

HW3 – Probability and Bayesian Stats – Due Tuesday 4 February

Suppose you are studying a pair of cryptic species. In your area 5% of individuals are species A and 95% of individuals are species B. There is currently no genetic assay capable of telling them apart. They differ however in the frequency of a rare color pattern. Species A has the rare color pattern 50% of the time while species B has the rare color pattern only 2% of the time. Assume these numbers are known with certainty, from many years of field research.

- 1) Now suppose you find one of these species with the rare color pattern. Use Bayes theorem to compute the probability that it is from species A.
- 2) A new paper comes out that states that species B has a morphological feature 50% time that is only present 10% of the time in species A. Your sample has this feature. What is the probability that you have a sample of species A now?
- 3) Suppose now that a genetic test is developed that can identify the species of our sample. But the test, like all tests, is imperfect. This is the information you have about the test:
 - a. The probability it correctly identifies species A is 0.7
 - b. The probability it correctly identifies species B is 0.98You run the test and it is positive for species A. Compute the posterior probability that your sample is species A using all the information available.

Prepare a document with your answers and R code you used to solve all five problems.