Creating R Packages

with devtools

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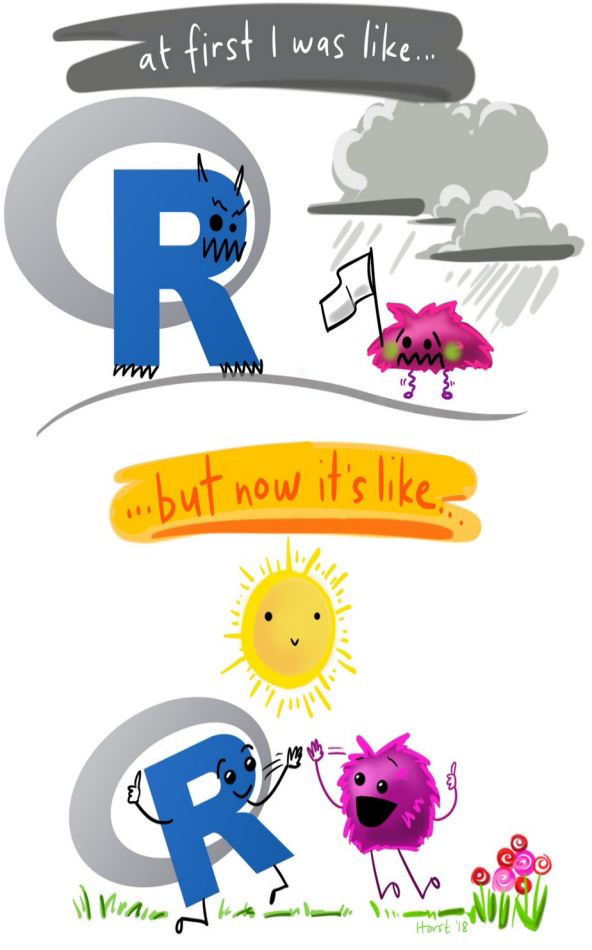
Welcome to the R Community



Why R Packages?

A simple way to distribute R code and documentation

An easier way to keep track of R functions that you write and reuse

A great way to help other R users

"If you will do it more than once, write a function. If more than you will do it more than once, develop a package" - Some clever person

Examples

```
library(faq)
df <- data.frame(
  question = c("Question1", "Question2"),
  answer = c("answer for question1",
             "question2 answer")
)
faq::faq(data = df, elementId = "faq", faqtitle = "")
```

