HEALTH
UNIVERSITY OF UTAH

Packages

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R Bootcamp 2020

Packages

Packages

Packages hold functions and other objects grouped according to theme or purpose described by the DESCRIPTION file.

Examples:

- boot (https://cran.r-project.org/package=boot) - Bootstrap Functions
- gam (https://cran.r-project.org/package=gam) - Generalized Additive Models
- forcats (https://cran.r-project.org/package=forcats) - Tools for Working with Categorical Variables (Factors)

Loading Packages

To load packages in R use `library` or `require`

```
library(tidyverse)
require(magrittr)
```

```
Message:## Loading required package: magrittr
```

```
Message:##
## Attaching package: 'magrittr'
```

```
Message:## The following object is masked from 'package:purrr':
##
##     set_names
```

```
Message:## The following object is masked from 'package:tidyr':
##
##     extract
```

Package Information

- `packageDescription('stats')`

```
## Package: stats
## Version: 3.6.3
## Priority: base
## Title: The R Stats Package
## Author: R Core Team and contributors worldwide
## Maintainer: R Core Team <R-core@r-project.org>
## Description: R statistical functions.
## License: Part of R 3.6.3
## Imports: utils, grDevices, graphics
## Suggests: MASS, Matrix, SuppDists, methods, stats4
## NeedsCompilation: yes
## Built: R 3.6.3; x86_64-w64-mingw32; 2020-02-29
##       09:37:04 UTC; windows
##
## -- File: C:/Program Files/R/R-3.6.3/library/stats/Meta/package.rds
```

Package Information

- `packageDescription('stats')` for DESCRIPTION information.
- `help(package='stats')` for index page, or
- `package?stats`

```
      Information on package ‘stats’

Description:

Package:            stats
Version:            3.6.3
Priority:           base
Title:              The R Stats Package
Author:             R Core Team and contributors worldwide
Maintainer:         R Core Team <R-core@r-project.org>
Description:        R statistical functions.
License:            Part of R 3.6.3
Imports:            utils, grDevices, graphics
Suggests:           MASS, Matrix, SuppDists, methods, stats4
NeedsCompilation:   yes
Built:              R 3.6.3; x86_64-w64-mingw32; 2020-02-29 09:37:04 UTC;
                    windows
```

Package Information

- `packageDescription('stats')` for DESCRIPTION information.
- `help(package='stats')` for index page, or
- `package?stats` for the package help page.

```
stats-package              package:stats              R Documentation

The R Stats Package

Description:

     R statistical functions

Details:

     This package contains functions for statistical calculations and
     random number generation.

     For a complete list of functions, use ‘library(help = "stats")’.

Author(s):
     R Core Team and contributors worldwide
     Maintainer: R Core Team <email: R-core@r-project.org>
```

Namespaces

Packages encapsulate functions and objects together in a Namespace. A namespace is comprised of three layers.

1. **Imports**
   - Functions available inside the package from other packages.
2. **Private**
   - Internal functions, those defined inside the package but only available to other functions in the namespace
3. **Exports**
   - Public interface functions.

Naming Conflicts

- Namespaces also manage naming conflicts.
- *Example:* `collapse()` function definitions exists in:
  - `dplyr` (https://www.rdocumentation.org/packages/dplyr/versions/0.7.8/topics/compu
  - `ggtree` (https://www.rdocumentation.org/packages/ggtree/versions/1.4.11/topics/colla
  - `nlme` (https://www.rdocumentation.org/packages/nlme/versions/3.1-148/topics/collapse)
  - `pkgcond` (https://www.rdocumentation.org/packages/pkgcond/versions/0.1.0/topics/coll
  - … (https://www.rdocumentation.org/search?q=collapse)

Search Path

To see what is loaded use `search()`

```
search()
```

```
##  [1] ".GlobalEnv"        "package:magrittr"
##  [3] "package:forcats"   "package:stringr"
##  [5] "package:dplyr"     "package:purrr"
##  [7] "package:readr"     "package:tidyr"
##  [9] "package:tibble"    "package:ggplot2"
## [11] "package:tidyverse" "package:printr"
## [13] "package:knitr"     "package:stats"
## [15] "package:graphics"  "package:grDevices"
## [17] "package:utils"     "package:datasets"
## [19] "package:methods"   "Autoloads"
## [21] "package:base"
```

