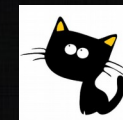
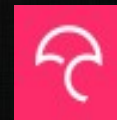
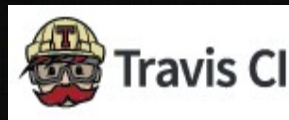


Professional R development  
using git, GitHub, Travis CI, testthat, lintr, covr, Codecov and  
goodpractice

© 2016 Richel Bilderbeek



<http://www.github.com/richelbilderbeek/PresentationsAboutR>



# What? Why? Mastery?

- What: follow all good practices by default
- Why: proven to pay off
- Mastery: set up tools to follow all good practices by default



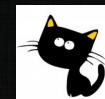
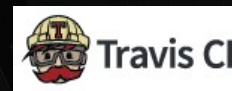
# Not about ...

- How to create a package
  - See the talk 'How to develop a package'
- Why to test a package
  - See the talk 'Test-driven development'
- Extending a package
  - See the talk 'Test-driven development'



# Setup

- Version control
- Code hosting
- Continuous integration
- Testing framework
- Coding standard
- Code coverage
- Static code analysis



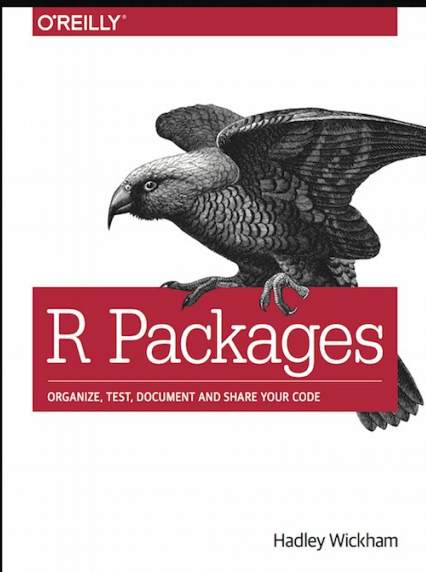
# Version control

- Keeps a history of code



Rule 9:  
Do source code  
management

Keynote Speech at useR!, 2014



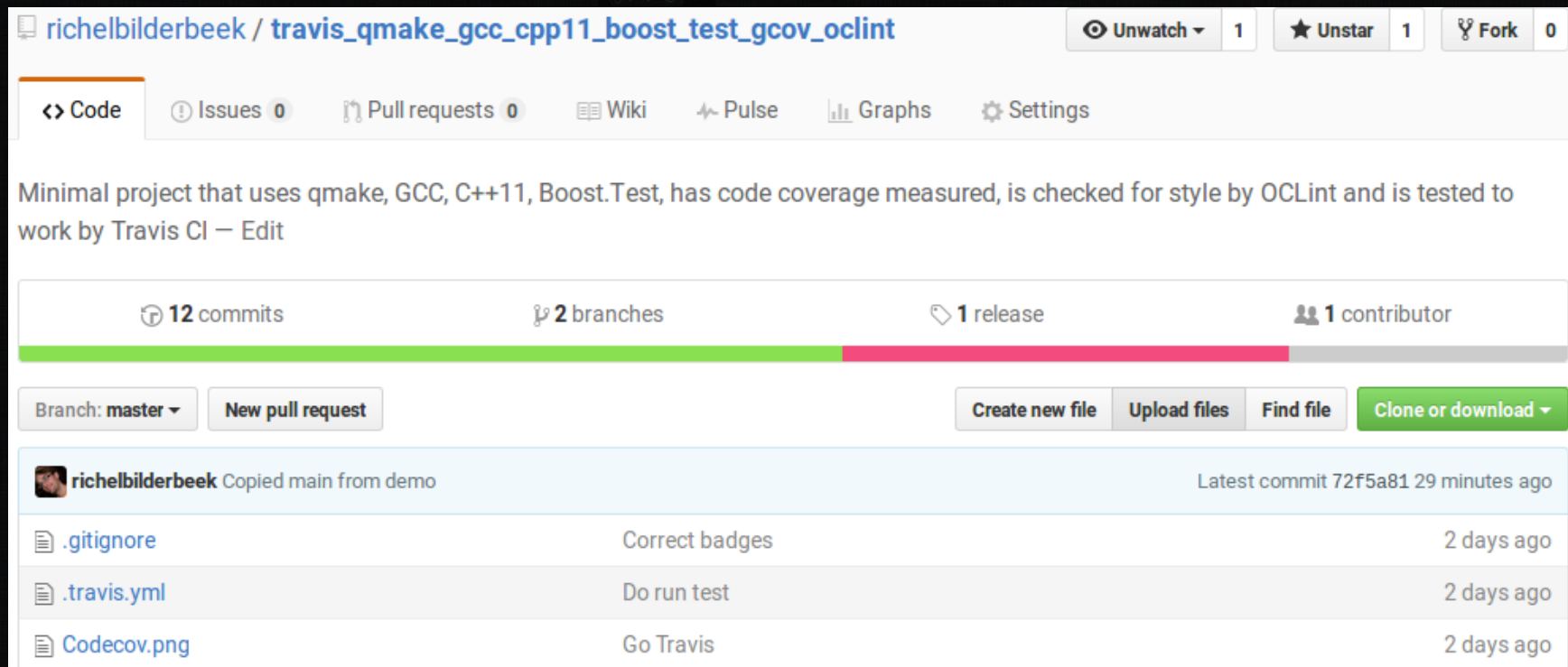
If you are serious  
about software development,  
you need to learn about git

