MTH225 Fall2016 Midterm Problem 13

In some situations where a regression model is a good choice, the nature of the phenomenon dictates that the intercept must be zero.

Rip rap stone used in landscaping consists of individual stones roughly 6-8 inches in diameter. An estimate of the density of the rock is to be made from a set of volumes and weights of individual stones. Because a stone with zero volume must have zero weight, the regression line will be constrained to pass through the origin by omitting the intercept parameter.

As an uninformative prior, use `normal(0,200)` for the slope, and `cauchy(0,20)` for the error standard deviation.

Using the data in `MTH225_Fall2016_MT_P13.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 paramter(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 mean and 95% confidence interval for the slope.
- 1 point: Use the printed summary of the output from the `stan()` function to estimate mean and 95% confidence interval for the error standard deviation.
- 1 point: Use the `extract()` function of the `rstan` package to extract the values in the posterior draw for the slope.
- 1 point: Use the posterior draw values for the slope to find a 95% confidence interval for the expected weight of a stone with a volume of 0.1 cubic feet.
- 1 point: Use the posterior draw values for the slope to find a 95% confidence interval for the expected weight of a stone with a volume of 0.3 cubic feet.
- 1 point: Use the posterior draw values for the slope and standard error to compute a 95% confidence interval for the actual weight of a stone with a volume of 0.3 cubic feet (compute the upper limit of this interval as the expected weight plus twice the error standard deviation, and obtain the lower limit by subtracting twice the error standard deviation from the expected weight).

(10 points possible)