Namespace Specifier

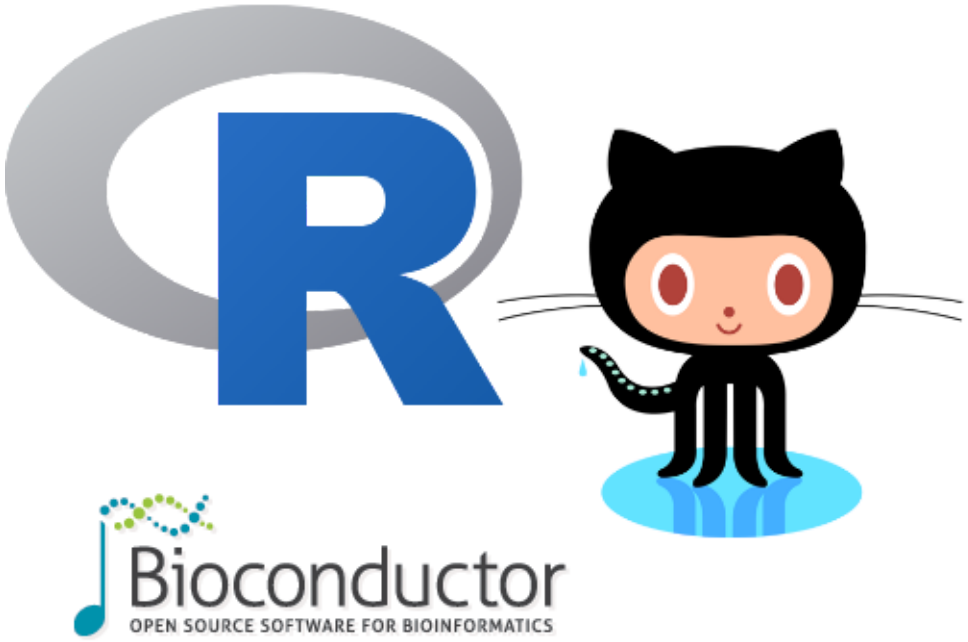
To use a function from a specific package use the `::` operator.
It may also be used to call a function from a package with loading the package to the search path.

```
dplyr::last(.leap.seconds)
```

```
## [1] "2016-12-31 17:00:00 MST"
```

BONUS: Triple Colon

The `:::` operator breaks encapsulation and retrieves the internal objects of a package, but you will have to know what you are looking for and these functions are rarely documented.



Finding Packages

Repositories

Repositories are locations where you (and R) can find packages to install and use.

- Structured/Organized
- Typically Online, but can be private.
- Two Major:
    - CRAN
    - BioConductor

CRAN

CRAN (https://cran.r-project.org/) stands for: Comprehensive R Archive Network

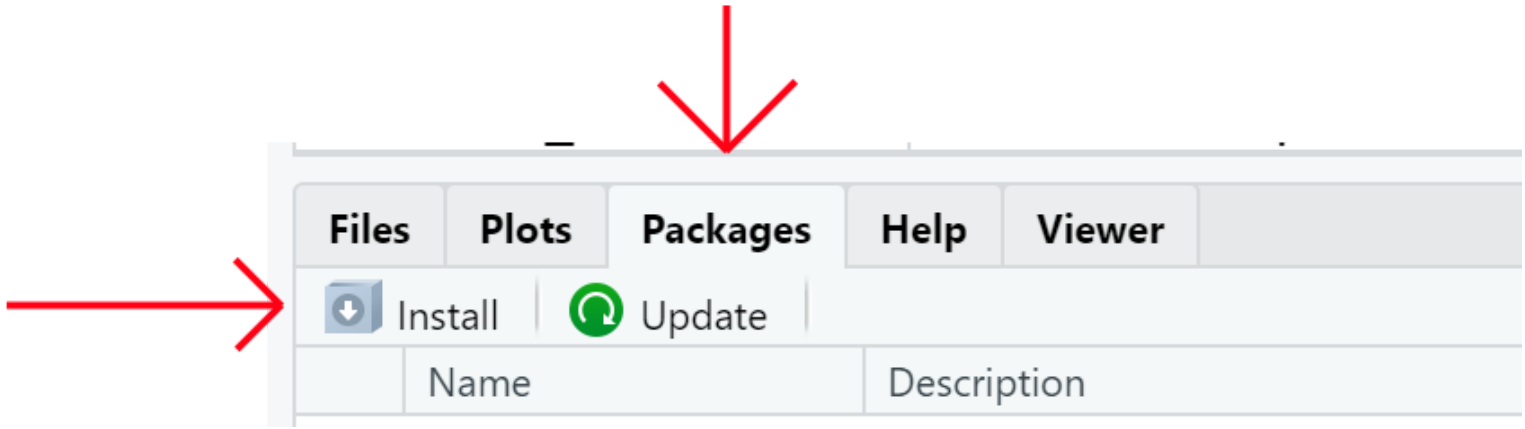
- The main (and official) repository for contributed R Packages.
- There are currently 16041 packages available on CRAN.
- Low bar to get in.
- Anyone can contribute.

CRAN:Installing

Most packages will be installed by `install.packages()` function:

```
# Tools for regression and classification models
install.packages('caret')
```

Most will find it easier to install through RStudio



BioConductor

BioConductor (http://www.bioconductor.org/)

- Additional Repository specializing in high throughput genomic data packages.
- Much more rigorous to gain entry to.

BioConductor - Installing

Prior to R < 4.0.0

```
source("https://bioconductor.org/biocLite.R")
biocLite()
biocLite("Rgraphviz")
```

R >= 4.0.0

```
if (!requireNamespace("BiocManager", quietly = TRUE))
    install.packages("BiocManager")
BiocManager::install(version = "3.11")
BiocManager::install("Rgraphviz")
```

Github

Not technicaly a repository

- Where most new R work in completed.
- Ties in with many other services for things like
    - testing
    - documentation
    - deployment

Github - installing

For latest development, i.e. pre-release code use the `devtools` (https://cran.r-project.org/package=devtools) package.

```
install.packages("devtools")
devtools::install('halpo/pivot')
```

Managing Packages

- `installed.packages()`
- `remove.package()` ← I don't think I have *ever* done this.
- `old.packages()`
- `update.packages()`

Of course all this can be acomplished through RStudio a bit easier.