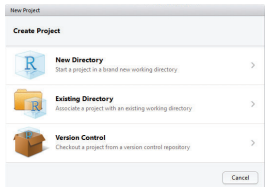


Working with RStudio

Michael Friendly

Psych 6135

http://friendly.github.io/6135

Getting started: Tools

- To profit best, you need to install both R and R Studio on your computer

The basic R system: R console (GUI) & packages
Download: http://cran.us.r-project.org/
Add my recommended packages:
source("http://euclid.psych.yorku.ca/www/psy6135/R/install-pkgs.R ")

The R Studio IDE: analyze, write, publish
Download:
https://www.rstudio.com/products/rstudio/download/
Add: R Studio-related packages, as useful

R package tools

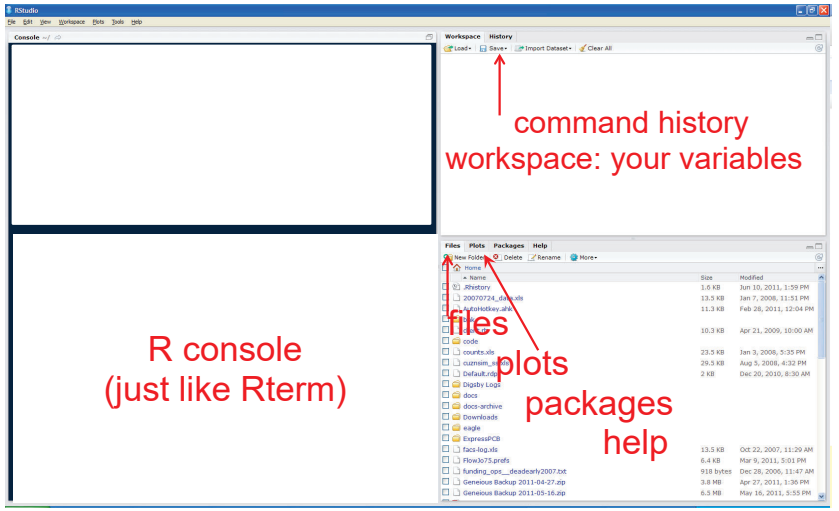
Data prep: Tidy data makes analysis and graphing much easier.
Packages: tidyverse, comprised of: tidyr, dplyr, lubridate, …

R graphics: general frameworks for making standard and custom graphics
Graphics frameworks: base graphics, lattice, ggplot2, rgl (3D)
Application packages: car (linear models), vcd (categorical data analysis), heplots (multivariate linear models)

Publish: A variety of R packages make it easy to write and publish research reports and slide presentations in various formats (HTML, Word, LaTeX, …), all within R Studio

Web apps: R now has several powerful connections to preparing dynamic, web-based data display and analysis applications.

Getting started: R Studio



R Studio navigation

R folder navigation commands:

- Where am I?

```
> getwd()
[1] "C:/Dropbox/Documents/6135"
```

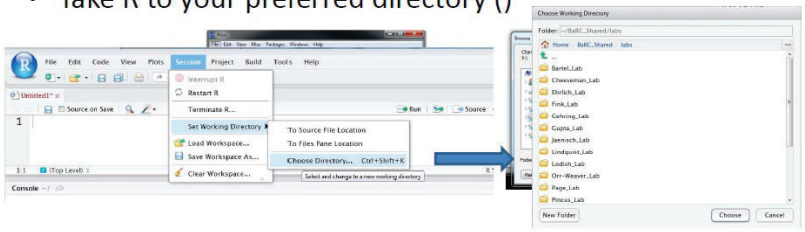
Better yet: create an R project!

