PSYC 4390/5090: Bayesian Statistics

Tarleton State University — Homework 5

1. A random sample of $N = 35$ individuals is selected from a population with a mean of 60, and a treatment is administered to each individual in the sample. After treatment, the sample mean is found to be 60.2 with an estimated standard deviation of 2.95. Perform a Bayesian t-test to investigate whether the treatment results in a meaningful score change. Report your results as you would if you were writing up the results for publication, using the reporting template provided in the lecture 5 video.

2. To evaluate the effect of a treatment, a sample is obtained from a population with a mean of 20 and the treatment is administered to the individuals in the sample. After treatment, the sample mean is found to be 17.7 with an estimated standard deviation of 3.

   (a) Compute the Bayes factor obtained when the sample consists of $N = 16$ individuals.

   (b) Compute the Bayes factor obtained when the sample consists of $N = 36$ individuals.

   (c) Comparing your answers for parts (a) and (b), how does the size of the sample influence the size of the obtained Bayes factor?

3. Borota et al. (2014) observed that in a sample of 73 participants, the 35 participants who received 200 mg of caffeine had significantly better scores on a test for memory of objects than did the 38 participants who took a placebo, $t(71) = 2.0$, $p = 0.049$. Borota et al. (2014) concluded that caffeine enhances memory consolidation.

   (a) Using the JASP Summary Statistics module, perform a Bayesian reanalysis of this claim. What do you find?

   (b) Note that the Bayes factor depends on the choice of prior on the population effect size δ. Are there any choices for prior that would result in the data becoming evidential for the null?

   (c) Given these results, how confident are you of Borota et al.'s claims?