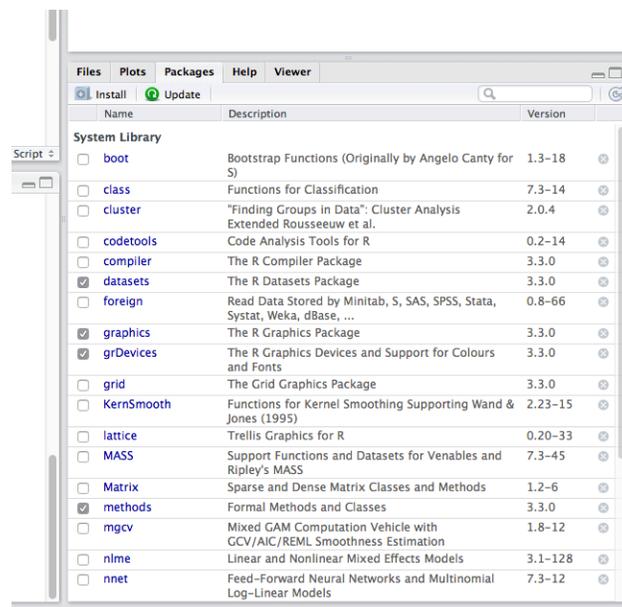


R Packages

R is based on the functional model. In R the functional model is simple. Everything is either a function or a storage object. Packages are used to collect functions in a container that represents a specific purpose or similar functionality. The R graphics package contains many of the commonly used functions for charts and plots [<https://stat.ethz.ch/R-manual/R-devel/library/graphics/html/00Index.html>]. Putting these functions into a single package makes it easier to manage all of these functions.

The base installation of R comes with many of the commonly used packages. Several of these packages are loaded and are ready to use when you start RStudio. you can view the packages installed on your computer in the Packages panel of RStudio.



The image above shows the packages installed. Those packages with check marks by their names are loaded and ready to use. The other packages, even though they are installed on your computer, must be loaded into R before you can use any of the functions in a given package.

You can load an installed package with the command [in the command panel]:

```
library(package-name)
```

If you wanted to load the MASS package, you would use the command:

```
library(MASS)
```

Another way to load a package is to simply check the box next to the package name in the Packages panel in RStudio. When you use this method, you will notice that RStudio enters the **library()** command in the Command console when you check the package box.

Once a package is loaded, you have access to all of its functions during your R session. If you do not load a package and try to use one of its functions, R will return an error message telling you that it cannot find the function.

Installing packages in R

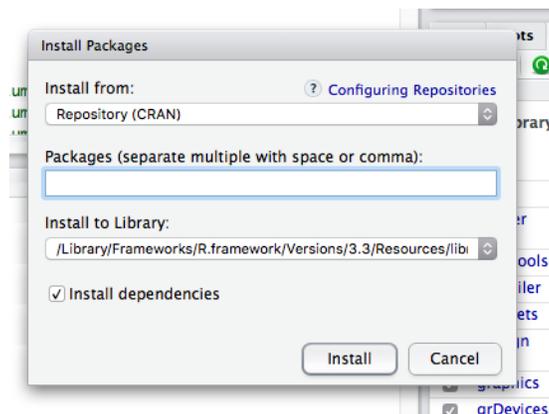
While many useful packages come with the base R installation, eventually you may want to use the functionality of a package not currently installed on your computer. If you wish to do this, you will need to install the package from CRAN and then load it into your R session.

You can install a package for the command prompt in the Command console with the command:

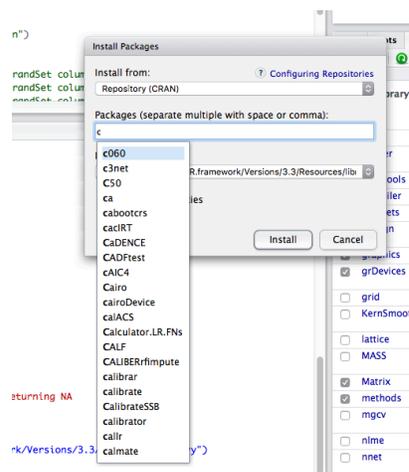
```
install.packages("package-name")
```

Several things are worth noticing in the syntax of this command. The function name contains a period dividing the two words **install** and **packages**. The word **packages** is plural even though you can use this to install only one package. The package name, inside the parentheses, is enclosed in quotation marks. The package name is case-sensitive, so if the package name is **ClassMaster**, entering "**classmaster**" will not find the correct package. Yes, you can install multiple packages with a single command, but the command syntax becomes more complex, therefore it is better to install a set of packages one by one.

Another way to install packages is to use the Install Packages functionality in RStudio. Simply click the **Install** button in the toolbar in the Packages panel. When you do this, an Install Packages dialog will open.



The image above shows what this dialog will look like. You can begin typing the name of the package you want to install into the Packages text entry box. As you begin typing, a completion box will appear showing the packages that match your typed text.



As you can see in the image above, the Install Packages dialog begins to recommend packages that begin with the letter **c**. One advantage of this method is that it accounts for the correct capitalization of package names. This makes it easier to find the desired package and install it.

Once you find the package you want to install, select it from the recommendation drop down. Its name will appear in the Packages entry box and you can click the **Install** button. RStudio will install the package and any other packages that this package is dependent for functionality that are not currently installed on your computer. Notice that RStudio enters the `install.packages()` command in the Command console when you click the **Install** button. Once a package is installed, it will be visible in the list of packages in the Packages panel of RStudio and it can be loaded into your R session.

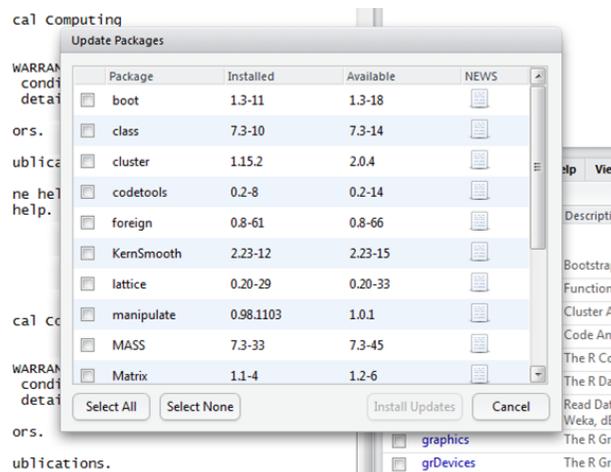
The RStudio Install Packages dialog allows you to install multiple packages at the same time. After you have selected the first package that you want to install, simply type a comma and begin searching for the next package you want to install. The dialog behavior is the same as before.

The above description discusses how to load CRAN packages. The procedure to load non-CRAN packages will be left for a later discussion.

Updating packages in R

R packages, like R itself, are sometimes updated to improve functionality or modify operation. It is advisable to occasionally update the packages installed on your computer. The command line method to update R packages is complex and unnecessary if you are using RStudio.

You can update your installed R packages in RStudio by clicking the **Update** button in the toolbar in the Packages panel. When you do this, RStudio verifies which installed packages need to be updated and displays them in a dialog.



You can select to update all of the identified packages or update only specific packages. Once you have made your selections, simply click the **Install Updated** button. RStudio will update the packages. Notice that RStudio does this by sending the appropriate commands to the command console for execution.