HW8

phil newsome (12.2.2024)

```
here() starts at /Users/philnewsome/Downloads/usc/coursework/Bayesian_Stats/HW8

This is cmdstanr version 0.8.1.9000

- CmdStanR documentation and vignettes: mc-stan.org/cmdstanr

- CmdStan path: /Users/philnewsome/.cmdstan/cmdstan-2.35.0

- CmdStan version: 2.35.0


Attaching package: 'dplyr'

The following objects are masked from 'package:stats':

    filter, lag

The following objects are masked from 'package:base':

    intersect, setdiff, setequal, union

Warning: package 'brms' was built under R version 4.3.3

Loading required package: Rcpp

Loading 'brms' package (version 2.22.0). Useful instructions
can be found by typing help('brms'). A more detailed introduction
to the package is available through vignette('brms_overview').
```

```
Attaching package: 'brms'

The following object is masked from 'package:stats':

    ar

Warning: package 'modelsummary' was built under R version 4.3.3

`modelsummary` 2.0.0 now uses `tinytable` as its default table-drawing
  backend. Learn more at: https://vincentarelbundock.github.io/tinytable/

Revert to `kableExtra` for one session:

  options(modelsummary_factory_default = 'kableExtra')
  options(modelsummary_factory_latex = 'kableExtra')
  options(modelsummary_factory_html = 'kableExtra')

Silence this message forever:

  config_modelsummary(startup_message = FALSE)

Warning: package 'posterior' was built under R version 4.3.3

This is posterior version 1.6.0


Attaching package: 'posterior'

The following objects are masked from 'package:stats':

    mad, sd, var

The following objects are masked from 'package:base':

    %in%, match

Warning: package 'bayesplot' was built under R version 4.3.2

This is bayesplot version 1.11.1
```

```
- Online documentation and vignettes at mc-stan.org/bayesplot

- bayesplot theme set to bayesplot::theme_default()

   * Does _not_ affect other ggplot2 plots

   * See ?bayesplot_theme_set for details on theme setting


Attaching package: 'bayesplot'

The following object is masked from 'package:posterior':

    rhat

The following object is masked from 'package:brms':

    rhat
```

Research Question

Does fear recognition accuracy predict prenatal-postpartum change in amygdala responses to fear faces in first-time fathers?

Variables

- 'hit_rate' : unbiased hit-rate (raw accuracy and differential accuracy combined)
- 'lamyg_mean_change' : change in left amygdala activation to fear>rest contrast
- 'ramyg_mean_change' : change in right amygdala activation to fear>rest contrast

Table @tbl-summ-var shows summary statistics

	N	Mean	SD	Min	Max	Histogram
hit_rate	22	0.62	0.28	0.18	1.07	
ramyg_mean_change	22	−0.04	0.20	−0.40	0.24	
lamyg_mean_change	22	−0.06	0.24	−0.60	0.23	

Model (w. left amygdala)

Let Y = hit_rate, G = lamyg_mean_change

model (left)

$$Y_i \sim N(\mu_i, \sigma)$$
$$\mu_i = \beta_0 + \beta_1 G_i$$

priors:

$$\beta_0 \sim N(0.6, .3)$$
$$\beta_1 \sim N(0, 0.2)$$
$$\sigma \sim N^+(0, 1)$$

Analysis

Results

As shown in the rank histogram in @fig-rank-hist-fit below, the chains mixed well.