Chapter 13: git and GitHub



# Code hosting

- Host your (version controlled) code
- Using GitHub is good practice [1]

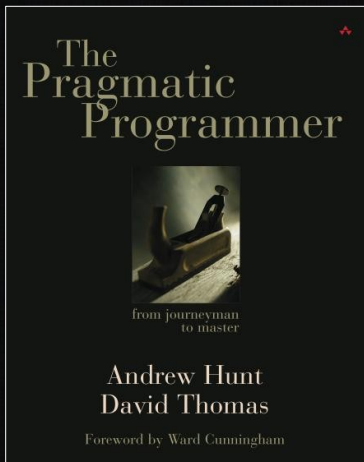


[1] Perez-Riverol, Yasset, et al. "Ten Simple Rules for Taking Advantage of git and GitHub." bioRxiv (2016): 048744.

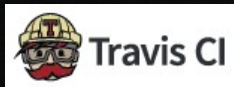
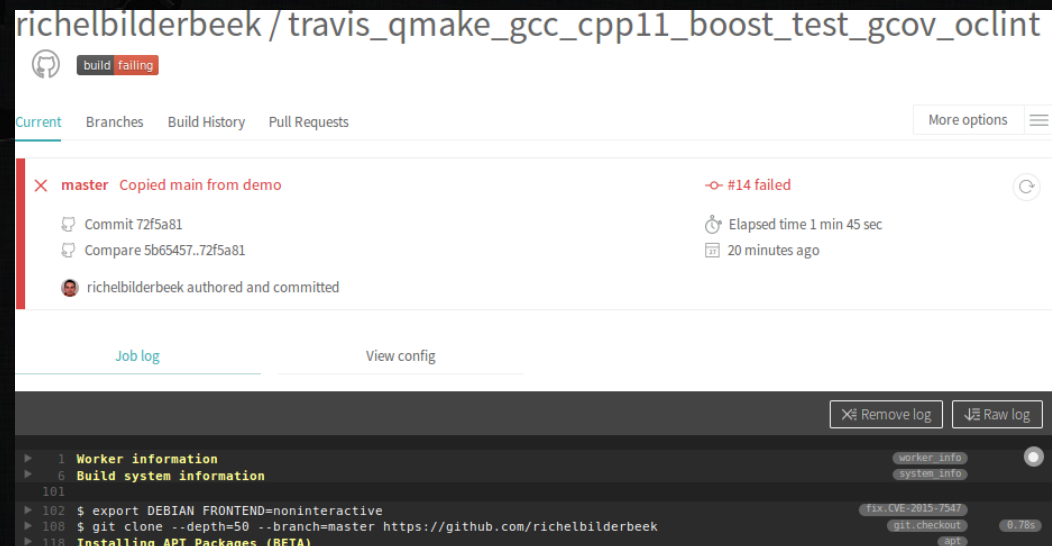


