Problem Set 9

[Your name] and [student ID]
MAT1801-2020

Problem 1 [BHK 5.16] (10 points). What is the VC-dimension of the class $\mathcal{H}$ of axis-parallel boxes in $\mathbb{R}^d$. i.e. $\mathcal{H} = \{h_{\mathbf{a},\mathbf{b}} | \mathbf{a}, \mathbf{b} \in \mathbb{R}^d\}$, where $h_{\mathbf{a},\mathbf{b}} = \{\mathbf{x} | a_i \leq x_i \leq b_i \quad \forall i \in [d], \mathbf{x} \in \mathbb{R}^d\}$. Prove your answer.

Problem 2 [BHK 5.15] (10 points). Consider the instance space $X = \mathbb{R}^2$. What is the VC-dimension of right corners with axis aligned edges that are oriented with one edge going to the right and the other edge going up? i.e. choose a point, and take everything up and to the right of that point as your subset.

Problem 3 [BHK 5.17] (10 points). Directly prove that the VC-dimension of circles in the plane is 3. i.e. you may not use any theorems where we have proven things about the VC-dimension of hyperspheres or hyperplanes.