MTH225 Fall2016 Midterm Problem 12

Fuel records for a Boeing-777ER list kilometers flown and fuel used, in units of 100kg.

Use a simple regression model to predict fuel used as a function of kilometers flown.

As an uninformative prior, use `normal(0,200)` for the intercept, `normal(0,20)` for the slope, and `cauchy(0,100)` for the error standard deviations.

Using the data in `MTH225_Fall2016_MT_P12.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 means and 95% confidence intervals for the slope and intercept.

- 1 point: Use the `extract()` function of the `rstan` package to extract the values in the posterior draw for the slope, intercept, and error standard deviation parameters.

- 1 point: Use the posterior draw values for the slope and intercept to compute a 95% confidence interval for the *expected* amount of fuel used on a flight of 4,000 km (compute the expected value as the intercept + 4000 times the slope).

- 1 point: Use the posterior draw values for the slope and intercept to compute a 95% confidence interval for the *expected* amount of fuel used on a flight of 6,000 km (compute the expected value as the intercept + 6000 times the slope).

- 1 point: Use the posterior draw values for the slope and intercept to compute a 95% confidence interval for the *actual* amount of fuel used on a flight of 4,000 km (compute the upper limit of this interval as the expected amount of fuel plus twice the error standard deviation, and obtain the lower limit by subtracting twice the error standard deviation).

(10 points possible)