# Continuous integration

- Run scripts upon pushing new code

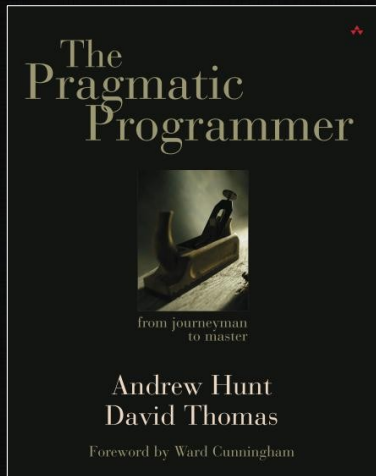


Tip 61: Don't Use Manual Procedures



# Testing framework

- To test your code



Tip 62: Test Early.  
Test Often. Test Automatically

Testing is a vital part of  
package development

Fewer bugs  
Better code structure  
Easier restarts  
Robust code



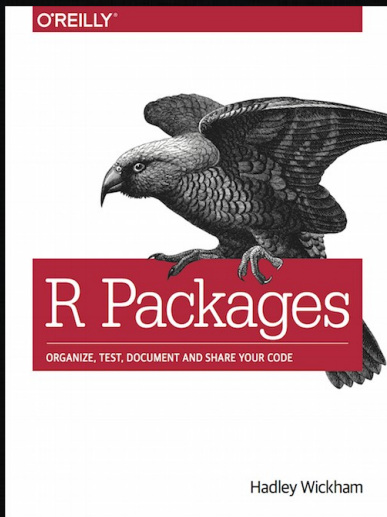
Chapter 7: Testing





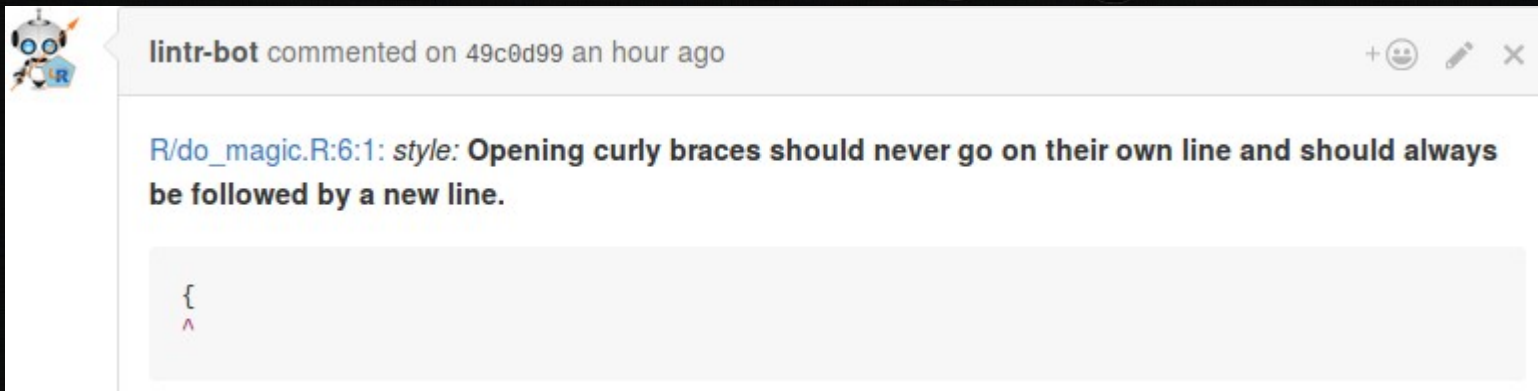
# Coding standard

- Use a coding standard [1]



I strongly recommend  
that you use a  
consistent style

Chapter 3, paragraph 'Code Style'

