Introduction to the Bayesian Exercises

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Schedule

Monday:
14:40 - 15:30: Lecture part I

Tuesday:
9:00 - 10:15: Lab part I
10:45 - 12:00: Lecture part II
13:00 - 14:15: Lecture part III
14:15 - 16:30: Lab part II

Bayes Lab

Lab part I:

- Get everyone set up with R and RStudio (If not done yet)
- Introduction to R
- Start with the exercises (In particular conjugate analysis)

Lab part II:

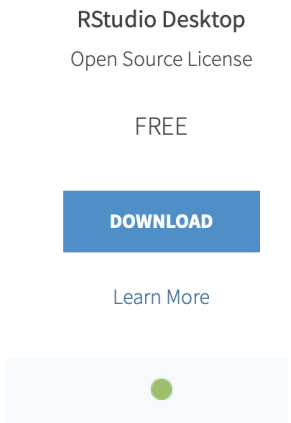
- Continue with the exercise (Finishing conjugate, MCMC methods)

All materials (Bayes lecture slides, Introduction to R, Exercises To Do, Solutions) are available and ready to download at :
`https://github.com/WolfgangWaltenberger/oeawai/tree/master/Bayes`

Setting up R and RStudio

Download and install R depending on your system from:
`https://cran.r-project.org`

Download and install the **free** RStudio depending on your system from:
`https://www.rstudio.com/products/rstudio/download/#download`



Download and installation takes around 10-15 minutes but no more software is needed!

Necessary R packages and further software

Make sure to install the following R packages before you knit the R Markdown files:

- bookdown
- pscl
- invgamma
- MASS
- truncnomr
- rjags
- coda

Further (for exercise 8) make sure to download and install JAGS from: `https://sourceforge.net/projects/mcmc-jags/`

Set up of the lab

Three R Markdown files:

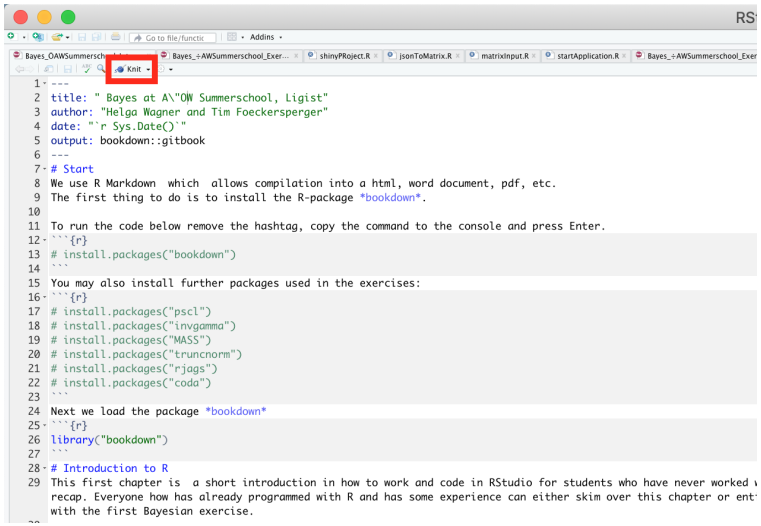
1. Bayes_OeAWSummerschool_IntroR.Rmd:
   Introduction to R and how to code in R

2. Bayes_OeAWSummerschool_Exercises_ToDo.Rmd:
   Bayes exercises on conjugate analysis and MCMC methods accordingly to what was shown in the lecture

3. Bayes_OeAWSummerschool_Exercises_Solutions.Rmd:
   Solution of the exercises

Let's get started:

1. Open "Bayes_OeAWSummerschool_IntroR.Rmd"
2. Install the packages by deleting the # and running the code
3. After installing add the # to each line again (otherwise you cannot knit the file)
4. To compile the R Markdown press *knitr*



Exercises Overview

The file of the exercise is *Bayes_OeAWSummerschool_Exercises_ToDo.Rmd*. Questions are asked and chunk of codes are to be filled in. The solutions can be found in *Bayes_OeAWSummerschool_Exercises_Solutions.Rmd*.

Conjugate Analysis:

- Exercise 1: Posterior inference for the Binomial model
- Exercise 2: Posterior inference for the Poisson model
- Exercise 3: Normal model with known variance
- Exercise 4: Normal model, mean and variance unknown

MCMC methods:

- Exercise 5: Gibbs sampling - Linear regression analysis
- Exercise 6: Gibbs sampling with data augmentation- Probit model
- Exercise 7: Metropolis-Hastings for sampling from a Student-distribution
- Exercise 8: Metropolis-Hastings sampling- Logit model

Have fun and don't hesitate if you got questions :-)