Writing R packages

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Why write an R package?

- ► To distribute R code and documentation
- ► To keep track of the misc. R functions you write and reuse
- ► To distribute data and software accompanying a paper.
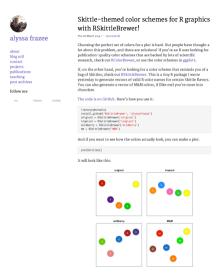
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Writing R Extensions

R Core Team

A simple example: RSkittleBrewer

R package contents

```
RSkittleBrewer/

    DESCRIPTION
    NAMESPACE

    R/RSkittleBrewer.R
    R/plotSkittles.R
    R/plotSmarties.R

    man/RSkittleBrewer.Rd
    man/plotSkittles.Rd
    man/plotSmarties.Rd
```

github.com/alyssafrazee/RSkittleBrewer

DESCRIPTION file

```
Package: RSkittleBrewer
Version: 1.1
Author: Alyssa Frazee
Maintainer: Alyssa Frazee <afrazee@jhsph.edu>
Title: Fun with R Colors
Description: For those times you want to make plots with
    candy-themed color schemes.
URL: https://github.com/alyssafrazee/RSkittleBrewer
License: MIT + file LICENSE
Imports: graphics, stats, grDevices
Suggests: knitr, rmarkdown
VignetteBuilder: knitr
RoxygenNote: 5.0.1
```

NAMESPACE file

```
export(RSkittleBrewer)
export(plotSkittles)
export(plotSmarties)
```

An .Rd file

```
\name{RSkittleBrewer}
\alias{RSkittleBrewer}
\title{Candy-based color palettes}
\description{Vectors of colors corresponding to different
            candies.}
\usage{RSkittleBrewer(flavor = c("original", "tropical",
                     "wildberry", "M&M", "smarties"))
}
\arguments{
  \item{flavor}{Character string for candy-based color
  palette.}
}
\value{Vector of character strings representing the chosen
      set of colors.}
\examples{
plotSkittles()
plotSmarties()
}
\keyword{hplot}
\seealso{ \code{\link{plotSkittles}},
         \code{\link{plotSmarties}} }
```

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Roxygen2 comments

```
#  RSkittleBrewer
#' Candy-based color palettes
#'
#' Vectors of colors corresponding to different candies.
#'
#' @param flavor Character string for candy-based color palette.
#'
#' @export
#' @return Vector of character strings representing the chosen...
#'
#' @examples
#' plotSkittles()
#' plotSmarties()
#'
#' @seealso \code{\link{plotSkittles}},
#'   \code{\link{plotSmarties}}
#' @keywords hplot
RSkittleBrewer <-
...
```

Makefile

```
# build package documentation
doc:
  R -e "devtools::document()"
```

.Rbuildignore

```
Makefile
```

Include a README or README.md file

```
fun with R Colors
=================

If you want high-quality, scientifically-researched color
schemes for your R plots, check out
[RColorBrewer](http://cran.r-project.org/web/packages/RColorBrewer).
If you want your plots to be colored the same way as packs of
Skittles (or M&Ms), then this package (RSkittleBrewer) is the
way to go.

### install
with `devtools`:

```S
devtools::install_github('RSkittleBrewer', 'alyssafrazee')
```

use
There are only three functions in this package.

Call `RSkittleBrewer` on a flavor to get a vector of R color
names that correspond to that Skittle flavor.
```

That's it!

Building, installing, and checking

```
R CMD build RSkittleBrewer
R CMD INSTALL RSkittleBrewer_1.1.tar.gz
R CMD check RSkittleBrewer_1.1.tar.gz

R CMD check --as-cran RSkittleBrewer_1.1.tar.gz

R CMD INSTALL --library=~/Rlibs RSkittleBrewer_1.1.tar.gz
# (~/.Renviron file contains R_LIBS=~/Rlibs)

# On windows:
R CMD INSTALL --build RSkittleBrewer_1.1.tar.gz
```

```
# also consider (within R):
library(devtools)
build("/path/to/RSkittleBrewer")
build("/path/to/RSkittleBrewer", binary=TRUE)
```

Package vignettes

▶ Include *vignettes* to show how to use your package.

▶ It's simplest to use R Markdown.
  – Create a `vignettes/` subdirectory.
  – Place a `.Rmd` file there.
  – The name of the file becomes the name of the vignette.

▶ Include the following in the `.Rmd` file's YAML header:
```
output: rmarkdown::html_vignette
vignette: >
    %\VignetteIndexEntry{Intro to RSkittleBrewer}
    %\VignetteEngine{knitr::rmarkdown}
    \usepackage[utf8]{inputenc}
```

▶ Load the package in an initial chunk
```
library(RSkittleBrewer)
```

Package vignettes

▶ In the DESCRIPTION file, include:
```
Suggests: knitr, rmarkdown
VignetteBuilder: knitr
```

▶ The following lists the vignettes for a package and then opens a selected vignette.
```
library(RSkittleBrewer)
vignette(package="RSkittleBrewer")
vignette("RSkittleBrewer", "RSkittleBrewer")
```

Optional stuff

- ▶ `NEWS` file describing changes in each version of the package.

- ▶ `inst/CITATION` file describing how to cite your package.

- ▶ `inst/doc/` directory any sort of misc. documentation (e.g., pre-compiled computationally heavy vignettes)

- ▶ `data/` directory containing data

- ▶ `src/` directory containing C/C++/Fortran code

- ▶ `demo/` directory with demonstrations (like vignettes, but to be executed in real-time).

- ▶ `tests/` and/or `inst/tests/` containing tests.

devtools

Get to know the devtools package.

- ► `dev_mode()`
- ► `load_all()`
- ► `install_github()`, `install_bitbucket`, ...
- ► `document()`
- ► `build()`
- ► `check()`
- ► `check_doc()`
- ► `run_examples()`
- ► `test()` (next week)

usethis

automates things otherwise hard to remember

- ▶ create_package()
- ▶ use_git(), use_github()
- ▶ use_mit_license(), use_gpl3_license()
- ▶ use_readme_md()
- ▶ use_r("function_name")
- ▶ use_roxygen_md()
- ▶ use_package("stats", "imports")
- ▶ use_vignette()

Summary

► R packages really aren't that hard.

► R packages are really useful.
  – Distributing software and data
  – Organizing code for a paper
  – Organizing your misc. R functions

► Look at others' packages, and learn from them.

► Adopt the tools in the devtools package.

► Use hrefhttps://usethis.r-lib.orgusethis package to assist with all of the little nit-picky package development things.