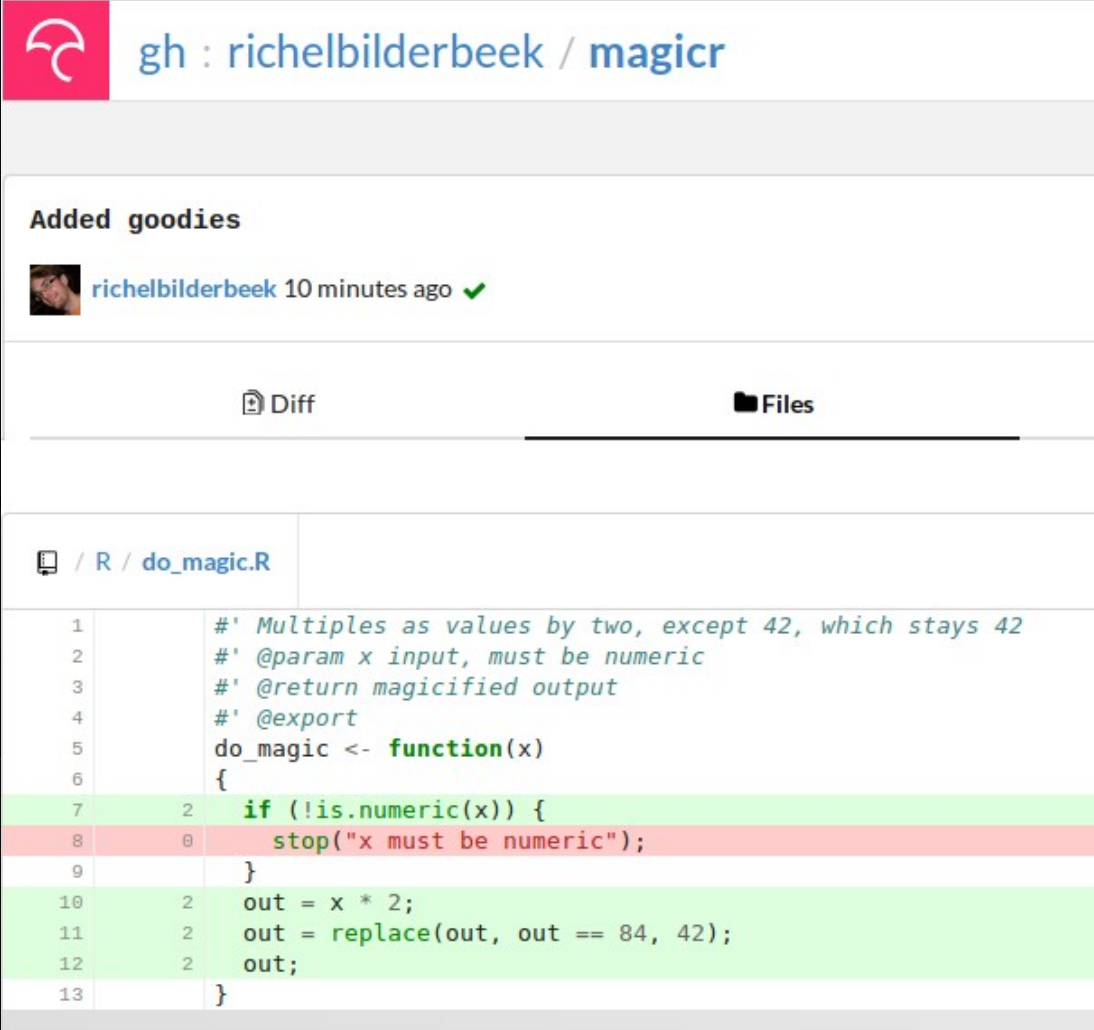


Johnson, Paul E. "R Style. An Rchaeological Commentary." (2016).



# Code coverage

- Measures code that is actually used
- Correlates with quality [1]



gh : richelbilderbeek / magicr

Added goodies

richelbilderbeek 10 minutes ago ✓

Diff Files

/ R / do\_magic.R

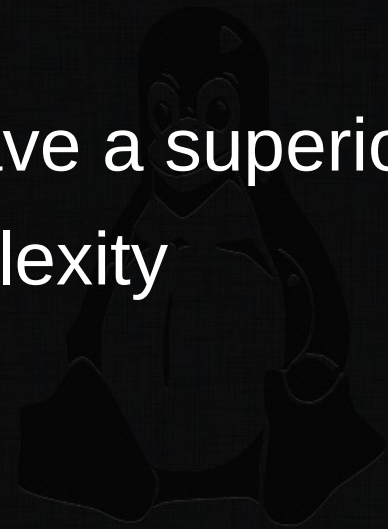
```
1      #' Multiplies as values by two, except 42, which stays 42
2      #' @param x input, must be numeric
3      #' @return magicified output
4      #' @export
5      do_magic <- function(x)
6      {
7      2    if (!is.numeric(x)) {
8      0    stop("x must be numeric");
9      }
10     2    out = x * 2;
11     2    out = replace(out, out == 84, 42);
12     2    out;
13 }
```

[1] Del Frate, Fabio, et al. "On the correlation between code coverage and software reliability." Software Reliability Engineering, 1995. Proceedings., Sixth International Symposium on. IEEE, 1995.