- Go somewhere:

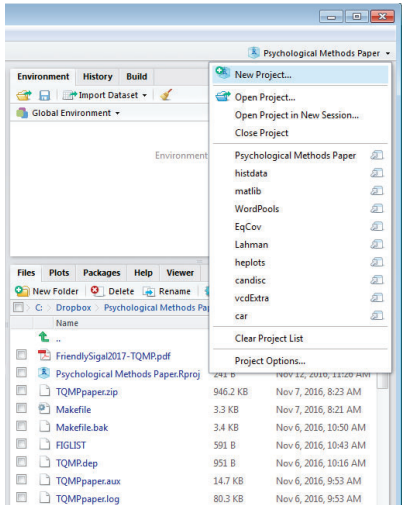
```
> setwd("C:/Dropbox")
> setwd(file.choose())
```

R Studio GUI

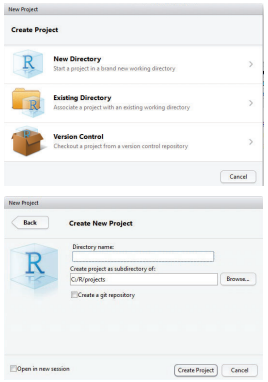
- Take R to your preferred directory ()



R Studio projects



R Studio projects are a handy way to organize your work

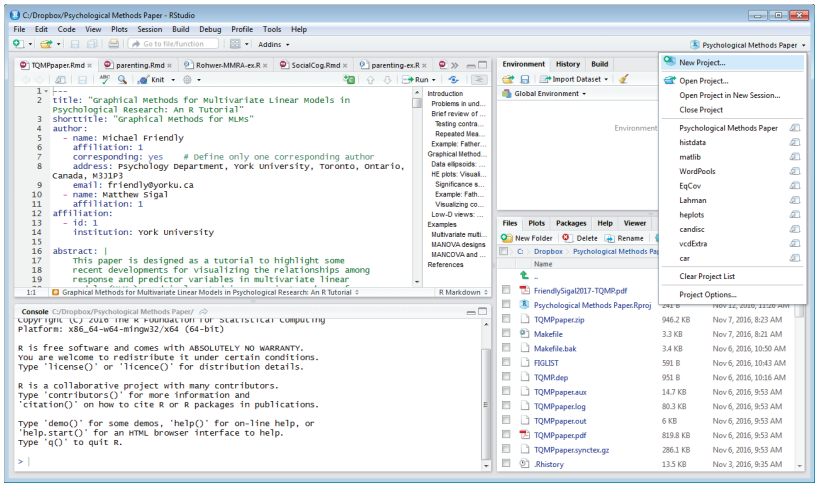


Lahman.Rproj

The .Rproj item opens the project in R Studio

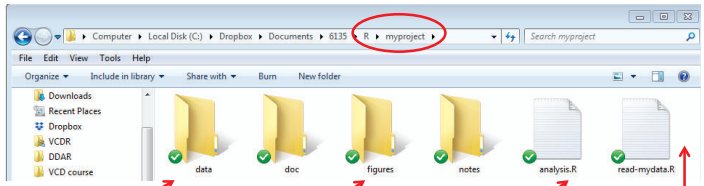
R Studio projects

An R Studio project for a research paper: R files (scripts), Rmd files (text, R "chunks")



Organizing an R project

- Use a separate folder for each project
- Use sub-folders for various parts



data files:
- raw data (.csv)
- saved R data (.Rdata)

figures:
- diagrams
- analysis plots

R files:
- data import
- analysis

Write up files will go here (.Rmd, .docx, .pdf)

This project, saved in a Dropbox folder automatically syncs with all my computers & collaborators. I use Git & GitHub for more serious work.

Organizing an R project

- Use separate R files for different steps:
  - Data import, data cleaning, … → save as an RData file
  - Analysis: load RData, …

read-mydata.R

```
# read the data; better yet: use RStudio File -> Import Dataset ...
mydata <- read.csv("data/mydata.csv")

# data cleaning:
#       filter missing, make factors, transform variables, ....

# save the current state
save("data/mydata.RData")
```


Organizing an R project

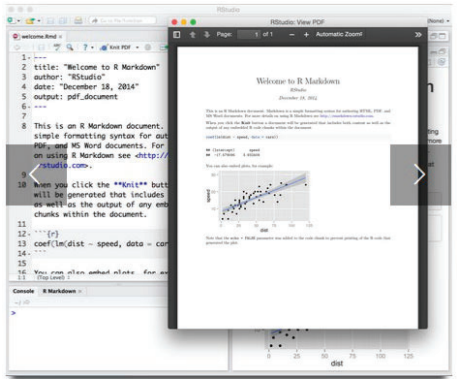
- Use separate R files for different steps:
  - Data import, data cleaning, … → save as an RData file
  - Analysis: load RData, …

analyse.R

```
#' ## load the data
load("data/mydata.RData")

#' ## do the analysis – exploratory plots
plot(mydata)

#' ## fit models
mymod.1 <- lm(y ~ X1 + X2 + X3, data=mydata)

#' ## plot models, extract model summaries
plot(mymod.1)
summary(mymod.1)
```

