Some Review Problems

Stat 341 – Spring 2017

10H1 recap

In problem 10H1, one parameter in particular showed a substantial difference between the MAP fit and the Stan fit. Which parameter? Why that one? (This is an example of a general principle, and a reason to be cautious about using MAP for logistic regression models.)

Two little models went out to play

Consider the following models. (Note: since no prior is given, both are using uniform priors.)

```
D1 <- data_frame(x = c(1L, 0L, 1L))
m1 <-  map( alist(
  x ~ dbinom(1, p),
  logit(p) ~ a,
  a ~ dnorm(0, 4)
), data = D1)
```

```
D2 <- data_frame(x = 2L, n = 3L)
m2 <-
  map( alist(
    x ~ dbinom(n, p),
    logit(p) ~ a,
    a ~ dnorm(0, 4)
  ), data = D2)
```

1. Here is the precis output for the first model. What value of `p` is associated with mean of the posterior distribution for `a`?

```
precis(m1)
```

```
##   Mean StdDev  5.5% 94.5%
## a 0.63   1.16 -1.22  2.49
```

2. Let $L_1(p)$ and $L_2(p)$ be the likelihood functions for the two models for a given value of p. For each pair below, without making any computations, determine which is larger and explain how you know.
   - $L_1(0.5)$ or $L_1(0.6)$?
   - $L_2(0.5)$ or $L_2(0.6)$?
   - $L_1(0.6)$ or $L_2(0.6)$?
3. These models and data sets are simple enough that you should be able to compute the likelihood function for each by hand. Let's do it for `p = 0.5` and `p = 0.6` (for each model).
4. Determine the values of $L_1(0.5)/L_2(0.5)$ and $L_1(0.6)/L_2(0.6)$.
5. Without running the code, say what the result of the following code chunk would be

```
exp(logLik(m1)) / exp(logLik(m2))
```

6. What output will be produced by `precis(m2)`