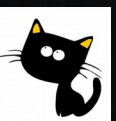
# Test for good practices

- Checks code beyond the interpreter and lintr
  - Coding style
  - Functions that have a superior alternative
  - Cyclomatic complexity



It is good practice to

\* omit trailing semicolons from code lines. They are not needed and most R coding standards forbid them





# This presentation

- Introduce the package 'magickr'
  - Code that can be improved
  - <https://github.com/richelbilderbeek/prde>
- Put it on GitHub
- Activate Travis CI
- Activate other tools



# do\_magic.R

```
#' Multiplies all values by two,
#'   except 42, which stays 42
#' @param x input, must be numeric
#' @return magicified output
#' @export
do_magic <- function(x)
{
  if (!is.numeric(x)) {
    stop("x must be numeric");
  }
  out = x * 2;
  out = replace(out, out == 84, 42);
  out;
}
```

# test-do\_magic.R

```
context("do_magic")

test_that("do_magic: use", {
  expect_equal(do_magic(42), 42)
  expect_equal(do_magic(1), 2)
})
```



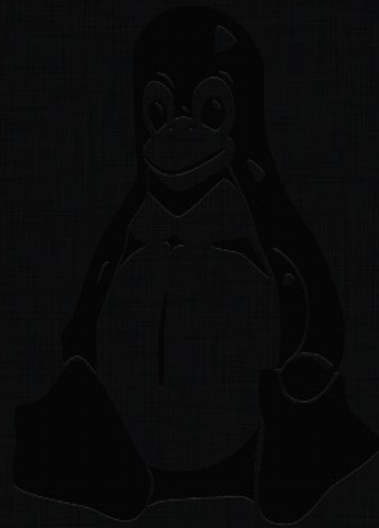
# Output

```
> devtools::check()  
Updating prde documentation  
Loading prde  
[...]  
* checking tests ...  
  Running 'testthat.R'  
OK  
* DONE  
  
Status: OK  
  
R CMD check results  
0 errors | 0 warnings | 0 notes
```



# Demo

- Show that the package builds



# Next steps

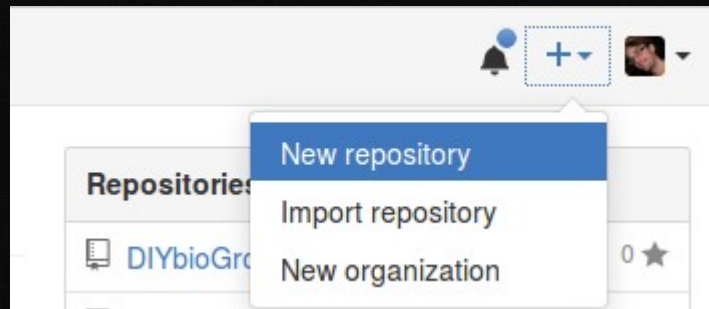
- Create a GitHub repository
- Clone it to the local computer
- Put your code in that folder
- Upload the code





# Create a GitHub repository



- Create a new repository



## Create a new repository

A repository contains all the files for your project, including the revision history.

**Owner** **Repository name**

 richelbilderbeek / magicr 

Great repository names are short and memorable. Need inspiration? How about **fluffy-broccoli**.


**Description (optional)**

Does magic

☒ **Public**  
Anyone can see this repository. You choose who can commit.

☐ **Private**  
You choose who can see and commit to this repository.


☒ **Initialize this repository with a README**  
This will let you immediately clone the repository to your computer. Skip this step if you're importing an existing repository.

