Lecture 0: Introduction to Bayesian data analysis, example code

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Load some necessary libraries:

```
library(brms)
```

```
## Loading required package: Rcpp
```

```
## Loading 'brms' package (version 2.16.3). 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
```

```
library(bcogsci)
library(bayesplot)
```

```
## This is bayesplot version 1.8.1
```

```
## - 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
```

```
data("df_pupil")
```

A standard frequentist linear model (incorrect here!):

```
m<-lm(p_size~load,df_pupil)
summary(m)
```

```
##
## Call:
## lm(formula = p_size ~ load, data = df_pupil)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -216.07  -80.49  -14.68   46.95  335.41
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)   617.37      34.22  18.039  < 2e-16 ***
## load           34.31      11.55   2.971  0.00506 **
## ---
```

```
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 124.4 on 39 degrees of freedom
## Multiple R-squared:  0.1846, Adjusted R-squared:  0.1636
## F-statistic: 8.827 on 1 and 39 DF,  p-value: 0.005062
```

Graphical summary:

```
plot(p_size~load,df_pupil)
abline(coef(m))
```
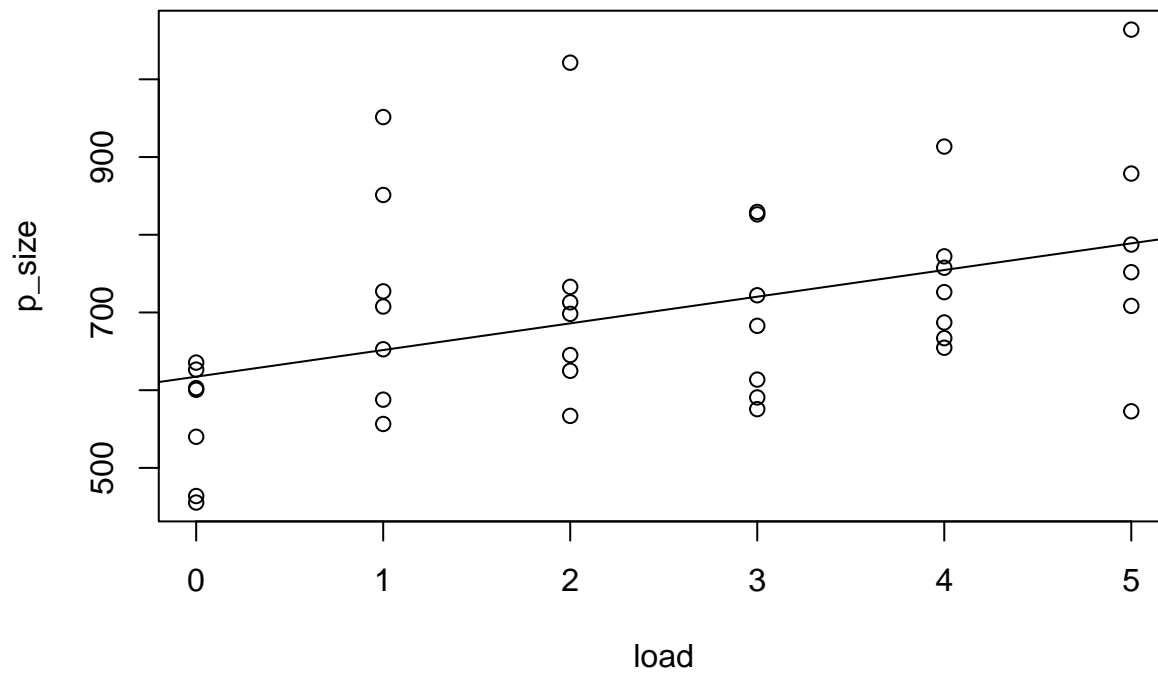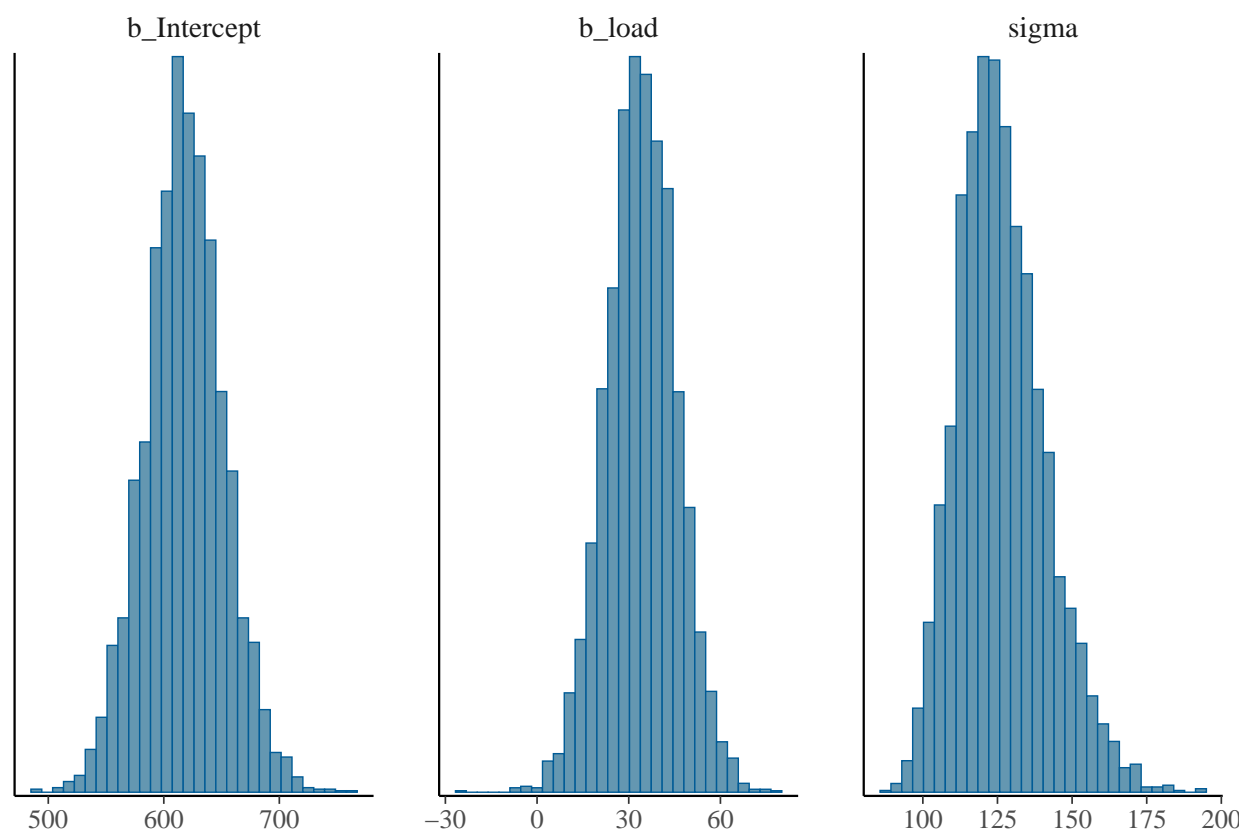