NB: #' ## is a special R comment for a H2 heading in an R "notebook" script

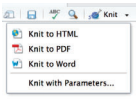
Reproducible analysis & reporting



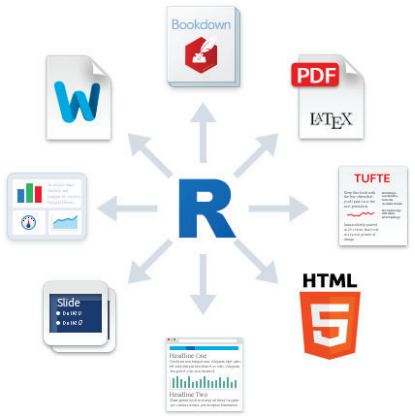
R Studio, together with the knitr and rmarkdown packages provide an easy way to combine writing, analysis, and R output into complete documents

.Rmd files are just text files, using rmarkdown markup and knitr to run R on "code chunks"

A given document can be rendered in different output formats:



Output formats and templates



Templates are available for APA papers, slides, handouts, entire web sites, etc.

The integration of R, R Studio, knitr, rmarkdown and other tools is now highly advanced.

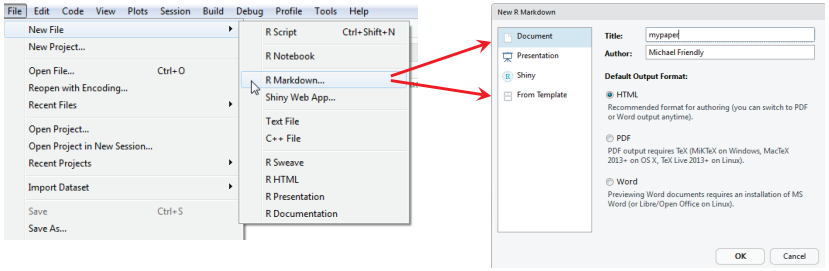
My last book was written entirely in R Studio, using .Rnw syntax → LaTeX → PDF → camera ready copy

The ggplot2 book was written using .Rmd format.

The bookdown package makes it easier to manage a book-length project – TOC, fig/table #s, cross-references, etc. Also: blogdown, posterdown, …

Writing it up

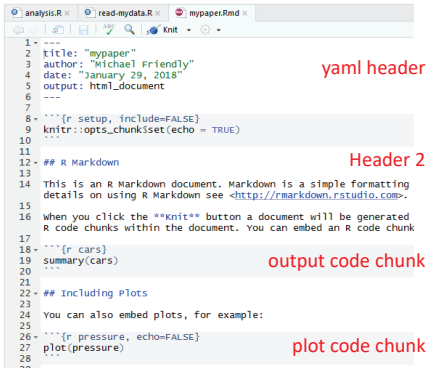
- In R Studio, create a .Rmd file to use R Markdown for your write-up
  - lots of options: HTML, Word, PDF (needs LaTeX)
  - templates for various pub types



