Lab 1 - Bayesian Statistics

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January 2022

Contents

0.1 Helpful `R Markdown` Cheat sheets and Links

- Lesson 1 for R Markdown
- R Markdown Cheat sheet (v2.0)
- R Markdown Reference Guide
- Other R Markdown Cheat sheets

0.2 Examples of `LaTex` Formulae with R

- Note helpful LaTex repository here

0.2.0.1 Example `a`:

$$(x+a)^n = \sum_{k=0}^{n} \binom{n}{k} x^k a^{n-k}$$

0.2.0.2 Example `b`:

$$(1+x)^n = 1 + \frac{nx}{1!} + \frac{n(n-1)x^2}{n!} + \cdots$$

0.2.0.3 Example c:

$$f(x) = a_0 + \sum_{n=1}^{\infty}(a_n \cos\frac{n\pi x}{L} + b_n \sin\frac{n\pi x}{L})$$

0.2.0.4 Example d:

$$e^x = 1 + \frac{x}{1!} + \frac{x^2}{2!} + \frac{x^3}{3!} + \cdots, -\infty < x < \infty$$

0.3 Histogram of μ

```
library(rstan)
```

```
## Loading required package: StanHeaders
```

```
## Loading required package: ggplot2
```

```
## rstan (Version 2.21.3, GitRev: 2e1f913d3ca3)
```

```
## For execution on a local, multicore CPU with excess RAM we recommend calling
## options(mc.cores = parallel::detectCores()).
## To avoid recompilation of unchanged Stan programs, we recommend calling
## rstan_options(auto_write = TRUE)
```

```
## Do not specify '-march=native' in 'LOCAL_CPPFLAGS' or a Makevars file
```

```
library(Intro2R)

# Suggested to do this with multiple cores
options(mc.cores = parallel::detectCores())
rstan_options(auto_write = TRUE)

# Read in the ddt csv file
ddt <- read.csv("Input_Files/DDT.csv")

# Create model using rstan
basic_data <- list(y=ddt$LENGTH, N=length(ddt$LENGTH))
fit <- stan(file = "Input_Files/basic.stan",
```

```
            model_name = "basic",
            data = basic_data,
            chains = 3,
            warmup = 1000,
            cores = 3,
            iter = 5000,
            pars = c("mu")
            )

# ---

library(ggplot2)
library(rstanarm)
```

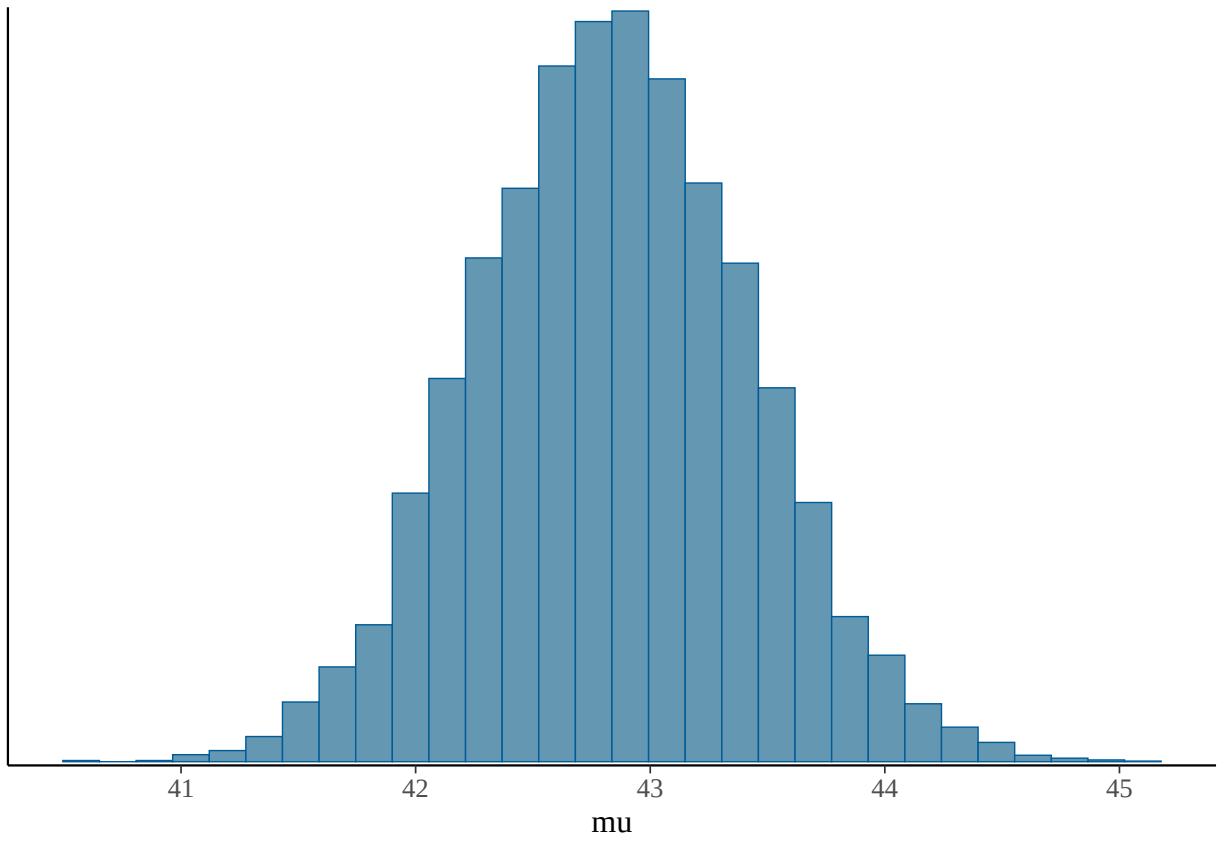
```
## Loading required package: Rcpp

## This is rstanarm version 2.21.1

## - See https://mc-stan.org/rstanarm/articles/priors for changes to default priors!

## - Default priors may change, so it's safest to specify priors, even if equivalent to

## - For execution on a local, multicore CPU with excess RAM we recommend calling

##   options(mc.cores = parallel::detectCores())

##
## Attaching package: 'rstanarm'

## The following object is masked from 'package:rstan':
##
##     loo
```

```
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
```

```r
# Create a blue histogram of mu
color_scheme_set("blue")
mcmc_hist(fit,pars = c("mu"))
```

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



0.4 Assessment for Bayesian Statistics

Group	Weight
Assignments	40%
Midterm Exam	10%
Lab Exercises	10%
Chapter Quizzes	10%
Final Exam	30%
Total	**100%**