

## STA402L: HOMEWORK 2

DUE: 11:59 PM ON XXX

**Instructions.** Solutions must be submitted to Gradescope as a single PDF. Programming exercises must be completed in R, should be clearly presented, and include all R code. Lab questions are restated here for convenience, but you should refer to the lab itself for details.

**Total points.** Book exercises: XXX; Lab exercises XXX; Overall: XXX.

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### BOOK EXERCISES

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B1. (3 points) Show that the posterior variance of the beta-binomial model can be written as

$$\text{Var}(\theta | y) = \frac{\mathbb{E}(\theta | y)\mathbb{E}(1 - \theta | y)}{a + b + n + 1}.$$

B2. Hoff 3.1.

- (a) (1 point)
- (b) (1 point)
- (c) (1 point)
- (d) (1 point)
- (e) (2 points)

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### LAB EXERCISES

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L1. (1 point) Plot a histogram of  $\theta$  from the `rstan` object called `pool_output`. Describe the distribution.

L2. Visualize the posterior distributions of the  $\theta_i$  with boxplots. In the plot, there should be one box and whiskers object for each  $\theta_i$ .

L3. Take a few minutes to look at the contents of the two files `lab-02-pool.stan` and `lab-02-nopool.stan`. How are they different?