

# Awesome R Package Development Tools

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A curated list of awesome tools to assist development in R programming language.

 What is included?

- Only *tools* helpful for package development are included, and not other resources (e.g. books).
- All relevant tools are included, irrespective of their availability on [CRAN/Bioconductor](#).
- Tools which are part of publicly archived/retired GitHub repositories are *not* included.

If you wish to suggest any additional tools, please make a PR or create an issue [here](#).

# 1 Code of Conduct

Please note that the `awesome-r-pkgtools` project is released with a [Contributor Code of Conduct](#). By contributing to this project, you agree to abide by its terms.

## 2 Swiss army knives

Tools useful across all stages of package development (some of these are meta-packages and their component packages are also included in respective sections for the sake of completeness), irrespective of whether the package is meant to be submitted to CRAN or Bioconductor.

- `{usethis}`
- `{devtools}`
- `{biocthis}`
- `{packager}`
- `{pacs}`
- `{pkgmaker}`

## 3 Package templates

### 3.1 Generic

- `{pkgkitten}` (useful for creating new packages for R)
- `{rcompendium}` (to make the creation of R package/research compendium easier)
- `{r.pkg.template}` (an opinionated R package template with CI/CD built-in)
- `{skeleton}` (An R Package Skeleton Generator)

### 3.2 RMarkdown-based

- `{fusen}` (to build a package from RMarkdown files)
- `{litr}` (to write a complete R package in a single R markdown document)

### 3.3 Shiny

- `{golem}` (framework for building shiny applications)
- `{leprechaun}` (leaner framework for building shiny applications)
- `{rhino}` (a framework to build high quality, enterprise-grade Shiny apps at speed)

### 3.4 Meta-packages

- `{pkgverse}` (for package meta-verse)
- `{metamkr}` (for package meta-verse)

## 4 Naming things

- `{available}` (to check if a package name is available to use)
- `{collidr}` (to check for namespace collisions)
- `{changer}` (to change the name of an existing R package)

## 5 Working with package components

- `{rprojroot}` (accessing files w.r.t. package root directory)
- `{desc}` (manipulating DESCRIPTION files)
- `{withr}` (to manage package side effects by safely and temporarily modifying global states)
- `{pkgload}` (to simulate the process of installing and loading a package)
- `{pkgbuild}` (to find tools needed to build packages)

## 6 Package configuration

- `{config}` (to manage environment specific configuration values)
- `{dotenv}` (to load environment variables from `.env` files)
- `{options}` (provides simple mechanisms for defining and interpreting package options)
- `{potions}` (to update and retrieve options, either in the workspace or during package development, without overwriting global options)

## 7 Package management tools

- `{pkgspace}` (to cache ‘CRAN’-like metadata and packages)

## 8 Documentation

### 8.1 Manual

- `{roxygen2}` (to generate R package documentation from inline R comments)
- `{Rd2roxygen}` (in case you inherit a project where documentation was not written using `{roxygen2}`)
- `{rdoxygen}` (to create Doxygen documentation for R package C++ code)
- `{roxyglobals}` (to generate global variables with `{roxygen2}` documentation)
- `{sineu}` (generate `{roxygen2}` skeletons)
- `{autoimport}` (to automatically generate `@importFrom` roxygen tags from R files)
- `{roclang}` (helpers for diffusing content across function documentation)
- `{Rdpack}` (for inserting references, figures, and evaluated examples in Rd docs)
- `{roxygen2md}` (to allow Markdown syntax usage in `{roxygen2}` documentation)
- `{rd2markdown}` (to convert `.Rd` package documentation files into markdown files)
- `{rd2list}` (converts Rd docs to a human-readable list)
- `{pasteAsComment}` (RStudio addin for pasting copied code as roxygen comment)
- `roxygen2Comment` (Rstudio addin for adding and remove `{roxygen2}` comment)

## 8.2 Math rendering in HTML/PDF manual

- `{katex}` (to convert latex math expressions to HTML for use in package manual pages)
- `{mathjaxr}` (provides ‘MathJax’ and macros to enable its use within Rd files for rendering equations in the HTML help files)
- `{mathml}` (translates R expressions to ‘MathML’ or ‘MathJax’ so that they can be rendered in HTML manual and Shiny apps)

