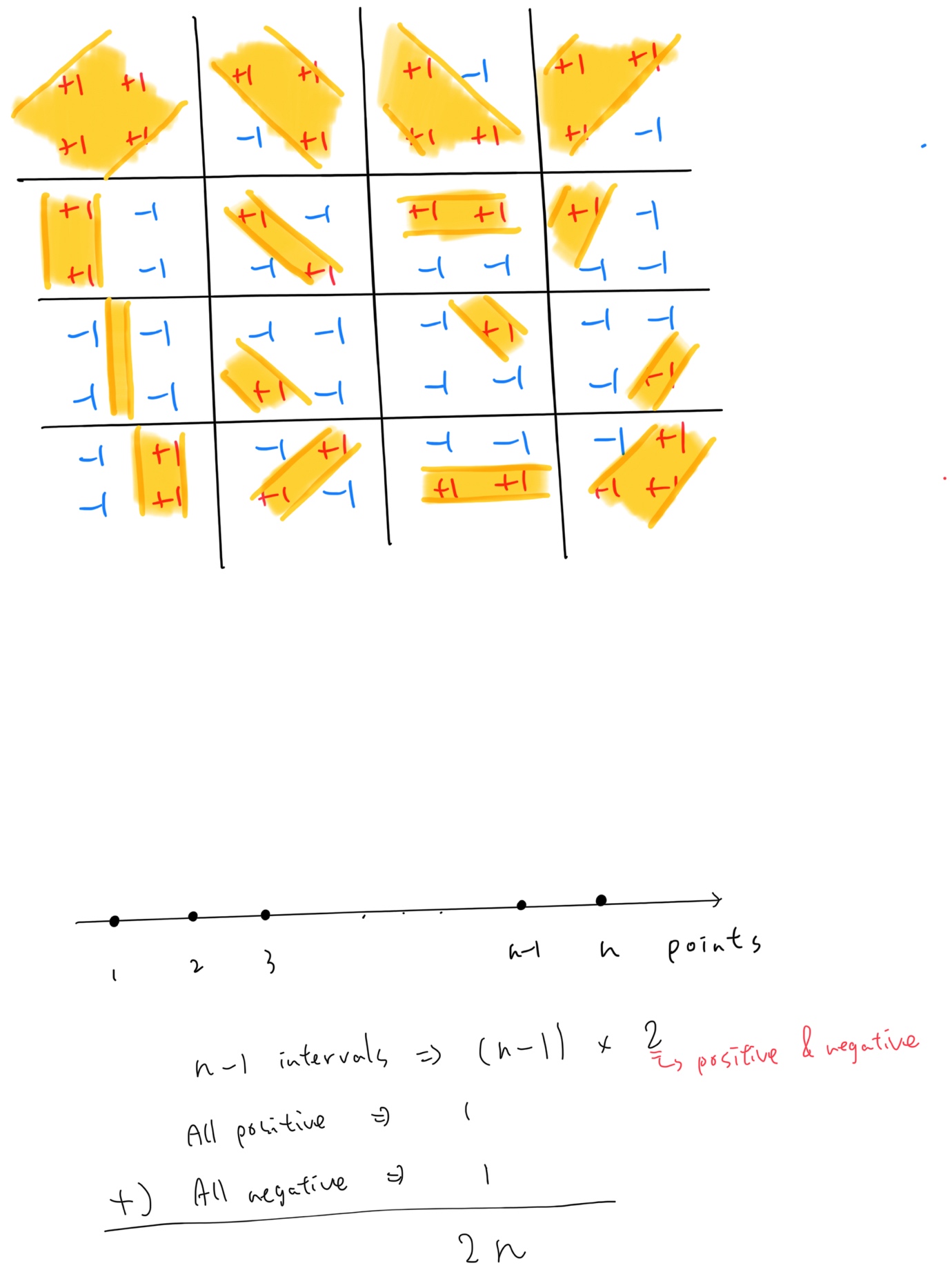
1. 



We can know from the picture above that the hypothesis set shatters n = 4, which means that the VC-Dimension of the hypothesis set is no less than 4.

