Lec 26 - R Packages

Statistical Programming

Sta 323 | Spring 2022

Dr. Colin Rundel

What are R packages?

R packages are just a collection of files (R code, compiled code, data, documentation, etc.) that live in your library path.

```
.libPaths()
```

```
## [1] "/opt/homebrew/lib/R/4.1/site-library"       "/opt/homebrew/Cellar/r/4.1.3/lib/R/library"
```

When you run `library(pkg)` the functions (and objects) in the package's namespace are attached to the global search path.

```
dir(.libPaths())
```

```
##   [1] "abind"            "airports"         "archive"          "arrayhelpers"     "arrow"
##   [6] "ash"              "AsioHeaders"      "askpass"          "assertthat"       "av"
##  [11] "available"        "babynames"        "backports"        "base"             "base64enc"
##  [16] "BayesFactor"      "bayesplot"        "beeswarm"         "bench"            "benchmarkme"
##  [21] "benchmarkmeData"  "BH"               "bit"              "bit64"            "bitops"
##  [26] "blob"             "bookdown"         "boot"             "boot"             "brew"
##  [31] "brio"             "broom"            "broom.mixed"      "bslib"            "cachem"
##  [36] "callr"            "car"              "carData"          "caret"            "caTools"
##  [41] "cellranger"       "checklist"        "checkmate"        "cherryblossom"    "chromote"
##  [46] "chron"            "class"            "class"            "classInt"         "cli"
```

Search path

```
search()
```

```
## [1] ".GlobalEnv"        "package:stats"     "package:graphics"  "package:grDevices" "package:utils"
## [6] "package:datasets"  "package:methods"   "Autoloads"         "package:base"
```

```
library(diffmatchpatch)
```

```
search()
```

```
##  [1] ".GlobalEnv"             "package:diffmatchpatch" "package:stats"          "package:graphics"
##  [5] "package:grDevices"      "package:utils"          "package:datasets"       "package:methods"
##  [9] "Autoloads"              "package:base"
```

Loading vs attaching

If you do not want to attach a package you can directly use functions via `::` or load it with `requireNamespace()`.

```
loadedNamespaces()
```

```
##  [1] "Rcpp"           "grDevices"      "digest"         "diffmatchpatch" "R6"             "jsonlite"
##  [7] "magrittr"       "evaluate"       "datasets"       "xaringan"       "stringi"        "rlang"
## [13] "utils"          "cli"            "rstudioapi"     "jquerylib"      "bslib"          "graphics"
## [19] "rmarkdown"      "base"           "tools"          "stringr"        "xfun"           "yaml"
## [25] "fastmap"        "compiler"       "stats"          "htmltools"      "knitr"          "methods"
## [31] "sass"
```

```
requireNamespace("forcats")
```

```
## Loading required namespace: forcats
```

```
loadedNamespaces()
```

```
##  [1] "Rcpp"           "grDevices"      "digest"         "diffmatchpatch" "R6"             "jsonlite"
##  [7] "magrittr"       "evaluate"       "datasets"       "xaringan"       "stringi"        "rlang"
## [13] "utils"          "cli"            "rstudioapi"     "jquerylib"      "bslib"          "graphics"
## [19] "rmarkdown"      "base"           "forcats"        "tools"          "stringr"        "xfun"
## [25] "yaml"           "fastmap"        "compiler"       "stats"          "htmltools"      "knitr"
## [31] "methods"        "sass"
```

```
search()
```

```
##  [1] ".GlobalEnv"             "package:diffmatchpatch" "package:stats"          "package:graphics"
##  [5] "package:grDevices"      "package:utils"          "package:datasets"       "package:methods"
```

Where to R packages come from

We've already seen the two primary sources of R packages:

CRAN:

```
install.packages("diffmatchpatch")
```

GitHub:

```
remotes::install_github("rundel/diffmatchpatch")
```

there is one other method that comes up (particularly around package development), which is to install a package from local files.