## 8.3 Vignettes

- `{knitr}` (a general-purpose tool for dynamic report generation to be used as a vignette builder for R package vignettes)
- `{rmarkdown}` (to convert R Markdown documents to a variety of formats)
- `{quarto}` (provides R interface to frequently used operations in the Quarto CLI)
- `{R.rsp}` (for incorporating static and dynamic vignettes)
- `{RmdConcord}` (to provide support for concordances in R Markdown files)
- `{prettydoc}` (creates lightweight yet pretty vignettes)
- `{readme2vignette}` (to convert README to vignette during package installation)

## 8.4 Tutorials

- `{learnr}` (to turn any R Markdown document into an interactive tutorial)

## 8.5 Website

- `{pkgdown}` (static website for package documentation)
- `{gitdown}` (software changes as a gitbook)
- `{altdoc}` (use `docute`, `docsify`, or `MkDocs` to create a static website for package documentation)

## 8.6 Translation

- `{potools}` (for translating messages and checking the “health” of the messaging corpus)

## 8.7 Lifecycle

- `{lifecycle}` (to manage the life cycle of exported functions)

## 8.8 Badges and stickers

- `{badger}` (to query information and generate badges for use in README)
- `{badgen}` (provides bindings to `badgen` to generate beautiful ‘svg’ badges in R without internet access)
- `{hexSticker}` (helper functions for creating reproducible hexagon sticker purely in R)
- `{hexFinder}` (to scavenge the web for possible hex logos for packages)
- `hexwall` (to create a wall of hexstickers)

## 8.9 Presentation

- `{xaringan}` (an RMarkdown output format for `remark.js` slides)

## 8.10 Book

- `{bookdown}` (authoring framework for books and technical documents with R Markdown)

## 8.11 Change log and versioning

- `{fledge}` (to streamline the process of updating change logs and versioning R packages developed in git repositories)
- `{newsmd}` (utilities to add updates to the `NEWS.md` file)
- `{autonewsmd}` (to auto-generate change log using conventional commits)

## 9 Documentation quality

- `{docreview}` (to check quality of docs)
- `{spelling}` (to check for spelling mistakes)
- `{gramr}` (for grammar suggestions)



## 10 Logging

- `{logger}` (provides a flexible and extensible logging framework for R)
- `{loggit}` (effortless newline-delimited JSON logger, with two primary log-writing interfaces)
- `{log4r}` (logging in R based on the widely-emulated ‘log4j’ system and etymology)
- `{lgr}` (a flexible, feature-rich yet light-weight logging framework based on ‘R6’ classes)
- `{rsyslog}` (write messages to the ‘syslog’ system logger API)
- `{logging}` (pure R implementation of the ubiquitous ‘log4j’ package)
- `{lumberjack}` (to log changes in data)

## 11 Unit testing

### 11.1 Generic R Packages

- `{testthat}` (a testing framework for R that is easy to learn and use; also provides snapshot testing)
- `{patrick}` (for parameterized unit testing with `{testthat}`)
- `{testdat}` (a family of functions and reporting tools focused on checking of data)
- `{tinytest}` (zero-dependency unit testing framework that installs tests with the package)
- `{tinysnapshot}` (snapshots for unit tests using the `{tinytest}` framework)
- `{tinytest2JUnit}` (to convert `{tinytest}` output to JUnit XML needed by CI/CD)
- `{checkmate.tinytest}` (additional expectations for `{tinytest}` framework)
- `{RUnit}` (a standard unit testing framework, with additional code inspection and report generation tools)
- `{testit}` (a simple package for testing R packages)
- `{realtest}` (a framework unit testing that distinguishes between expected, acceptable, current, fallback, ideal, or regressive behaviours)
- `{roxytest}` (to inline `{testthat}` tests with `{roxygen2}`)
- `{doctest}` (to write `{testthat}` tests by adding `{roxygen2}` tags)
- `{exampletestr}` (tests based on package examples)

