CSDS 440: Assignment 6

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Problem 25

$$P(T = i \mid c_1, \ldots, c_N) = \frac{P(c_1, \ldots, c_N \mid T = i) \cdot P(T = i)}{\sum_{i \in \{1,2,3\}} P(c_1, \ldots, c_N \mid T = i) \cdot P(T = i)}$$
$$= \frac{\prod_{j=1}^{N} P(c_j \mid T = i) \cdot P(T = i)}{\sum_{i \in \{1,2,3\}} \big(\prod_{j=1}^{N} P(c_j \mid T = i) \cdot P(T = i) \big)}$$

Since no prior information is exposed, we know $P(T = i) = \frac{1}{3}$ for $i \in \{1, 2, 3\}$. Thus we have:

$$P(T = i \mid c_1, \ldots c_N) = \frac{\prod_{j=1}^{N} P(c_j \mid T = i) \cdot \frac{1}{3}}{\sum_{i \in \{1,2,3\}} \big(\prod_{j=1}^{N} P(c_j \mid T = i) \cdot \frac{1}{3} \big)}$$

In comparision to *Problem 27*. In *Problem 25* we have all boxes having probablity of $\frac{1}{3}$ instead of $\{0.1, 0.1, 0.8\}$ in *Problem 27*. Reflecting the setting of the questions.

Also it is observable that as more candies were picked, which box we are picking from becomes clear; reflecting the change of decision boundary. Also, boxes with better similiarity (in terms of candy distribution) with the box we picking from will maintain a higher probablity for a longer

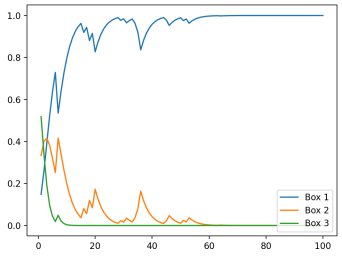

Figure 1: Box 1

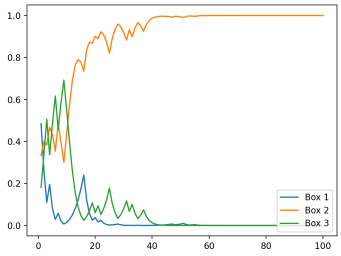

Figure 2: Box 2

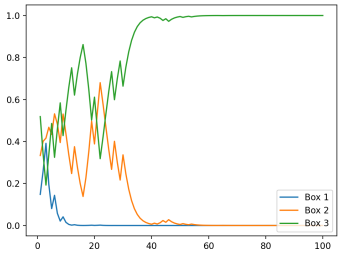

Figure 3: Box 3

period time comparing to boxes lack of similiarity to the box we picking from. e.g. When we are picking from Box 1, Box 2 has a higher probablity than Box 3 for a longer period of time before it goes to 0. This is because Box 1 and Box 2 have similar distribution, while Box 3 has the almost opposite distribution to Box 1.