

Exercise Sheet 4

Due at the beginning of the exercise session at 16:20. A total of at least 50% of all available points is required for the “Studienleistung” (I expect there to be 12 or 13 sheets).

Note: When you are asked to provide a VC dimension, you also need to prove that your VC dimension is the correct one!

Exercise 1 (BDSS 6.8.2(2), 2 points). Let \mathcal{X} be a finite domain set and let $k \leq |\mathcal{X}|$. Find the VC dimension of

$$\mathcal{H} := \{h : \mathcal{X} \rightarrow \{0, 1\} \mid |\{x : h(x) = 1\}| \leq k \text{ or } |\{x : h(x) = 0\}| \leq k\},$$

i.e. the hypothesis class consisting of functions that take the value 1 on at most k elements or 0 on at most k elements.

Exercise 2 (MRT 3.15, 2 points). Let \mathcal{H} be the hypothesis class of intervals of the real line parameterized by a single variable $r \in \mathbb{R}$ as follows:

$$I_r = [r, r + 1] \cup [r + 2, +\infty)$$

What is the VC dimension of this class?