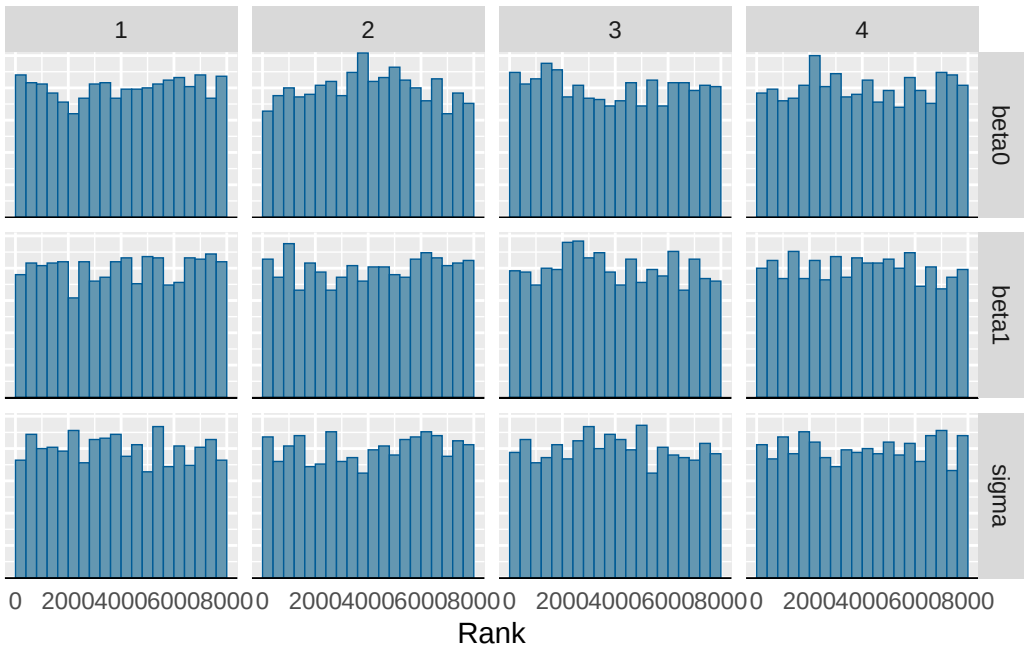
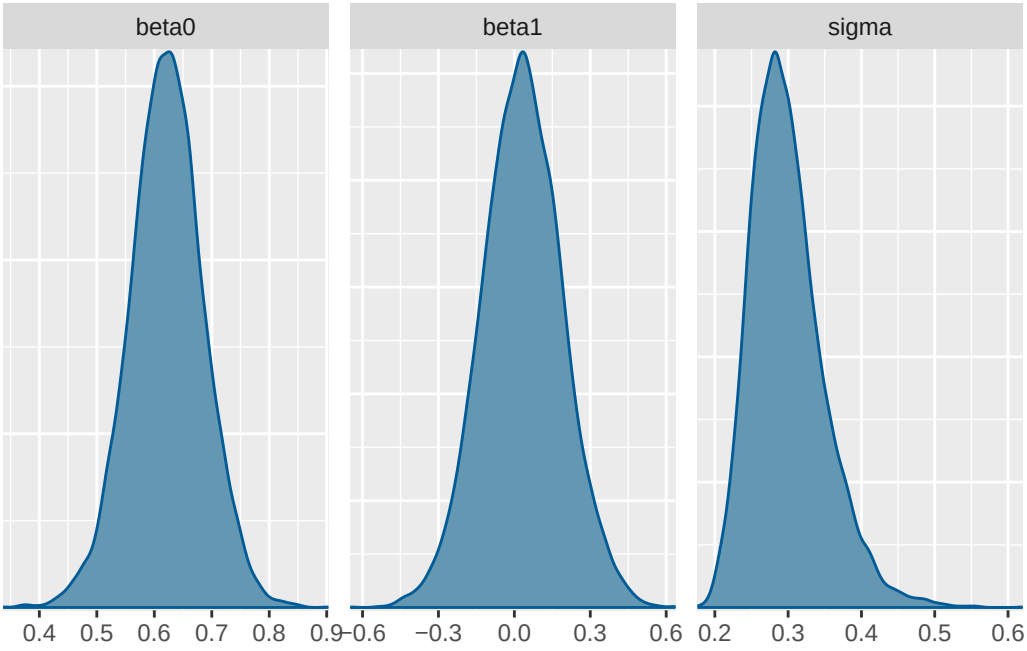
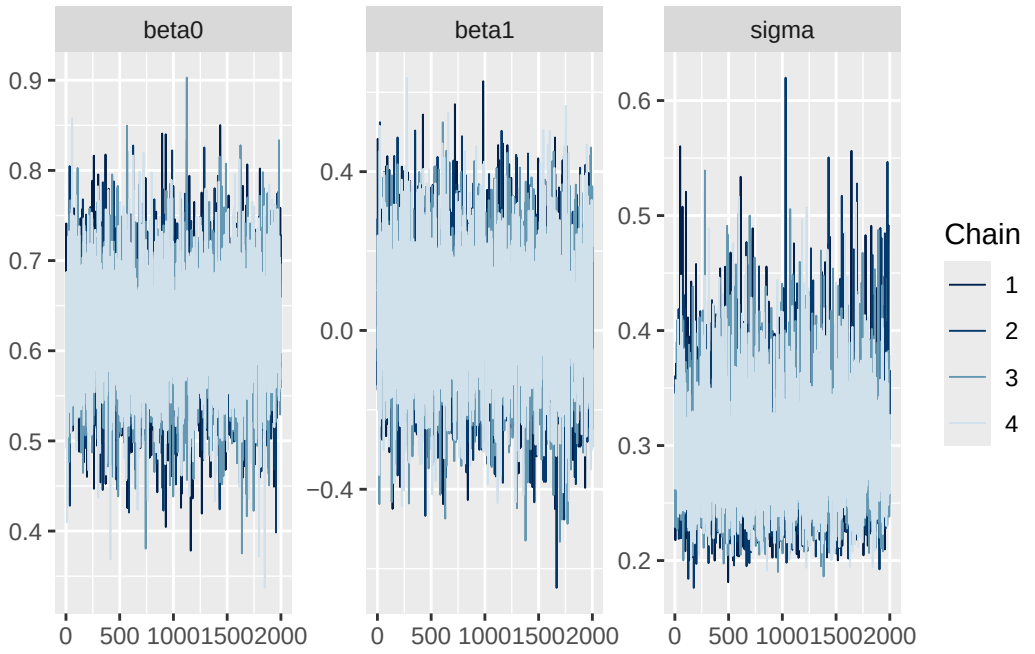


Figure 1: Rank histogram of the posterior distributions of model parameters.





@tbl-summ-fit shows the posterior distributions

Table 1: Posterior summary of the model parameters.

variable	mean	median	sd	mad	q5	q95	rhat	ess_bulk	ess_tail
beta0	0.62	0.62	0.06	0.06	0.52	0.73	1	6545.54	4862.16
beta1	0.03	0.03	0.16	0.16	-0.23	0.29	1	7017.67	5309.82
sigma	0.30	0.29	0.05	0.05	0.23	0.39	1	6466.11	5424.61

Evidence for a positive relationships between fear recognition accuracy and left amygdala response change is inconclusive, with a posterior mean of 0.03 and a 90% CI of [-0.23, 0.29].