

Lab. 1: Introduction to Bayesian Statistics

Getting R markdown working.

Objectives:

- Obtain a summary of the course and its objectives
- Install software
- Configure R and RStudio
- Configure R Markdown
- Make a working R markdown document

Tasks

1. Install Software
 - a. Install Latex (MikTex for PC) <https://www.latex-project.org/get/> (Get full distribution)
 - b. Install R <https://cran.r-project.org>
 - c. Install RStudio <https://www.rstudio.com/products/rstudio/download2/>
 - d. Install Jags <https://sourceforge.net/projects/mcmc-jags/files/JAGS/4.x/>
 - e. Install OpenBUGS (PC only) <http://www.openbugs.net/w/Downloads>
 - f. Install the R package rstan <https://mc-stan.org/rstan/>
 - g. Install the Intro2R package from GITHUB. Detailed instructions are given below:

Introduction

All of the statistics courses I teach use R to a large degree, I am developing a package (Intro2R) that is largely dedicated to MATH 4753. However, much that is contained in the package is applicable to all those learning R and that includes DSA 5403.

Intro2R

To get the package working you will need to install dependencies! On the R command line (internet-connected) copy and paste the following code then hit "enter":-

```
install.packages(c("ggplot2", "tidyverse", "dplyr", "data.table", "prettydoc", "readxl", "stringr", "purrr", "s2ox",  
"gpairs", "boot", "shiny", "MCMCpack", "ggmcmc", "coda", "plotly", "roxygen2", "devtools", "usethis", "rstan"),  
type = "binary", quiet = TRUE, dependencies = TRUE)
```

Now copy and paste the following line:

```
devtools::install_github("MATHSTATSOU/Intro2R",dependencies = "Imports", upgrade = TRUE, force =  
TRUE,build_vignettes = TRUE)
```

If all goes to plan you will have the latest Intro2R installed.

On the command line copy and paste:

```
help(package = Intro2R)
```

Now click on the link "User guides ..." and view lab 1.

You will notice that there is a lot more information.

2. Learn how to make and use R markdown
 - a. Make a new R Markdown document using the New File menu or Alt+F, F, M
 - b. Call the file Lab 1
 - c. Open <http://rmarkdown.rstudio.com/lesson-1.html>
 - d. Save the Cheatsheet and reference guide on the above web page at the bottom – or
 - i. <https://www.rstudio.com/wp-content/uploads/2016/03/rmarkdown-cheatsheet-2.0.pdf>
 - ii. <https://www.rstudio.com/wp-content/uploads/2015/03/rmarkdown-reference.pdf>
 - iii. <http://rmarkdown.rstudio.com/lesson-15.html>
 - e. Using the cheat sheets or reference guides find out how to place web links into the document.
 - f. You will soon make knitted html, etc documents for this lab.
 - g. Place all the links above in the RMD document (Lab 1.RMD)
3. Learn how to make Latex formulae – use \$\$ \$\$, or inline \$ \$ see https://www.sharelatex.com/learn/Learn_LaTeX_in_30_minutes#!#Adding_math_to_LaTeX
4. Place the following formulae in the RMD document using Latex
 - a. $(x + a)^n = \sum_{k=0}^n \binom{n}{k} x^k a^{n-k}$
 - b. $(1 + x)^n = 1 + \frac{nx}{1!} + \frac{n(n-1)x^2}{2!} + \dots$
 - c. $f(x) = a_0 + \sum_{n=1}^{\infty} \left(a_n \cos \frac{n\pi x}{L} + b_n \sin \frac{n\pi x}{L} \right)$
 - d. $e^x = 1 + \frac{x}{1!} + \frac{x^2}{2!} + \frac{x^3}{3!} + \dots, -\infty < x < \infty$
5. Use **rstan** and the files supplied on CANVAS for Example 1: basic.stan, basic.R and DDT.csv and create a histogram of mu. Do this by using an R chunk in lab 1.RMD, you may copy the relevant code from the files supplied (Use the option values as supplied). The CANVAS page is called “Bayesian Computation” <https://canvas.ou.edu/courses/231426/pages/bayesian-computation>
6. What is the assessment for this course? Labs, Assignments, Mid-Term, Final
7. Place the code chunks into the document as found in lab1.R
8. Now remake this document in R markdown with a toc including questions and answers.
9. Render the document **into html, pdf and word**.
10. Place all files (4) into Lab 1 drop box according to the CANVAS schedule

End of Lab

Doing Bayesian Data Analysis



