Statistics 568 Bayesian Analysis Spring 2021

Homework 13

Due: Wed 04/28/21 @ 11:59pm rutgers.instructure.com/courses/120689

Problem 1. Consider again the medical screening decision problem discussed in Chapter 9.3 of the book, as well as slides 13-18 from week 13. Suppose that, as an alternative to bronchoscopy, we now have a novel medical test that may help discern if the patient's tumor is indeed malignant. The **sensitivity** of the novel test, i.e. the probability of correctly flagging (+) a malignant tumor, is an unknown value $\alpha \in [0, 1]$. The **specificity** of the test, i.e. the probability of correctly identifying (-) a benign tumor, is 98% (which is the same as bronchoscopy). All other information remain the same, and as before, the patient will need to choose one of the three options (radiotherapy, surgery and no treatment) that maximizes his expected utility as measured by quality-adjusted life expectancy.

Suppose taking the novel test does not harm the patient's life quality. What range of values does the sensitivity α need to be, in order for taking the novel test to be worthwhile at all?

Problem 2. Another attempt at Chapter 8, Exercises 12 and 13. Note: please reproduce all portions of your work for Homework 12 that you wish to retain and be evaluated. Homework 12 will not be graded.