- `{roxut}` (to write the unit tests in the same file as the function)
- `{unitizer}` (simplifies regression tests by comparing objects produced by test code with earlier versions of those same objects)
- `{r-hedgehog}` (property based testing)
- `{autotest}` (automatic mutation testing of R packages)
- `{cucumber}` (an implementation of the [Cucumber testing framework](#) in R)
- `{quickcheck}` (provides property-based testing in `{testthat}` framework)

## 11.2 Web/database applications

- `{httptest}`/`{httptest2}` (a test environment for HTTP requests in R)
- `{webfakes}` (to fake web apps for HTTP testing)
- `{vcr}` (to record HTTP requests and responses on disk and replay them for the unit tests)
- `{dittodb}` (makes testing against databases easy)

## 11.3 Visual regression testing

- `{vdiff}` (for visual regression testing with `{testthat}`)
- `{gdiff}` (for performing graphical difference different package or R versions)

## 11.4 Mock testing

- `{mockthat}` (provides a way to mock package function for unit testing, while coping with S3 dispatch)
- `{mockr}` (provides a way to mock package function for unit testing)
- `{mockery}` (provides a way to mock package function for unit testing and can be used with any testing framework)

## 11.5 Mutation testing

- `{mutant}` (mutation testing for R)

## 11.6 Markdown documents

- `{pandoc}` (to check Markdown documents across various version of [Pandoc](#))

## 11.7 Shiny applications

- `{shinytest}` (testing Shiny apps)
- `{shinytest2}` (testing Shiny apps using a headless Chromium web browser)
- `{shinyloadtest}` (to load test deployed Shiny apps)

## 11.8 Helpers for testing frameworks

- `{testthis}` (RStudio addins for working with files that contain tests)
- `{xpectr}` (builds unit tests with the `{testthat}` package by providing tools for generating expectations)
- `{testdown}` (turn `{testthat}` results into a `{bookdown}` project)
- `{ttdo}` (provides ‘diff’-style comparison of R objects for `{tinystest}` framework)

# 12 Code/Document Formatting

- `{styler}` (to format code according to a style guide)
- `{stylermd}` (to format text in Markdown documents)
- `{formatR}` (to format R source code)
- `{RFormatter}` (extension of `{formatR}` with slightly improved heuristics)
- `{grkstyle}` (extension package for `{styler}` that supports author’s personal code style preferences)
- `{codegrip}` (addin for RStudio IDE to reshape R code and navigate across syntactic constructs)
- `{BiocStyle}` (provides standard formatting styles for Bioconductor PDF and HTML documents)
- `AlignAssign` (RStudio addin that aligns the assignment operators within a highlighted area)
- `{snakecase}` (helpful for having consistent case while naming objects in the package)

- `{dotInternals}` (to distinguish non-exported package functions by prepending their names with a dot)

## 13 Code analysis

### 13.1 General

- `{codetools}` (code analysis tools for R)
- `{goodpractice}` (Swiss army knife for good practices)
- `{inteRgrate}` (provides an opinionated set of rules for R package development)
- `{checklist}` (to provide an elaborate and strict set of checks for R packages and R code)
- `{pkgcheck}` (checks if package follows good practices recommended for packages in the `rOpenSci` ecosystem)
- `{pkgstats}` (a static code analysis tool)
- `{rchk}` (provides several bug-finding tools that look for memory protection errors in C source code using R API)
- `{sourcetools}` (tools for reading, tokenizing, and parsing R code)
- `{precommit}` (git hooks for common tasks like formatting files, spell checking, etc.)

### 13.2 Code review

- `{PaRe}` (reviews other packages during code review by looking at their dependencies, code style, code complexity, and how internally defined functions interact with one another)

### 13.3 Code coverage

- `{covr}` (to compute code coverage)
- `{covrpage}` (to include summary README of code coverage and more detailed information about tests)
- `{covtracer}` (provides tools for contextualizing tests)

