Introduction to Pattern Recognition Homework 1

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March 26, 2020

1. **Suppose we have three colored boxes R (red), B (blue), and G (green). Box R contains 3 apples 4 oranges, and 3 guavas, box B contains 12 apples, 4 oranges, and 4 guavas. If a box is chosen at random with probabilities $p(R) = 0.2, p(B) = 0.4, p(G) = 0.4$ and a piece of fruit is removed from the box (with equal probability of selecting any of the items in the box), then what is the probability of selecting guava? If we observe that the selected fruit is in fact an apple, what is the probability that it came from the blue box?**

   First, let a represent the event of selecting an apple, and B be the event of choosing a fruit from the blue box.

2. **Using the definition**

$$\mathrm{var}[f] = E[(f(x) - E[f(x)])^2]$$

   show that $\mathbf{var}[f(x)]$ satisfies

$$\mathrm{var}[f(x)] = E[f(x)^2] - E[f(x)]^2$$