Installation of R with RStudio and Packages

Overview

In case you want to install the standard version of R follow the guidelines described in *Chapter 1: Getting R* by Lander[1].

Because standard R has just a rudimentary user interfaces, it is highly recommended to install the integrated development shell RStudio. It provides tools that go far beyond simple code editing of R scripts (these are a collection of R commands), such as, browsing generated graphics, exploring data datasets, writing marked-up documents that merge the results of your R data analyses with its code and your commentary, or other programming languages.

The installation of RStudio as well as some of its features are discussed in *Chapter 2: The R Environment* by Lander. Note that we will not use RStudio's advanced functionalities such as version control or reporting tools, compiling our own packages etc.; however, an example of SHINY, which provides interactive graphical interface to your own scripts, will be shown in class.

The functionality of standard R can be extended by installing additional packages. These package bundle [i] collections of specialized functions including their online documentation, [ii] sample datasets, [iii] sample scripts showing us how to use the functions or datasets and [iv] potentially vignettes that document full-fledged data analysis projects. Each package is installed into its specific "library" directory on your computer's hard drive.
We will use several additional packages, which are not part of R's standard installation, throughout this semester. To learn more about packages see Lander *Chapter 3: R Packages*.

Installation Steps

Important note for Mac OS X users: some R packages only install properly under Mac's OS X if you first install X11 (also known as XQuartz) on your Mac computer (see https://support.apple.com/en-us/HT201341) before you proceed with the installation steps of R.

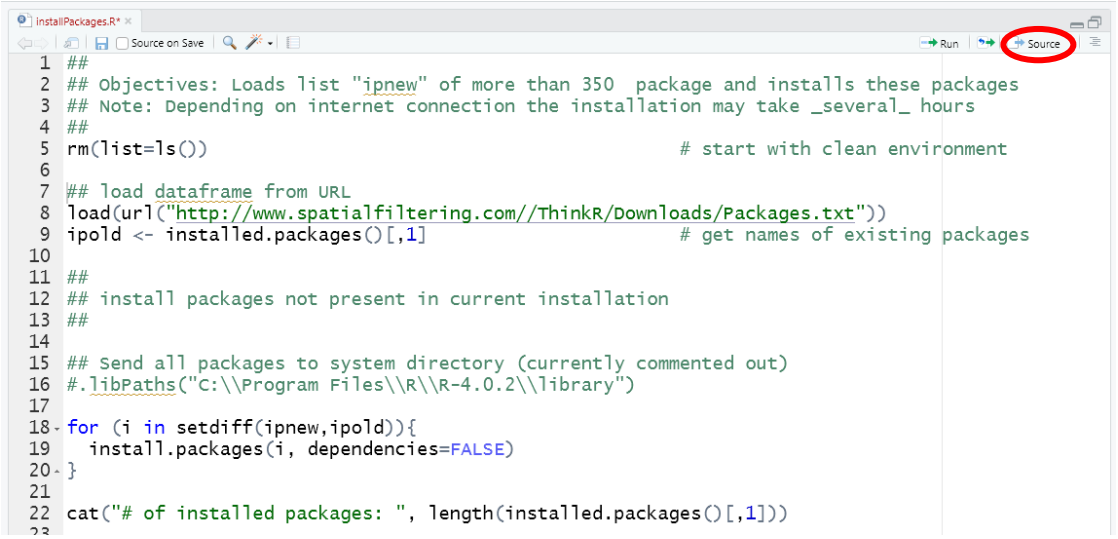
1. Install the current version[2] of R from https://mirrors.nics.utk.edu/cran/. Select your computer's operating system and for Window's the **base** option. Accept the **all** default installation options.
2. Install RStudio from https://www.rstudio.com/products/rstudio/download/. Select ***RStudio Desktop (free license)***. Select the appropriate ***Installer*** version for your operating system, click on the installation link and select all default installation options.
   If you want faster access to RStudio on your computer then copy and paste the link to RStudio from the ***Start*** folder ***RStudio*** onto your desktop.