## 13.4 Code quality

- `{lintr}` (static code analysis)
- `{flint}` (to fix lints found by `{lintr}`)
- `{roxygenlint}` (to lint `{roxygen2}`-generated documentation)
- `{checkglobals}` (to check R-packages for globals and imports)
- `{CodeDepends}` (analysis of R code for reproducible research and code view)
- `{adaptalint}` (infer code style from one package and use it to check another)
- `{box.linters}` (linters for `{box}` modules)
- `{roger}` (provides tools for grading the coding style and documentation of R scripts)
- `{cleanr}` (tests code for some of the most common code layout flaws)

## 13.5 Code complexity

- `{cyclocomp}` (to index the complexity of a function)
- `{pkgGraphR}` (to visualize the relationship between functions in an R package)

## 13.6 Code similarity

- `{dupree}` (identifies code blocks that have a high level of similarity within a set of R files)
- `{rsccl}` (provides source code similarity evaluation by variable/function names)
- `{SimilarR}` (quantifies the similarity of the code-base of R functions by means of program dependence graphs)

## 13.7 Compiled code

- `{memtools}` (to solve memory leaks)
- `{sanitizers}` (to test for memory violations and other undefined behaviour)
- `{cppcheckR}` (to check C and C++ code using `Cppcheck`)

## 13.8 JavaScript code

- `{jshintr}` (to run `JSHint` for static code analysis for JavaScript code included in the package)

## 13.9 Lines of code

- `{cloc}` (counts blank lines, comment lines, and physical lines of source code in source files)

## 14 Refactoring

- `{refactor}` (to check speed and performance of both the original and refactored version of code)

## 15 Code performance

### 15.1 Benchmarking

- `{bench}` (provides high precision benchmarks for R expressions)
- `{microbenchmark}` (infrastructure to accurately measure and compare the execution time of R expressions)
- `{tictoc}` (functions for timing R scripts)
- `{touchstone}` (to benchmark pull requests)
- `{benchmarkme}` (to crowd-source system benchmarking)
- `{comparer}` (to compare the results of different code chunks)

### 15.2 Profiling

- `{profvis}` (to profile and visualize profiling data)
- `{proffer}` (to create friendlier, faster visualizations for profiling data)
- `{jointprof}` (to profile packages with native code in C, C++, Fortran, etc.)
- `{xrprof}` (an external sampling profiler)

## 16 Reproducible Environments

### 16.1 Package management

- `{renv}` (to create project-local environments)
- `{rix}` (to create reproducible data science environments using the Nix package manager)
- `{bspm}` (to enable binary package installations via Linux distribution's package manager)
- `{rspm}` (to access [Posit Public Package Manager](#) for binary package installations on Linux)
- `{groundhogr}` (to load packages and their dependencies as available on chosen date on CRAN)

### 16.2 Containerization

- `{containerit}` (to package R script/session/workspace and all dependencies as a Docker container by generating a suitable Dockerfile)
- `{dockerfiler}` (to generate Dockerfile for R projects)
- `{pracpac}` (a `{usethis}`-like interface to create Docker images from R packages under development)
- `{usethat}` (to automate analytic project setup tasks)

## 17 Dependency Management

- `{pkgdepends}` (to find recursive dependencies of from various sources)
- `{deepdep}` (to visualize and explore package dependencies)
- `{itdepends}` (to assess usage, measure weights, visualize proportions, and assist removal of dependencies)
- `{DependenciesGraphs}` (to visualize package dependencies)
- `{DependencyReviewer}` (to investigate packages during code review by looking at their dependencies)
- `{pkgdepR}` (to visualize dependencies between functions for a group of R packages)
- `{deps}` (to manage source code dependencies by decorating R code with roxygen-style comments)

- `{pkgnet}` (to build a graph representation of a package and its dependencies)
- `{functiondepends}` (to find functions in an unstructured directory and explore their dependencies)
- `{pkgndep}` (checks the heaviness of the packages used)
- `{attachment}` (to deal with package dependencies during package development)

## 18 CRAN/Bioconductor checks

- `{rcmdcheck}` (to run R CMD check form R programmatically)
- `{BiocCheck}` (to run Bioconductor-specific package checks)
- `{rhub}` (to run R CMD check on CRAN architectures)
- `{checked}` (systematically run R CMD check against multiple packages)
- `{checkhelper}` (to help avoid problems with CRAN submissions)
- `{extrachecks}` (to run some additional CRAN checks)
- `{foghorn}` (to check for results and submission portal status)
- `{urlchecker}` (to checks for URL rot)