+ Expand All

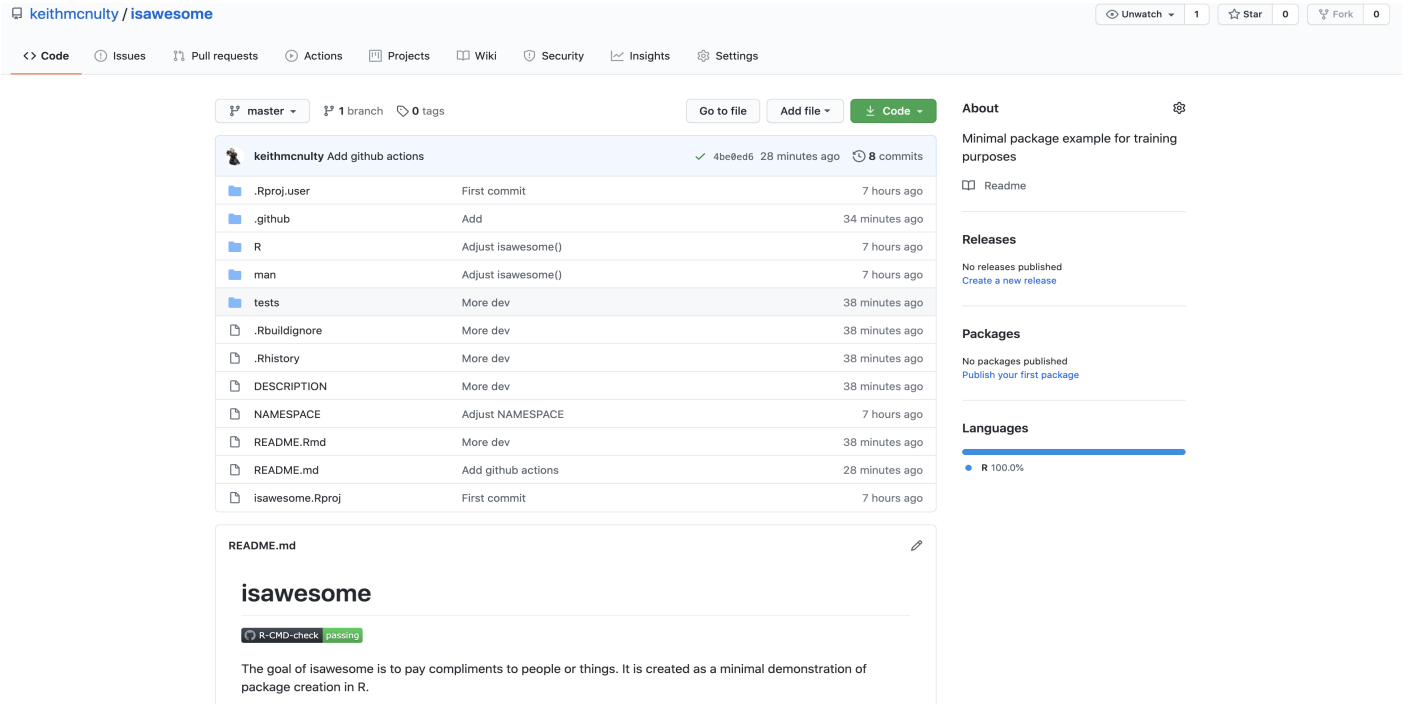
+ **Question1**

+ **Question2**

Important resources for package creation

- The package bible: R Packages by Hadley Wickham
- The `devtools` package for managing the package development workflow
- The `usethis` package to make it easier to use things in your development workflow
- The `testthat` package for unit testing your functions (optional, but highly recommended)

We've created a minimal package example on Github to demonstrate



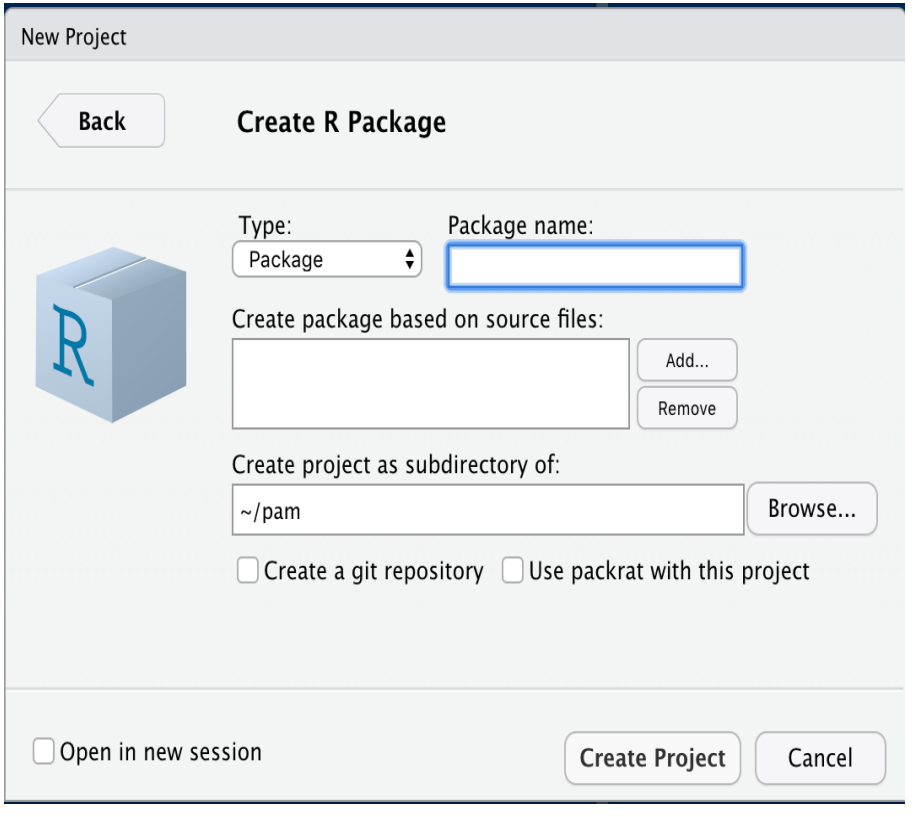
https://github.com/keithmcnulty/isawesome

```
devtools::install_github("keithmcnulty/isawesome")
```

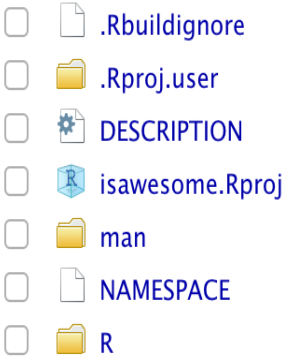
Get Started

Step a): Set up package project

Install the **devtools** package



Minimal project infrastructure



- `DESCRIPTION` lists package details, description, authors, dependencies
- `NAMESPACE` is used for listing which functions are exported versus hidden, and also imported functions from other packages
- `R` directory is where code for package functions is written
- `man` is for help files - usually automatically generated.

