Worksheet 7: PAC Guarantees (Part 1)

Name: Due November 20, 2023

This worksheet will give you practice with concepts relating to 'probably approximately correct' learnability. Most of the problems for this assignment are taken from *Foundations of Machine Learning* (Second Edition, [1]).

1. Let $\mathcal{X} = \mathbb{R}$, $\mathcal{Y} = [0, 1]$, and $\mathcal{H} = \{\tilde{y} : \mathcal{X} \to \mathcal{Y} : \tilde{y} \equiv c\}$ a hypothesis class of constant functions. Show that $\mathcal{H}$ is PAC learnable. (Recall that you will need to exhibit a learning algorithm and provide complexity analysis for this algorithm.)

2. Problem [1, 2.3]

3. Problem [1, 2.9]

4. Problem [1, 2.12]

5. Problem [1, 3.13]

6. Let $\mathcal{H} = \{\mathbb{1}_{x \in A} : A \subset \mathcal{X} \text{ is measurable}\}$. Conclude that $\mathcal{H}$ is not PAC learnable (you may reference or use the previous exercise.)

References

[1] M. Mohri, A. Rostamizadeh, and A. Talwalkar. *Foundations of Machine Learning*. MIT Press, 2018. 1, 2