Add .gitignore: **R** | Add a license: **GNU General Public License v3.0** 

**Create repository**

# Clone it to the local computer

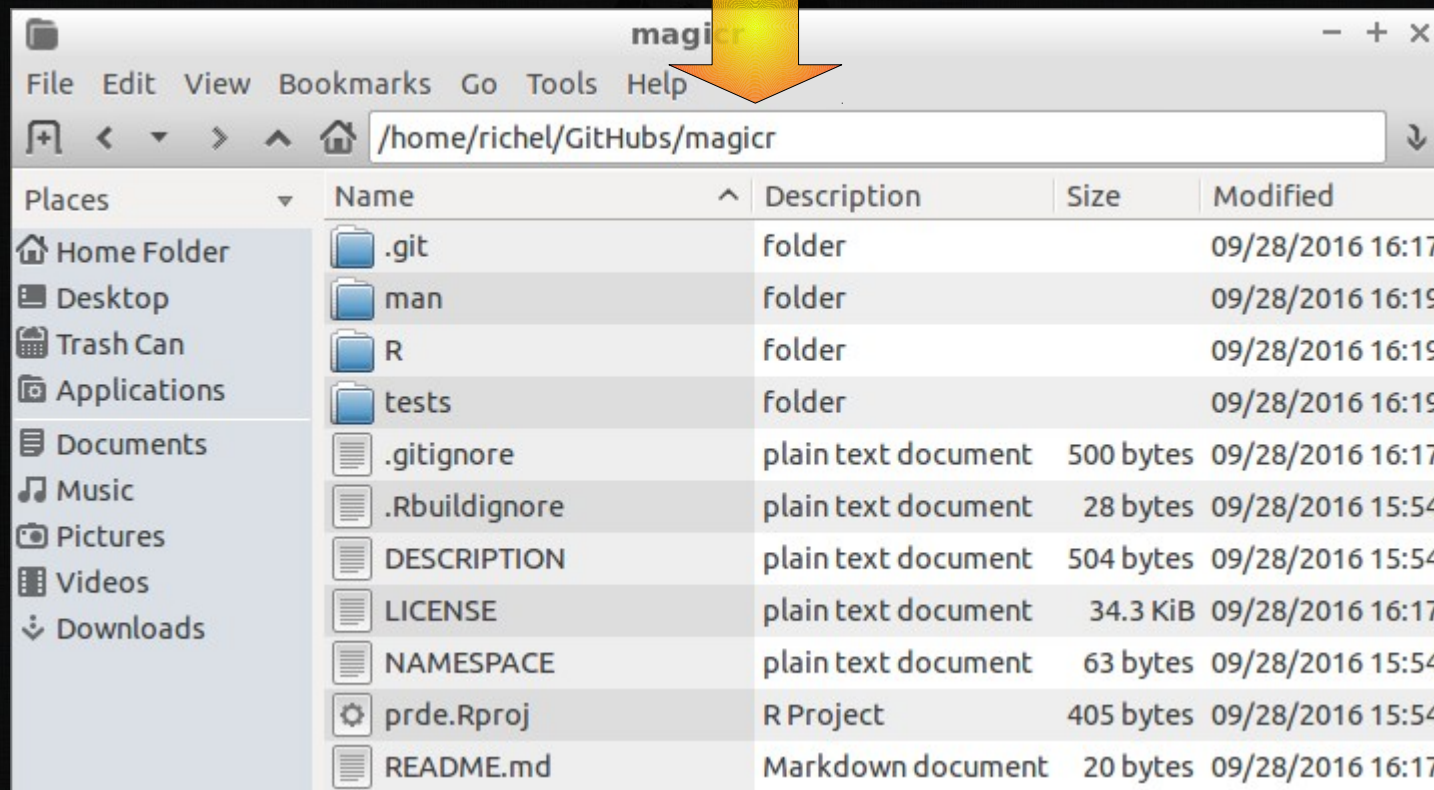
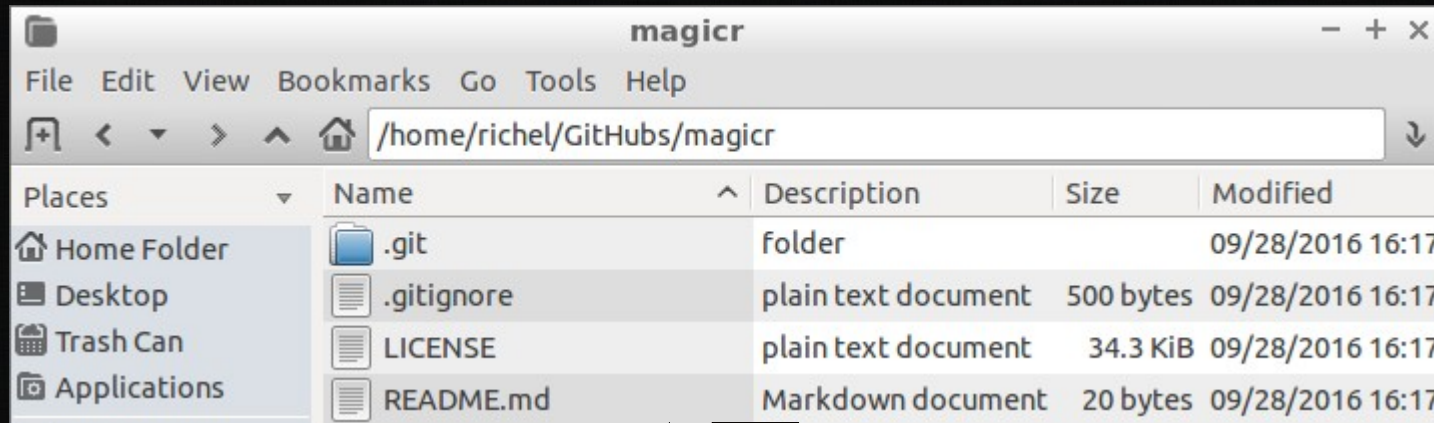
- `git clone https://github.com/[username]/[repository name]`