Example DESCRIPTION file

```
Package: isawesome
Type: Package
Title: Tells people they are awesome
Version: 0.1.0
Author: c(
  person(given = "Jiena",
         family = "McLellan",
         role = c("aut", "cre"),
         email = "jienagu90@gmail.com")
  person(given = "Keith",
         family = "McNulty",
         role = c("ctb"),
         email = "keith.mcnulty@gmail.com"))
Maintainer: Jiena McLellan <jienagu90@gmail.com>
Description: This package creates functions which pay you compliments.
  It is created as a minimal example for a training on R package creation.
License: CC0
Imports:
  magrittr
Encoding: UTF-8
LazyData: true
RoxygenNote: 7.1.1
```

Example NAMESPACE file

```
exportPattern("^[:a-z:]+") # any function whose name starts with a-z
importFrom("magrittr", "%>%") # import the pipe operator from magrittr
```

Step b): Write functions

Give a function an evocative name that makes your code easier to understand

As requirements change, you only need to update code

Eliminate the chance of making incidental mistakes when you copy and paste

Example exported function

```r
# this function will be exported

isawesome <- function(name = "Someone", alternative = FALSE,
                      return_message = TRUE) {
  if (!alternative) {
    if (return_message) {
      paste(name, "is awesome!") %>%
        message()
    } else {
      paste(name, "is awesome!")
    }
  } else {
    if (return_message) {
      paste(name, .random_compliment()) %>%
        message()
    } else {
      paste(name, .random_compliment())
    }
  }
}
```

Example internal function

```
# this function is internal

.random_compliment <- function() {
  sample(c("is incredible!", "is amazing!", "rocks!"), 1)
}
```

Step c): Document

Use `roxygen` commenting above exported function

Write comments as you code

Include a README file with basic information

Use vignettes for more substantial guidance

Write error messages that provide solutions

Example `roxygen` commenting

```
#' Gives compliments
#'
#' @description
#' Displays a message that compliments the input.
#'
#' @param name A character string of the person or object to be compl
#' @param alternative A logical indicating whether alternatives to '
#' @param return_message A logical indicating whether a message shou
#' @return A message that pays a compliment.
#'
#' @examples
#' isawesome("Randy 'Macho Man' Savage")
#' isawesome("Hulk Hogan", alternative = TRUE)
```

- Running `devtools::document()` will turn these into manual pages (in `man` folder)
- Examples will be run during package check - they need to work
- For CRAN submission examples need to run in less than 5s

Creating a `README` or vignettes

- `README.md` is useful for general overview of what's in the package
- vignettes can be used to demonstrate the functionality in details
- `usethis::use_readme_rmd()` creates an RMarkdown where you can create your readme and knit it to `README.md`
- `usethis::use_vignette(name)` sets up RMarkdown documentation for vignette with name provided

Step d): Unit test

Time consuming but product saving

Any Bugs Are Found Easily and Quicker

Example: test file

- `usethis::use_testthat()` sets up testing in your package
- `usethis::use_test("isawesome")` creates `test-isawesome.R`

```
string <- stringi::stri_rand_strings(n = 1, length = sample(1:20, 1),

test_that("isawesome() produces the expected output", {
  isawesome(string, return_message = FALSE) %>%
    testthat::expect_equal(paste(string, "is awesome!"))
})
```

Step e): Build and check

Check package builds OK (incl documentation and tests)

Integrated build checks on Github using Github Actions (CI)

Windows OS testing via CRAN servers

Useful build and check tools

- `devtools::check()` performs check on your system
- `usethis::use_github_actions()` will set up for CI R-CMD check in (public) Github for Unix-based systems
- `devtools::check_win_release()` tests the package on CRAN's Window's servers (emails test results).
- CAUTION: The last two are not suitable for packages containing confidential material.

Step f): Submit to CRAN

Any package can go on CRAN if it works and is not dangerous

Aim for 0 ERRORS, 0 WARNINGS, 0 NOTES (last one not always possible)

Think about version numbering (usually start with 0.1.0)

New packages will always be manually checked (5-10 working days)

Updates are often immediately approved

CRAN Submission process

1. Use `devtools::release()` to do all checks and submit to CRAN.
2. Respond to the email to confirm submission.
3. Wait to see if it is auto-approved (only for package updates)
4. If manually checked, wait to hear from CRAN team.
5. Use `cran-comments.md` file to communicate with CRAN team if changes needed.
6. Some fixes are really tiny, like punctuation and capitalization rules.
7. Try to avoid debating with the CRAN team - just make the fix.
8. Congrats - you are on CRAN!
9. Tweet and blog about your package to let people know!
10. If you are feeling creative, use the `hexSticker` package to create a hex sticker for your package

Create hex logo

- Use template: https://emitanaka.org/post/hexsticker/
- Use `hexSticker` package

```
library(hexSticker)
s <- sticker(~plot(cars, cex=.5, cex.axis=.5, mgp=c(0,.3,0), xlab="",
             package="hexSticker", p_size=8, s_x=.8, s_y=.6, s_width=
             h_fill="#f9690e", h_color="#f39c12",
             filename="baseplot.png")
```

Thank you and happy package building