

MTH225 Fall2016 Midterm Problem 11

Atmospheric pressure (in kilopascals) is measured at multiple stations at 1, 2, and 3am.

Perform a single-factor ANOVA with three levels to compare the atmospheric pressure at the three times, with possibly different error standard deviations at each level.

As an uninformative prior, use `normal(0,200)` for the mean pressure and `cauchy(0,5)` for the error standard deviations.

Using the data in `MTH225_Fall2016_MT_P11.csv`.

- 2 points: Write R code to read the data and convert it to an R data frame.
- 1 point: Write the data block of a STAN model file that extracts the data from the R workspace.
- 1 point: Write the parameters block of a STAN model file that declares the parameter(s) of your model.
- 2 point: Write the model block of a STAN model file that specifies the priors and likelihood for your model.
- 1 point: Use the printed summary of the output from the `stan()` function to estimate means and 95% confidence intervals for the pressures for hours 1, 2, and 3.
- 1 point: Use the `extract()` function of the `rstan` package to extract the values in the posterior draw for the alpha and sigma parameters.
- 1 point: Use the `quantile(parms$alpha[,1]-parms$alpha[,2],c(0.025,0.975))` command to compute a 95% confidence interval for the difference between alpha1 and alpha2. Use similar statements for the difference between alpha1 and alpha3 and the difference between alpha2 and alpha3
- 1 point: Use the `quantile(parms$sigma[,1]-parms$sigma[,2],c(0.025,0.975))` command to compute a 95% confidence interval for the difference between sigma1 and sigma2. Use similar statements for the difference between sigma1 and sigma3 and the difference between sigma2 and sigma3
- 1 point: Use the R command `sum(parms$sigma[,1]>parms$sigma[,2])/length(parms$sigma[,1])` to estimate the probability that sigma1 is greater than sigma2. Use similar statements for the probability that sigma1 is greater than sigma3 and the probability that sigma2 is greater than sigma3.

(10 points possible)