Local install:

```
R CMD install diffmatchpatch_0.1.0.tar.gz
```

```
devtools::install("diffmatchpatch_0.1.0.tar.gz")
```

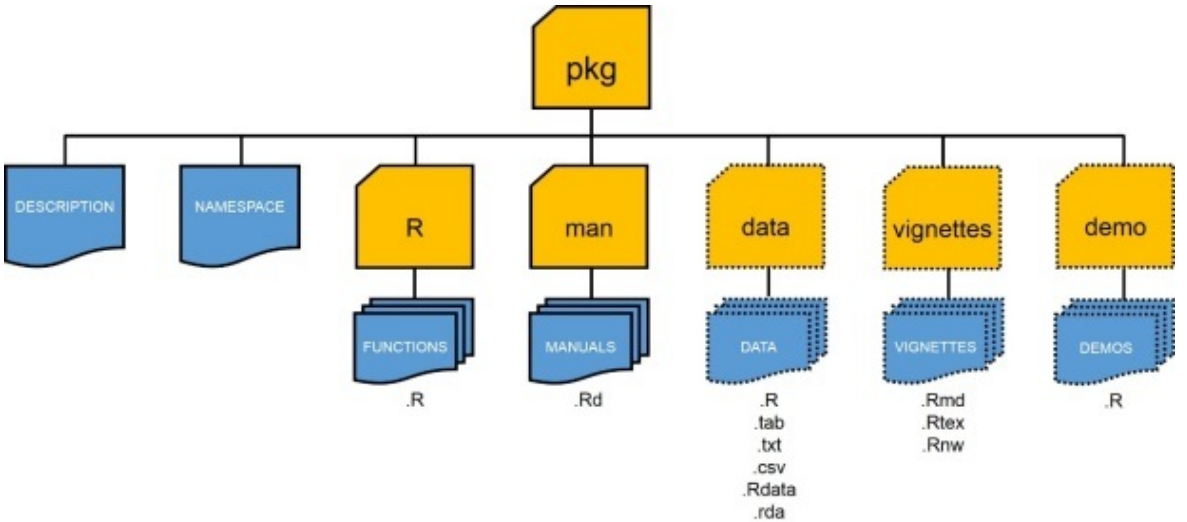
What is CRAN

It is the Comprehensive R Archive Network which is the central repository of R packages.

- Maintained by the R Foundation and run by a team of volunteers, ~22k packages
- Retains all current versions of released packages as well as archives of previous versions
- Similar in spirit to Perl's CPAN, TeX's CTAN, and Python's PyPI
- Some important features:
  - All submissions are reviewed by humans + automated checks
  - Strictly enforced submission policies and package requiements
  - All packages must be actively maintained and support upstream and downstream changes

See Writing R Extensions

Structure of an R Package



From A Quickstart Guide for Building Your First R Package

Core components

- `DESCRIPTION` - file containing package metadata (e.g. package name, description, version, license, and author details). Also specifies package dependencies,
- `NAMESPACE` - details which functions and objects are exported by your package
- `R/` - folder containing R script files (`.R`)
- `man/` - folder containing R documentation files (`.Rd`)

The following components are optional, but quite common:

- `tests/` - folder contain unit tests
- `src/` - folder containing code to be compiled (usually C / C++)
- `data/` - folder containing example data sets (exported as `.Rdata` via `save()`)
- `inst/` - files that will be copied to the package's top-level directory when it is installed (e.g. examples or data files that don't belong in `data/`)

Package contents

Source Package

```
fs::dir_tree("~/Desktop/Projects/diffmatchpatch/")
```

```
## ~/Desktop/Projects/diffmatchpatch/
## ├── DESCRIPTION
## ├── LICENSE.md
## ├── NAMESPACE
## ├── NEWS.md
## ├── R
## │   ├── RcppExports.R
## │   ├── diff.R
## │   ├── diffmatchpatch-package.R
## │   ├── match.R
## │   ├── options.R
## │   ├── patch.R
## │   └── print.R
## ├── README.Rmd
## ├── README.md
## ├── cran-comments.md
## ├── diffmatchpatch.Rproj
## ├── inst
## │   └── include
## │       └── diff_match_patch.h
## ├── man
## │   ├── diff.Rd
## │   ├── dmp_options.Rd
## │   ├── match.Rd
## │   └── patch.Rd
```

