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Homework 4

- 1) Using the the rademacher complexity model as guide we can order our hypothesis classes in terms of complexity in the following order: [hyperplanes through the origin, arbitrary hyperplanes, axis-aligned rectangles] The experimental data suggest such an ordering and the geometry of the problem supports this as well. Origin hyperplanes are of the lowest complexity because there are many possible arrangements of data which you would get many of the point wrong. For example if all your point fall on the line $y=x$ but they have alternating labels your rademacher complexity would be 0. With arbitrary hyperplanes you you have more options therefore more ways of aligning with random data. For axis aligned rectangles there are even more options. For example if you have a cluster of data and only the point in the middle was positive you would be able to label all point correctly with rectangles whereas you could not with hyperplanes.
- 2)
- 3) One example where the points could not be shattered is where the points are evenly spaced non integers and the labels are as follows: $[+,+,-,+]$. This makes the VC dimension no longer infinite. Thus this would suggest that this classifier is more complex than the one in the previous classifier which is odd because it is a very similar function.