A screenshot of a terminal window titled 'richel@arduinorood: ~'. The window has a menu bar with 'File', 'Edit', 'Tabs', and 'Help'. The terminal shows the command 'git clone https://github.com/richelbilderbeek/magicro' being executed. The output shows the cloning process: 'Cloning into 'magicro'...', 'remote: Counting objects: 5, done.', 'remote: Compressing objects: 100% (4/4), done.', 'remote: Total 5 (delta 0), reused 0 (delta 0), pack-reused 0', 'Unpacking objects: 100% (5/5), done.', and 'Checking connectivity... done.'

```
richel@arduinorood:~$ git clone https://github.com/richelbilderbeek/magicro
Cloning into 'magicro'...
remote: Counting objects: 5, done.
remote: Compressing objects: 100% (4/4), done.
remote: Total 5 (delta 0), reused 0 (delta 0), pack-reused 0
Unpacking objects: 100% (5/5), done.
Checking connectivity... done.
```

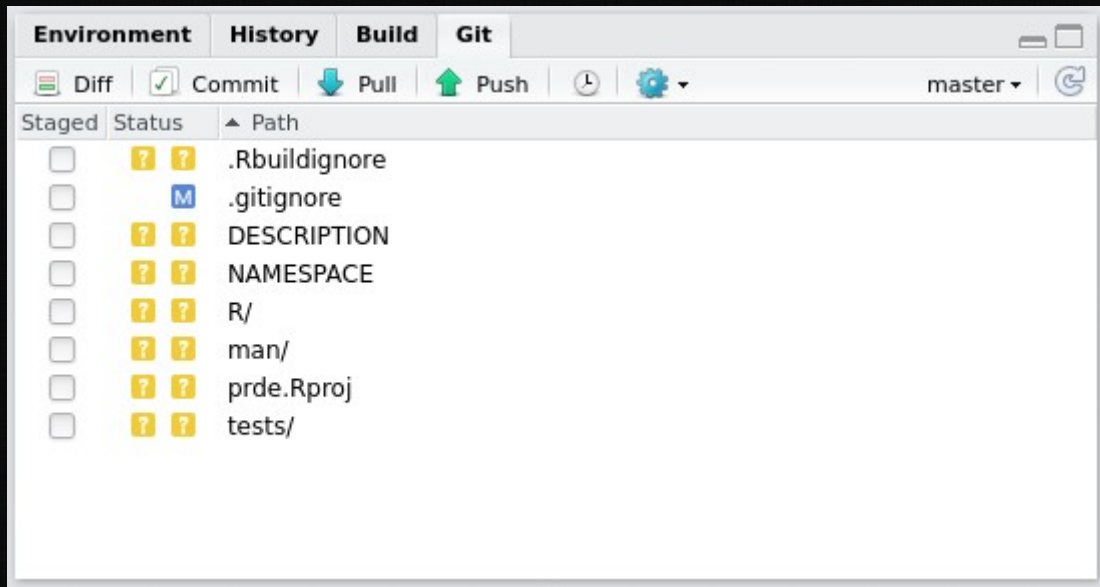
- (Wouldn't it be nice if this step could also be done from R studio?)