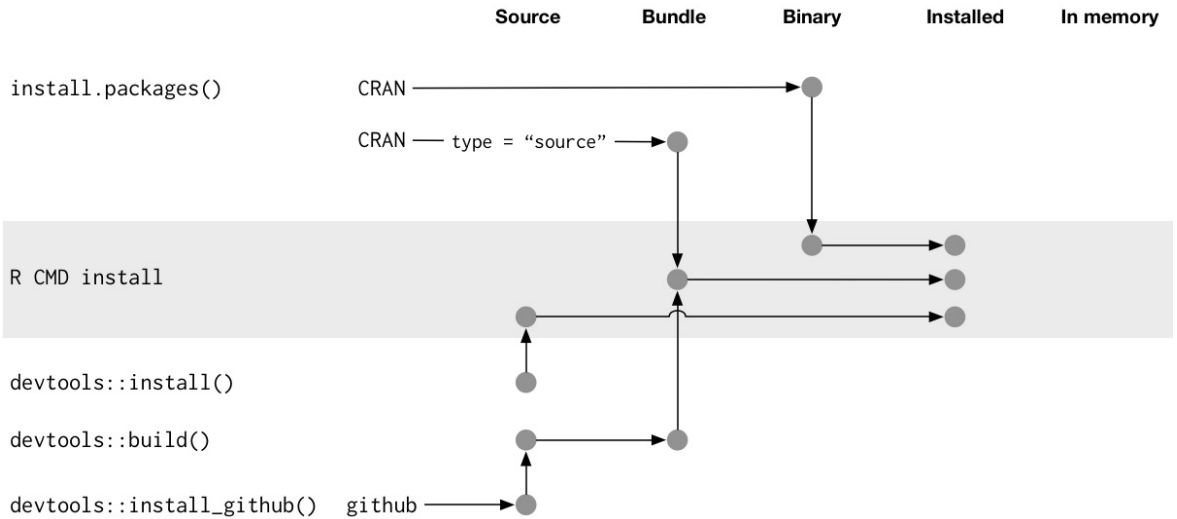
Installed Package

```
fs::dir_tree(system.file(package="diffmatchpatch"))
```

```
## /opt/homebrew/lib/R/4.1/site-library/diffmatchpatch
## ├── DESCRIPTION
## ├── INDEX
## ├── Meta
## │   ├── Rd.rds
## │   ├── features.rds
## │   ├── hsearch.rds
## │   ├── links.rds
## │   ├── nsInfo.rds
## │   └── package.rds
## ├── NAMESPACE
## ├── NEWS.md
## ├── R
## │   ├── diffmatchpatch
## │   ├── diffmatchpatch.rdb
## │   └── diffmatchpatch.rdx
## ├── help
## │   ├── AnIndex
## │   ├── aliases.rds
## │   ├── diffmatchpatch.rdb
## │   ├── diffmatchpatch.rdx
## │   └── paths.rds
## ├── html
## │   ├── 00Index.html
## │   └── R.css
```

