Assignment 3

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Preparation

```
# packages
library("brms")
library("ggplot2")
library("tidyverse")

# data
load("data/income.RData")
```

data: `income.RData`

```
head(income)
```

```
##    ls emotst inc_hh emotst_cat
## 1 3.8    6.0      7       high
## 2 1.0    3.0      6        low
## 3 5.0    4.0     10        low
## 4 4.2    3.5      7        low
## 5 4.4    6.0      2       high
## 6 3.8    6.5      7       high
```

The data set contains four variables

Variable	Description
`ls`	Life satisfaction (1-5)
`emotst`	Emotional stability (1-7)
`emotst_cat`	Emot. stability (high-low)
`inc_hh`	Household income (in 10.000)

Excercise 1

Fit the following Bayesian model to assess the effect of household income on life satisfaction.

```
# Casewise exclusion of missing data
income <- na.exclude(income)

# This function can be used to figure out the structure of the priors for the sepcific model including
# default_prior(ls ~ inc_hh,
#               data = income)

bprior <- c(brms::prior(normal(3, 2), class = Intercept)
            , brms::prior(normal(0, 1), class = b, coef = inc_hh)
            , brms::prior(normal(0, 2.5), class = sigma))
```

```r
model.1 <- brm(ls ~ 1 + inc_hh
               , data = income
               , prior = bprior
               , silent = 2
               , refresh = 0)
```

```
## Trying to compile a simple C file
```

```
## Running /usr/lib/R/bin/R CMD SHLIB foo.c
## using C compiler: ‘gcc (Ubuntu 13.3.0-6ubuntu2~24.04) 13.3.0’
## gcc -I"/usr/share/R/include" -DNDEBUG   -I"/home/juliahaaf/R/x86_64-pc-linux-gnu-library/4.4/Rcpp/in
## In file included from /home/juliahaaf/R/x86_64-pc-linux-gnu-library/4.4/RcppEigen/include/Eigen/Core
##                  from /home/juliahaaf/R/x86_64-pc-linux-gnu-library/4.4/RcppEigen/include/Eigen/Dens
##                  from /usr/lib/R/site-library/StanHeaders/include/stan/math/prim/fun/Eigen.hpp:22,
##                  from <command-line>:
## /home/juliahaaf/R/x86_64-pc-linux-gnu-library/4.4/RcppEigen/include/Eigen/src/Core/util/Macros.h:679
##   679 | #include <cmath>
##       |          ^~~~~~
## compilation terminated.
## make: *** [/usr/lib/R/etc/Makeconf:195: foo.o] Error 1
```

a) Consider the priors. Do you think they are a good choice? What would you change (if anything).

b) Ensure convergence and visuaalize the posterior distributions of all parameters. Interpret the results.

c) Is there evidence that household income influences life satisfaction? Compare Model 1 to an alternative model without the income effect using Bayes factor.

d) Also compare the posterior prediction of the models. Is one of them better than the other?