MTH225 Fall2017 Final Problem 7

Five delivery drive the same route. Fuel efficiency is recorded for each truck on each trip. In addition, headwind speed is recorded on each trip, with negative values indicating a following wind.

One purpose of covariates is to reduce the residual standard deviation sigma. In this exercise, we will run models with and without the windspeed covariate, and compare the error standard deviation for the two models.

The data in `MTH225_Spring2017_Final_Problem7.csv` contains measurements of fuel efficiency and widspeed for five delivery trucks.

The variable names are:

- `mpg` fuel efficiency in mpg
- `vehicle` vehicle number
- `windspeed` windspeed during this trip

The models in this exercise can use the following STAN files listed on the `example_models.html` web page:

- `single_factor_ancova_equal_slopes_and_sd.stan` Model with covariate for windspeed
- `single_factor_anova_n_levels.stan` Model with no covariate

Note that this will require calling Stan twice, once for each model file, and producing two stanfit objects.

- 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 points: Write the model block of a STAN model file that specifies the priors and likelihood for your model.
- 1 point: Write R code to apply the `extract` function to the data structure output from the `stan` function.
- 1 point: Use the `extract()` function of the RSTAN package to obtain the values for the parameters from the posterior draw.

- 1 point: Run an ANOVA model without the windspeed covariate and use it to estimate the residual standard error sigma.
- 1 point: Run an ANCOVA model with the windspeed covariate and compare the residual standard error sigma to the ANOVA model.

(10 points possible)