   You should now have the following icon on your desktop:

[1] The book by Jared P. Lander (2014). *R for Everyone Advanced Analytics and Graphics* can be viewed online from UTD's Library website.

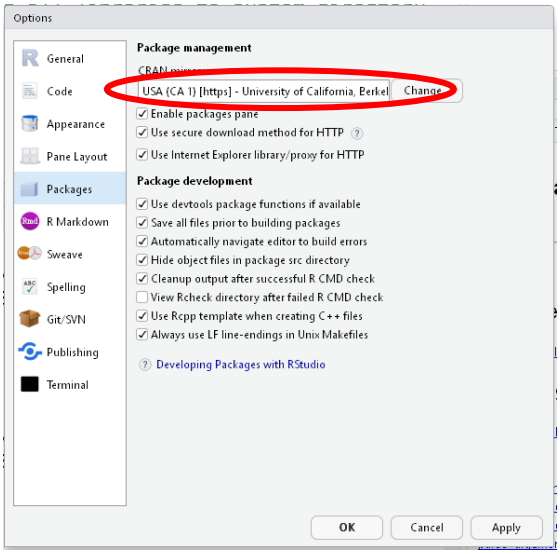
[2] As of August 2020 the most recent version of R is 4.0.2 called "*Taking Off Again*".

3. Windows users *only* may also want to install the 64-bits version of the **RTOOLS** at this step. You find version 4.0 at https://cran.r-project.org/bin/windows/Rtools/ . Click on it and accept the default values during the installation process. The **RTOOLS** allow you to build your own packages and it is needed to process a few packages during their installation from CRAN.
   If you skip this step you will experience a few warning messages during the installation of the packages. At this time, it is nothing to worry about.
4. Open RStudio. Unless you have older versions of R on your computer the latest version of R will will not be linked to RStudio.
5. Download from the course's **MS TEAMS** channel **WEEK01** under the **FILES** tab the script **`installPackages.R`**. It automates the installation of around 350 packages from a CRAN server.
6. In RStudio select File ▶ Open File… to open the script **`installPackages.R`** in RStudio's script editor. The editor window should show the script:



7. Click in the right upper corner on **Source** (or Ctrl-Shift-Enter) in the upper right corner of the script window to execute this script.
   Alert: Depending on the speed of your internet connection and the time of day, it may take an hour or longer to execute this script and install all the requested packages.
   Once the command prompt "**>**" in RStudio's Console window appears, the installation of all packages has been completed.
8. The Console should show that slightly more than 350 packages were installed on your computer.

Note: there may be a few warning messages that specific packages could not be installed. You can install these packages later, if we need them in this course. However, should you receive a lot of warning and error messages during the installation of the packages, then most likely the internet connection to the default CRAN server is not stable. You can select an alternative CRAN server in the RStudio from the **TOOLS ▶ GLOBAL OPTION…** menu by selecting the **PACKAGES** tab and picking another server from CRAN's mirror list:



Once another server has been selected please repeat step 6 in RStudio. Hopefully, the installation of the packages proceeds now smoothly.

In order to make a package accessible to your current R session, you need to call the function **`library(LibName)`**. For example use **`> library(TexMix)`** at the command prompt.

Microsoft's Open R

Microsoft's Open R is an enhanced version of the standard open-source version[3] of R on CRAN. *Microsoft's Open R* has computational advantages over the standard open-source version of R. However, since *Microsoft's Open R*, has not been updated for over a year, we will be currently using the standard R.

The main enhancements of Microsoft's Open R are:

1. some internal code has been substantially optimized to utilized internal functions of your computer's specific operation system and central processing units (CPU); and
2. it uses Intel's optimized *Mathematical Kernel Library* (MKL), which makes use of all computing cores on your computer's CPU. For instance, Intel's I7 chips have 4-6 cores.
   Therefore, MKL allows specific computations to be executed in parallel by multithreading, which can substantially speed up specific numerically extensive tasks.

[3] The most recent standard version of R can be downloaded from www.r-project.org . This site also provides links to the Comprehensive R Archive Network (CRAN), the R journal etc., and the source code of R and all its libraries on CRAN.