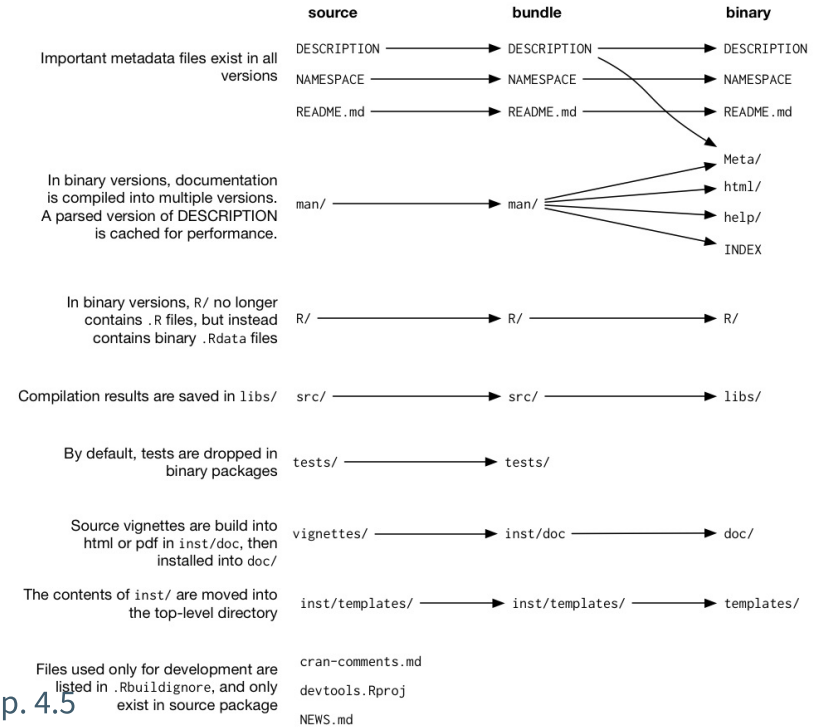
A deeper dive on diffmatchpatch

Package Installation



From R Packages - Chap. 4

Package Installion - Files

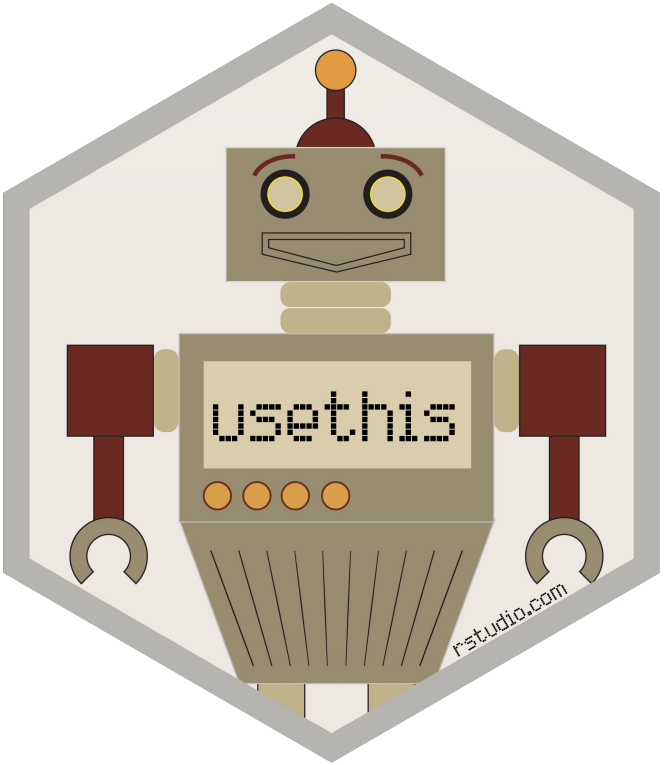


From R Packages - Chap. 4.5

Package development

What follows is an opinionated introduction to package development,

- this is not the only way to do thing (none of the following are required)
- I would strongly recommend using:
  - RStudio
  - RStudio projects
  - GitHub
  - usethis
  - roxygen2


usethis
rstudio.com

usethis

This is an immensely useful package for automating all kinds of routine (and tedious) tasks within R

- Tools for managing git and GitHub configuration
- Tools for managing collaboration on GitHub via pull requests (see `pr_*()`)
- Tools for creating and configuring packages
- Tools for configuring your R environment (e.g. `.Rprofile` and `.Renviron`)
- and much much more

Live demo - Building a Package