This week you will revisit a topic that you considered briefly during the first week of the semester – the PAC (Probably Approximately Correct) framework for analyzing learning algorithms. You will look in more detail at issues like finding the number of examples needed to learn a concept. You will also see how the VC dimension fits into this framework. Finally, you will consider a variety of concept classes and see how they can be proven to be PAC-Learnable.

1 Learning Theory

1.1 Reading

Please read the following:

- Mitchell, Chapter 7 (Computational Learning Theory), up to page 220,
- Kearns and Vazirani, pages 22-24 (Using 3-CNF Formulae to Avoid Intractability).

1.2 Exercises

Please do the following exercises:

- From Mitchell, 7.1, 7.3, 7.5 b, 7.7 a & b.
- At the bottom of page 24 of Kearns and Vazirani, it says that the mapping from one feature space to another distorts the distribution from which instances are drawn for learning. As an example, it says that if \( D \) is a uniform distribution over \( \{0, 1\}^n \), \( D' \) is not uniform over the transformed assignments. Demonstrate this.

2 The Theory behind Skewing

This is a good week to return to a paper that I promised we would read as a follow-up to the Skewing paper by Page and Ray. A number of you were uncomfortable with the fact that, even though the Skewing algorithm appeared to work, the authors could not present any theory that explained why it would work in general.

2.1 Reading


2.2 Reaction

Write a brief one- or two-page summary and reaction to the paper.