APPM 3570: Homework Set 5

Not collected

1. Chapter 4 in Ross: Problems 1, 5, 6, 10, 21, 23; Theoretical Exercises 11 and 12

2. **Geometric distribution.** The Seawolves are a college basketball team with a probability p of winning each game they play. Treat each game as an independent event.

   (a) What is the probability $P(k)$ that they will win their next k games in a row? Find a general formula for $P(k)$ for arbitrary $k = 0, 1, 2, 3, 4, ...$

   (b) Compute the probability that the Seawolves win at least w games in a row, $P(k \leq w) = \sum_{k=0}^{w} P(k)$.

   (c) Show that the probability mass function $P(k)$ sums to 1, that is $\sum_{k=1}^{\infty} P(k) = 1$. Hint: You can do so by taking the limit as $w \to \infty$ of your result from (b).

   (d) On a random season, the Seawolves either have a winning probability $p = 1/4$ or $p = 3/4$ with equal likelihood. That is, 1/2 the seasons $p = 1/4$ and the other 1/2, $p = 3/4$. Say you know they just won 5 games in a row. Use Bayes' Rule to compute the probability their winning probability is $p = 1/4$ or $p = 3/4$.

3. **Proofreading errors.** A professional proofreader has a 98% chance of detecting a given error in a written work.

   (a) If a work contains 4 errors, what is the probability they will catch all of them?

   (b) If a work contains k errors, what is the probability they will catch all of them?

   (c) If the proofreader has caught 5 errors, what is the probability these are the only errors in the work they are proofreading? You may assume that the prior probability assumed of there being $k = 1, 2, 3, ..., 10$ errors is $p(k) = 1/10$. The use Bayes' Rule.