Caltech ML HW1

The Learning Problem

1. [d] (i) Not learning, (ii) Supervised Learning, (iii) Reinforcement Learning
2. [a] (ii) & (iv)

Bins and Marbles

3. [d]

$$\begin{aligned} P[\text{2nd ball black}|\text{1st ball black}] &= P[\text{pick the all black bag}|\text{1st ball black}] \\ &= \frac{P[\text{1st ball balak}|\text{pick the all black bag}] \cdot P[\text{pick the all black bag}]}{P[\text{1st ball black}]} \\ &= \frac{1 \cdot 1/2}{1/2 \cdot 1/2 + 1/2} \\ &= \frac{2}{3} \end{aligned}$$

4. [b] 3.405×10^{-4}. $P[\text{one sample has } \nu = 0] = (1 - 0.55)^{10} = 3.405 \times 10^{-4}$
5. [c] 0.289.

$$\begin{aligned} P[\text{at least one of the samples has } \nu = 0] &= 1 - P[\text{all samples have } \nu \neq 0] \\ &= 1 - (1 - P[\text{one sample has } \nu = 0])^{1000} \\ &= 1 - (1 - 3.405 \times 10^{-4})^(1000) \\ &= 0.289 \end{aligned}$$

Feasibility of learning

6. [e] They are all equivalent (equal scores for g in [a] through [d]). All the scores equal to 12.

The Perceptron Learning Algorithm

see Jupyter Notebook