MTH225 Fall2017 Final Problem 8

Many kinds of events generated independently from many individuals such as telephone calls and websit hits have a Poisson arrival process, meaning that the number of calls or transactions arriving in each fixed time period has a Poisson distribution. The study of arrival processes, service times, and waiting times is known as queueing theory.

From queueing theory, it is known that if events have a Poisson arrival process, the time intervals between events has an exponential distribution.

The data in `MTH225_Spring2017_Final_Problem8.csv` contains measurements of time gaps between arrivals at a website. The objective of this exercise is to model the gaps using an exponential model, then use the posterior draw to compute a 95% confidence interval for the length of the gaps between transactions.

The variable names are:

- `gap` gap between arrivals (in seconds)

- 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: Use the posterior draw to construct to construct a 95% confidence interval for the parameter θ.
- 1 point: Use the function `rexp(length(theta),theta)` to generate a simulated gap for each theta value in the posterior draw, and compute a 95% confidence interval for the gaps.

(10 points possible)