

CSDS 440: Assignment 6

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Problem 26

Similar to pervious question, we have:

$$\begin{aligned} P(c_{N+1} = C \mid c_1, \dots, c_N) &= \frac{\sum_{i \in \{1,2,3\}} P(c_1, \dots, c_N, c_{N+1} = C \mid T = i)}{P(c_1, \dots, c_N)} \\ &= \frac{\sum_{i \in \{1,2,3\}} P(c_1, \dots, c_N \mid T = i) P(c_{N+1} = C \mid T = i)}{P(c_1, \dots, c_N)} \\ &= \sum_{i \in \{1,2,3\}} P(T = i \mid c_1, \dots, c_N) P(c_{N+1} = C \mid T = i) \end{aligned}$$

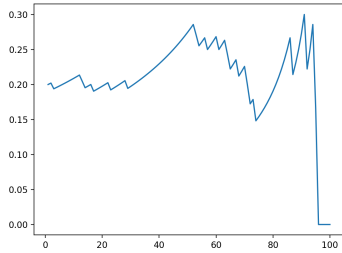


Figure 1: Box 1

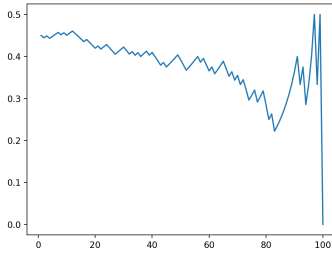


Figure 2: Box 2

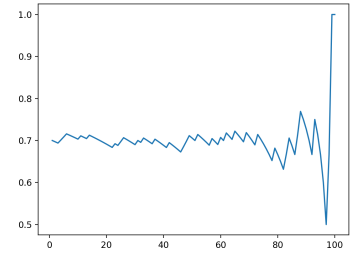


Figure 3: Box 3

First it is observable that boxes with more C inside has a higher probability, and every graph starts with the probability that representing their distribution, reflecting the setting of the problem.

As N is growing, the probability changes more and more suddenly. This is because candies picked at a later time will have more impact on the probability – e.g. the $N + 1$ round will either make the probability be 1 or 0 depending on if there is any C left after the N -th pick.