**Assignment 7**

**Hamid Khajehei**

Task1) Give an interpretation of theta0 and theta1 in plain text. Explain to a non-statistician what these two parameters mean.

In this work, the average reaction time is a function of attempts and we model it with a linear function with two parameters namely theta0 and theta1. In the model, theta0 is the intercept and theta0 is the slope of the model. It means we assume that there is a linear relationship between the average reaction time and the number of attempts. More information regarding theta0 and theta1 is that theta0 is the average reaction time for one person and theta1 is the rate of learning.

Task2) Give an interpretation of all the phi:s and mu:s in plain text. Explain to a non-statistician what these parameters mean. Try to do it in the original scale, i.e. in terms of average reaction time rather than log reaction time.

As we mentioned in Task1, linear model has been used in this work to find the relation between average reaction time and the number of attempts. Theta0 is the mean reaction time for one person (individual) without considering the training rate. So, mu0 represents the average of theta0 and phi shows the difference between mean reaction time of adults and kids. Now, if we consider the training rate and use linear function, theta1 shows the rate of training considering several attempts for one individual. Therefore, mu1 is the mean of theta1 and phi1 shows the difference between the average reaction time between adults and kids.

Task3) Provide the expected reaction time for the first attempt (x=1) and the fifth attempt (x=5) for the first individual (Oliver), third individual (Jesper) and fourth individual (“the dude”), i.e. individuals j = 0,2,3 in python or j=1,3,4 in julia/matlab. See my (soon to come) results below if you get similar results.

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Oliver:

Mean reaction time (x=1) = 805.02

Mean reaction time (x=5) = 783.53

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Jesper:

Mean reaction time (x=1) = 346.48

Mean reaction time (x=5) = 344.24

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Dude:

Mean reaction time (x=1) = 377.58

Mean reaction time (x=5) = 335.38

Task 4) Discuss possible model improvements to our model.

a. What would happen if x goes to infinity? Is this physically realistic? It seems like there is no way to get a reaction time less than 100ms looking at the website and our data.

If x (attempts) goes to infinity, the reaction time will be zero which is physically impossible.

b. How can we improve the model?

maybe we can improve the model by defining a maximum number of attempts in the model.

c. Should we change distributions (likelihood, priors)? What options do we have and why?

Regarding the priors, we have used a simple uniform distribution. Maybe using other distributions improve the model.

Task 5) Notice that your sigma has decreased in Assignment 7, but are the same in 6 and 5. Why is that do you think?

Because in Assignment 7, we consider the number of attempts in the model, it reduces the variation in the data. But, in previous assignment (5 and 6), we did not consider the number of attempts. Therefore, the model in assignment 7 is more accurate.

Task 6) When reporting your findings, you may follow section 25.1 on how to report Bayesian analysis using MCMC. However, this too cumbersome to for this Assignment. My suggestion is that you read section 25.1 and create the same bullet list as Kruschke has. In your bullet list, explain what you have not done according to Kruschke and similarly what you have done.

* **Motivate the use of Bayesian (non-NHST):** I have not applied this method in my assignments.
* **Clearly describe the data structure, the model, and the model’s parameters:** this section I have done in my view point as I defined the model, parameters and prior and likelihood distributions during the assignment.
* **Clearly describe and justify the prior:** regarding the prior, we have done this part in the assignment, but we did not justify the prior and we used a uniform distribution as prior for the parameters.
* **Report the MCMC details:** we have done this part and concerning the convergence, when we increase the number of samples, we observe that the results will not change.
* **Interpret the posterior:** this part also I have done by reporting the mean and HDI of the posterior.