## 19 Usage

- `{cranlogs}` (for computing CRAN download counts)
- `{packageRank}` (for visualizing CRAN download counts)
- `{Visualize.CRAN.Downloads}` (to visualize CRAN downloads)
- `{dlstats}` (provides download statistics for packages)



## 20 CI/CD

CI/CD: continuous integration and either continuous delivery or continuous deployment

- `actions` (provides [GitHub Actions](#) relevant for R)
- `{gha}` (Useful functions for GitHub Actions)
- `actions-sync` (to manage GitHub Actions workflows across repositories)
- `{rworkflows}` (GitHub Actions to automates testing, documentation website building, and containerized deployment)
- `AzureR` (a family of packages for working with [Azure](#) from R)
- `r-appveyor` (for [AppVeyor](#))
- `{tic}` (for [Circle CI](#) and [GitHub Actions](#))
- `{circle}` (for [Circle CI](#))
- `{jenkins}` (for [Jenkins CI](#))
- `{cronR}` (to schedule R scripts/processes with the cron scheduler)

## 21 Security/Privacy

- `{gpg}` (GNU privacy guard for R)
- `{oysteR}` (to secure package against insecure dependencies)

## 22 Build systems

- `{fakemake}` (to mock Unix Make build system in case it is unavailable)

## 23 Debugging

- `{debugme}` (provides helpers to specify debug messages as special string constants, and control debugging of packages via environment variables)
- `{debugr}` (tools to print out the value of R objects/expressions while running an R script)
- `{winch}` (provides stack traces for call chains that cross between R and C/C++ function calls)
- `{flow}` (to visualize as flow diagrams the logic of functions, expressions, or scripts, which can ease debugging)
- `{boomer}` (provides debugging tools to inspect the intermediate steps of a call)

## 24 Input validation

### 24.1 Function argument validation

- `{chk}` (to check user-supplied function arguments)
- `{checkmate}` (fast and versatile argument checks)
- `{assertthat}` (to declare the pre and post conditions that you code should satisfy and to produce friendly error messages)
- `{assertive}` (provides readable check functions to ensure code integrity)
- `{valaddin}` (functional input validation)
- `{dreamerr}` (to check the arguments passed to a function and to offer informative error messages)
- `{erify}` (to check arguments and generate readable error messages)

### 24.2 Data validation

- `{assertr}` (to verify assumptions about data early)
- `{ensurer}` (to ensure values are as expected at runtime)
- `{validate}` (to check whether data lives up to expectations based on the domain-specific knowledge)

## 25 Package metadata

- `{codemetar}` (provides utilities to generate, parse, and modify `codemeta.jsonld` files automatically for R packages), or `{codemeta}` (a leaner version of `{codemetar}`)
- `{cffr}` (provides utilities to generate, parse, modify and validate `CITATION.cff` files automatically for R packages)
- `{citation}` (creates `CITATION.cff` from R package metadata)
- `{pkgapi}` (to create the map of function calls in a package)
- `{riskmetric}` (provides a collection of risk metrics to evaluate the quality of R packages)
- `{packagemetrics}` (for comparing among packages)
- `{devtoolbox}` (to create a summary report for R package and to extract dependency statistics in a tidy data frame)
- `{pkgattr}` (useful for getting information on the contents of any R package)
- `{foreman}` (for unpacking, interrogating and subsetting R packages)
- `{sessioninfo}` (to include R session information)

## 26 Reverse dependency checks

- `{revdepcheck}` (for automated, isolated, reverse dependency checking)
- `{xfun}` (specifically, `xfun::rev_check()`)

## 27 Gratitude

To thank the contributors or maintainers of packages you rely on.