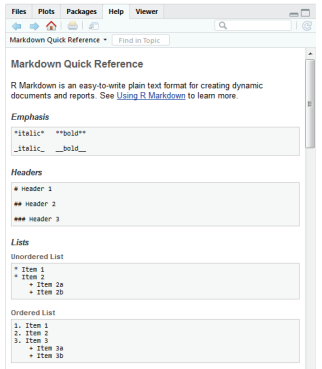
Writing it up

- Use simple Markdown to write text
- Include code chunks for analysis & graphs

mypaper.Rmd, created from a template

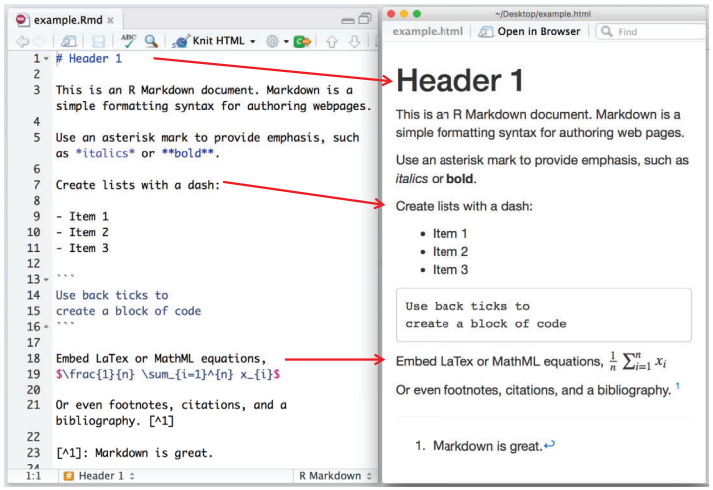


Help -> Markdown quick reference



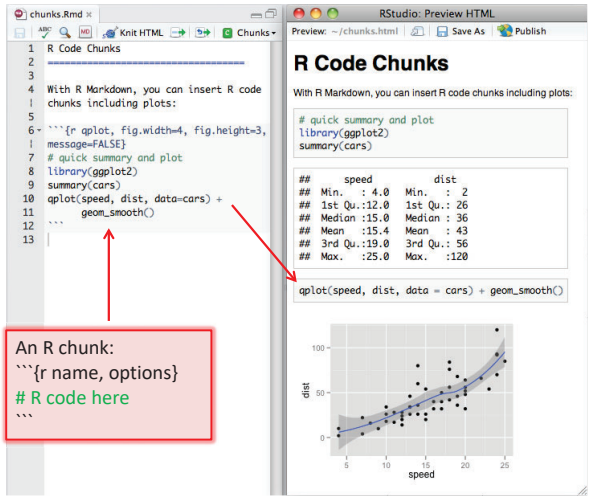
rmarkdown basics

rmarkdown uses simple formatting for all standard document elements



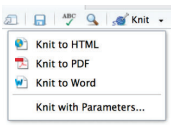
R code chunks

R code chunks are run by knitr, and the results are inserted in the output document

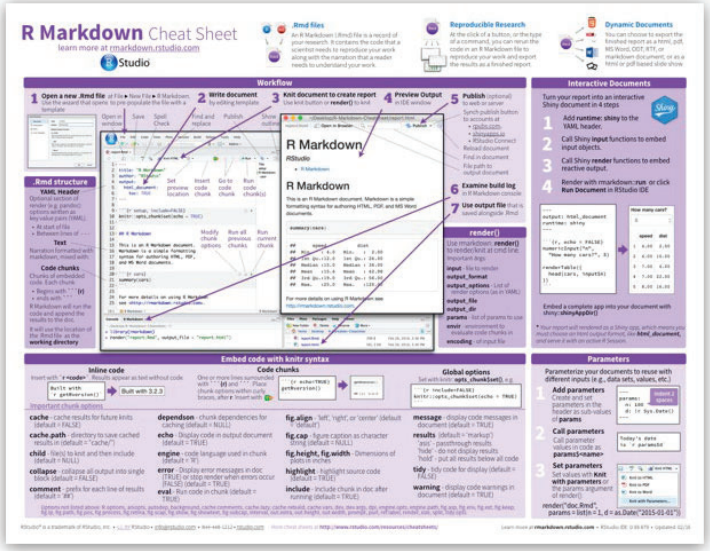


There are many options for controlling the details of chunk output – numbers, tables, graphs

Choose the output format:



The R Markdown Cheat Sheet provides most of the details
https://www.rstudio.com/wp-content/uploads/2016/03/rmarkdown-cheatsheet-2.0.pdf



R notebooks

Often, you just want to "compile" an R script, and get the output embedded in the result, in HTML, Word, or PDF. Just type Ctrl-Shift-K or tap the Compile Report button