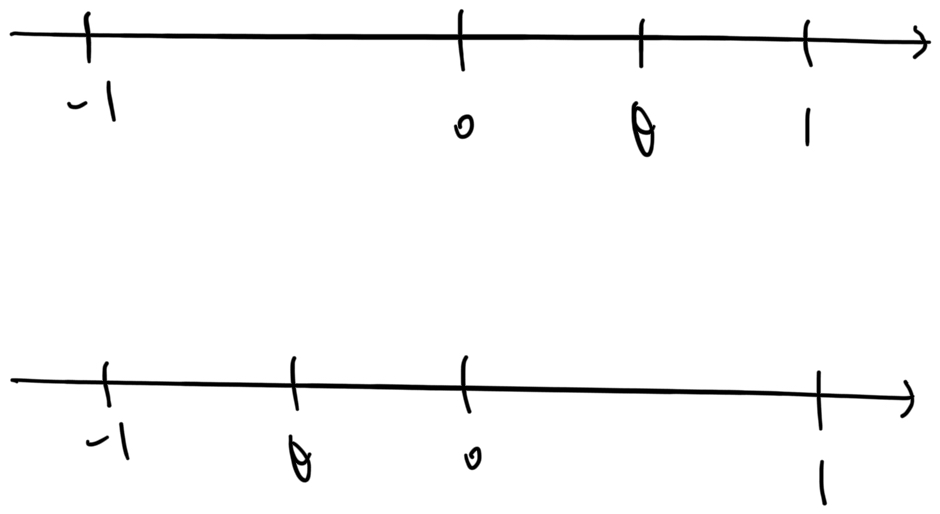
1. For all integer n, we can generate different kind of hypothesis by letting equals to a sum of combination of elements in (a total of different sums, including don’t take any, which means zero), these kinds of different hypothesis set can shatter this set of points: . Therefore, the VC dimension of the hypothesis set is infinity.
2. Let be . Because , so always has all hypothesis that has. This means that if can shatter a set of points , can definitely shatter it by using the same hypothesizes that uses. On the other hand, it’s possible that we can find some hypothesis in that doesn’t have. This means that there probably exist a group of points that can shatter but can’t because uses some hypothesis that doesn’t have. Therefore .



So . Therefore, .

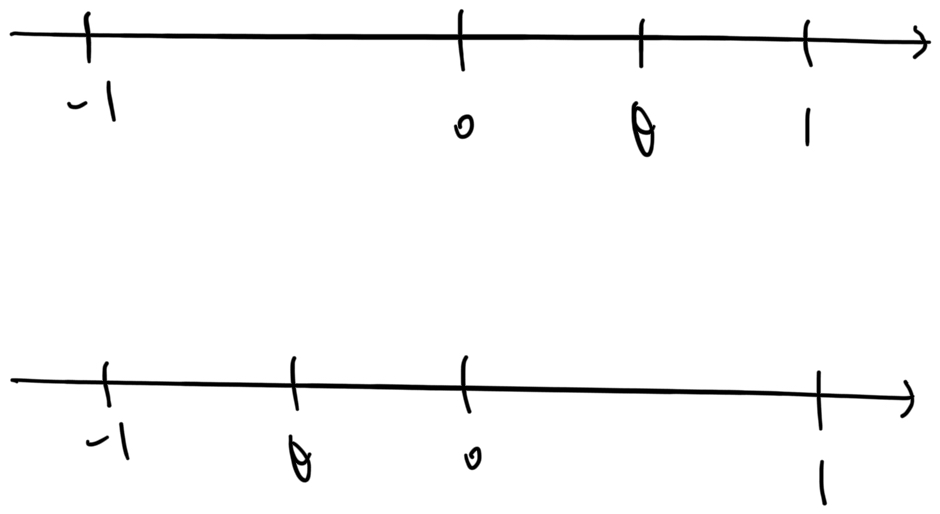


Let’s divide the problem into four cases:



Case 1:

Case 2:

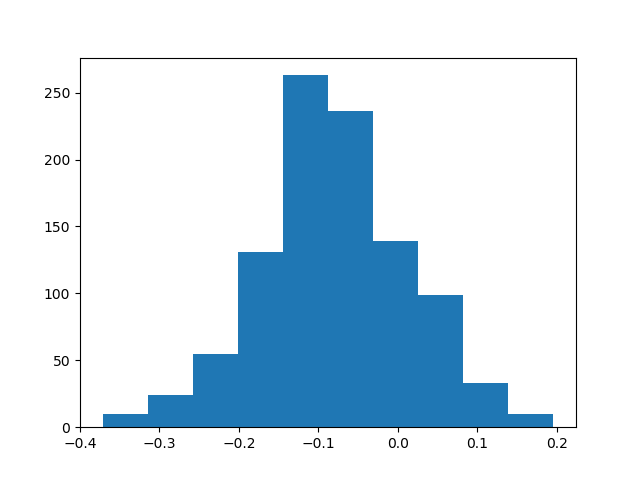


Case 3:

Case 4:

Combine the four equation above, we get:





We can observe from the graph above that and is close even with noise.

1. Let’s prove it by induction.
   1. Base case:

* 1. Guess that
  2. By Induction, the guess is correct.