A Bayesian equivalent using Stan (via a front-end, brms):

```
m_brm<-brm(p_size ~ load,data=df_pupil)
summary(m_brm)
```
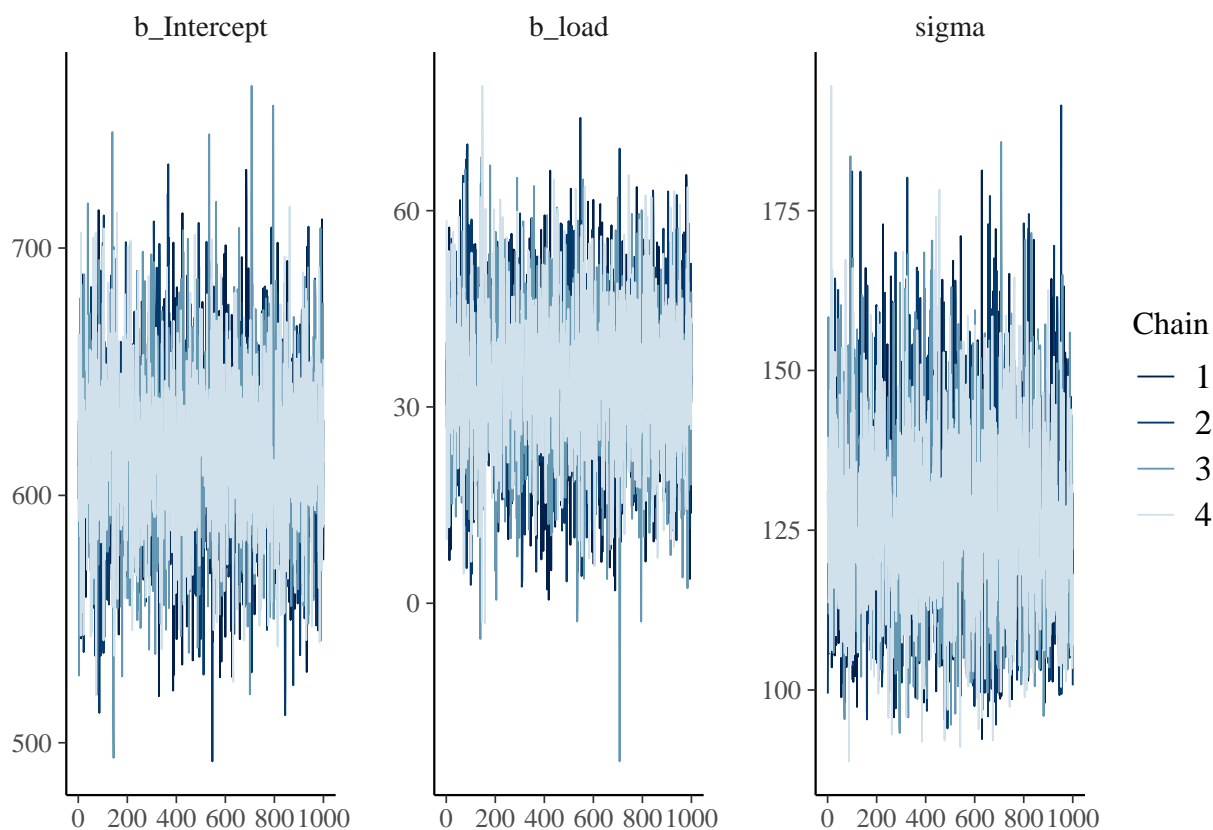
Graphical summary:

```
mcmc_hist(m_brm,pars=c("b_Intercept","b_load","sigma"))
```

```
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
```

```
mcmc_trace(m_brm,pars=c("b_Intercept","b_load","sigma"))
```


3

Interactive graphical summaries:

```
library(shinystan)
launch_shinystan(m_brm)
```