- `{thankr}` (to find out who maintains the packages you are using)
- `{allcontributors}` (to help acknowledge all contributions)

## 28 Integration with other languages

### 28.1 C++

- `{Rcpp}`
- `{cpp11}`

### 28.2 Fortran

- `{RfI}`

### 28.3 Python

- `{reticulate}`

### 28.4 Rust

- `{rextendr}`
- `{cargo}`
- `{hellorust}`

### 28.5 .NET Framework

- `{rClr}`

### 28.6 JavaScript/HTML/CSS

- `{htmltools}`
- `{packer}`

### 28.7 Julia

- `{JuliaCall}`

## 29 Upkeep

- `{TODOr}` (RStudio addin to list things that you need to do or change)

## 30 Sundry

- `{lazyData}` (supplies a lazy data loading for packages with datasets that do not provide `LazyData: true`)
- `{pkglite}` (tools to represent and exchange R package source code as text files)
- `{gpttools}` (RStudio addin that allows using `chatGPT` to automate writing documentation, tests, etc.)
- `{rfold}` (to work with many R folders within an R package)
- `{many}` (to create R packages from many directories)
- `{prefixer}` (prefix function with their namespace )
- `{onetime}` (for package authors to run code only once for a given user on a given computer)
- `{rstudioapi}` (to conditionally access the RStudio API from CRAN packages)
- `{rcheology}` (to access data on base packages for previous versions of R)
- `{gitignore}` (to fetch gitignore templates)
- `{DIZutils}` (helpers for packages dealing with database connections)
- `{dang}` (Miscellaneous utilities for CRAN packages)

## 31 Session information

Session details

```
- Session info -----
setting  value
version  R version 4.4.2 (2024-10-31)
os       Ubuntu 22.04.5 LTS
system   x86_64, linux-gnu
hostname fv-az2031-111
ui       X11
```

```

language (EN)
collate C.UTF-8
ctype C.UTF-8
tz UTC
date 2024-12-22
pandoc 3.6 @ /opt/hostedtoolcache/pandoc/3.6/x64/ (via rmarkdown)
quarto 1.7.5 @ /usr/local/bin/quarto

```

- Packages -----

package	* version	date (UTC)	lib	source
base	* 4.4.2	2024-10-31	[3]	local
cli	3.6.3	2024-06-21	[1]	RSPM
clipr	0.8.0	2022-02-22	[1]	RSPM
compiler	4.4.2	2024-10-31	[3]	local
datasets	* 4.4.2	2024-10-31	[3]	local
desc	1.4.3	2023-12-10	[1]	RSPM
details	* 0.3.0	2022-03-27	[1]	RSPM
digest	0.6.37	2024-08-19	[1]	RSPM
evaluate	1.0.1	2024-10-10	[1]	RSPM
fastmap	1.2.0	2024-05-15	[1]	RSPM
graphics	* 4.4.2	2024-10-31	[3]	local
grDevices	* 4.4.2	2024-10-31	[3]	local
grid	4.4.2	2024-10-31	[3]	local
htmltools	0.5.8.1	2024-04-04	[1]	RSPM
httr	1.4.7	2023-08-15	[1]	RSPM
jsonlite	1.8.9	2024-09-20	[1]	RSPM
knitr	1.49	2024-11-08	[1]	RSPM
magrittr	2.0.3	2022-03-30	[1]	RSPM
methods	* 4.4.2	2024-10-31	[3]	local
png	0.1-8	2022-11-29	[1]	RSPM
R6	2.5.1	2021-08-19	[1]	RSPM
rlang	1.1.4	2024-06-04	[1]	RSPM
rmarkdown	2.29	2024-11-04	[1]	RSPM
sessioninfo	1.2.2.9000	2024-11-03	[1]	<a href="#">Github</a> (r-lib/sessioninfo@37c81af)
stats	* 4.4.2	2024-10-31	[3]	local
tools	4.4.2	2024-10-31	[3]	local
utils	* 4.4.2	2024-10-31	[3]	local
withr	3.0.2	2024-10-28	[1]	RSPM
xfun	0.49	2024-10-31	[1]	RSPM
xml2	1.3.6	2023-12-04	[1]	RSPM
yaml	2.3.10	2024-07-26	[1]	RSPM

[1] /home/runner/work/\_temp/Library

```
[2] /opt/R/4.4.2/lib/R/site-library  
[3] /opt/R/4.4.2/lib/R/library  
* -- Packages attached to the search path.
```

---