# Put your code in that folder

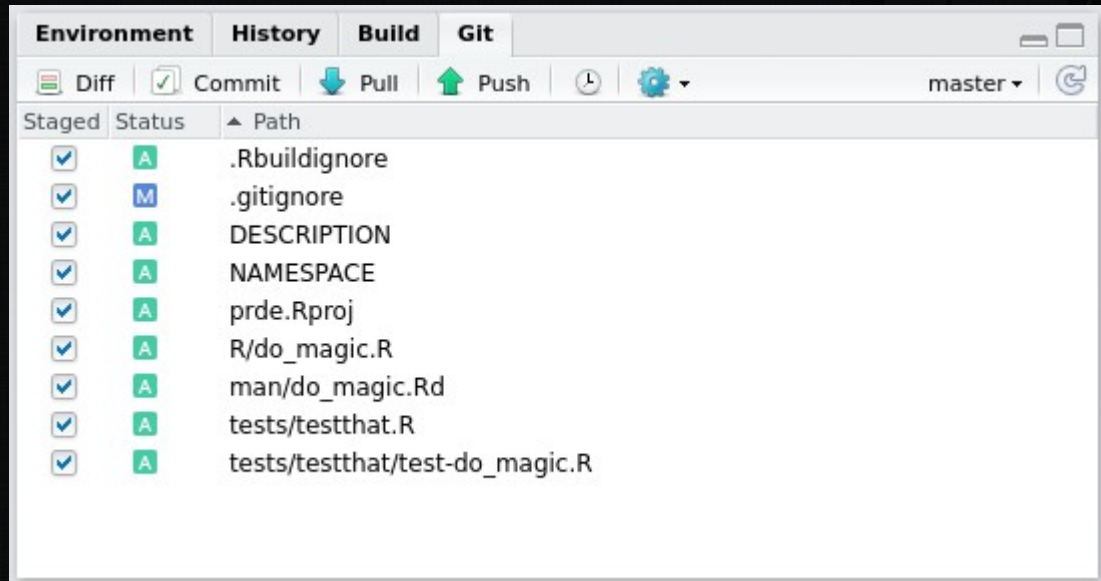




# Upload to GitHub

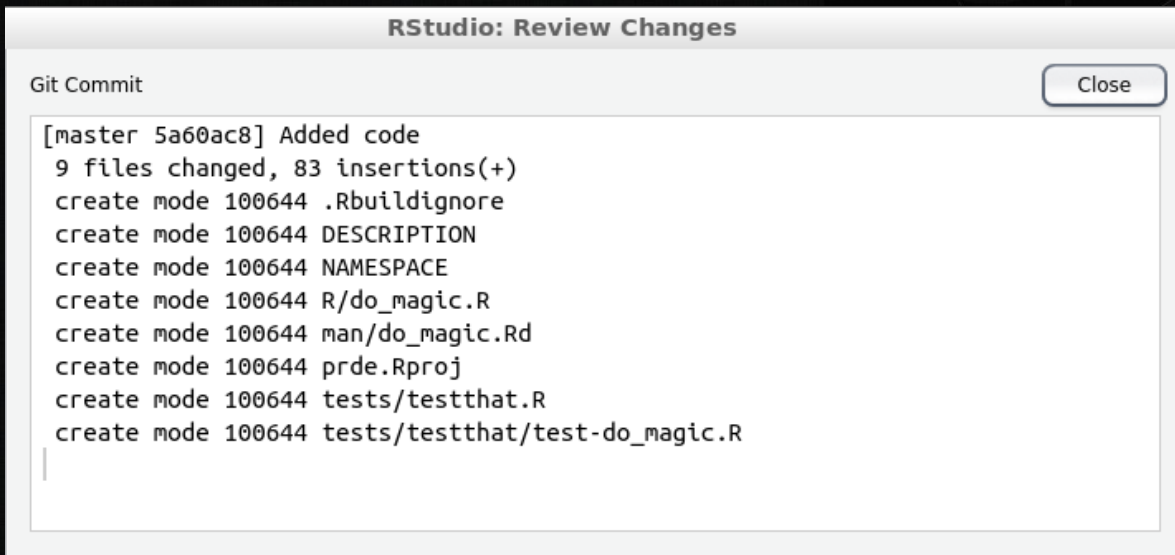
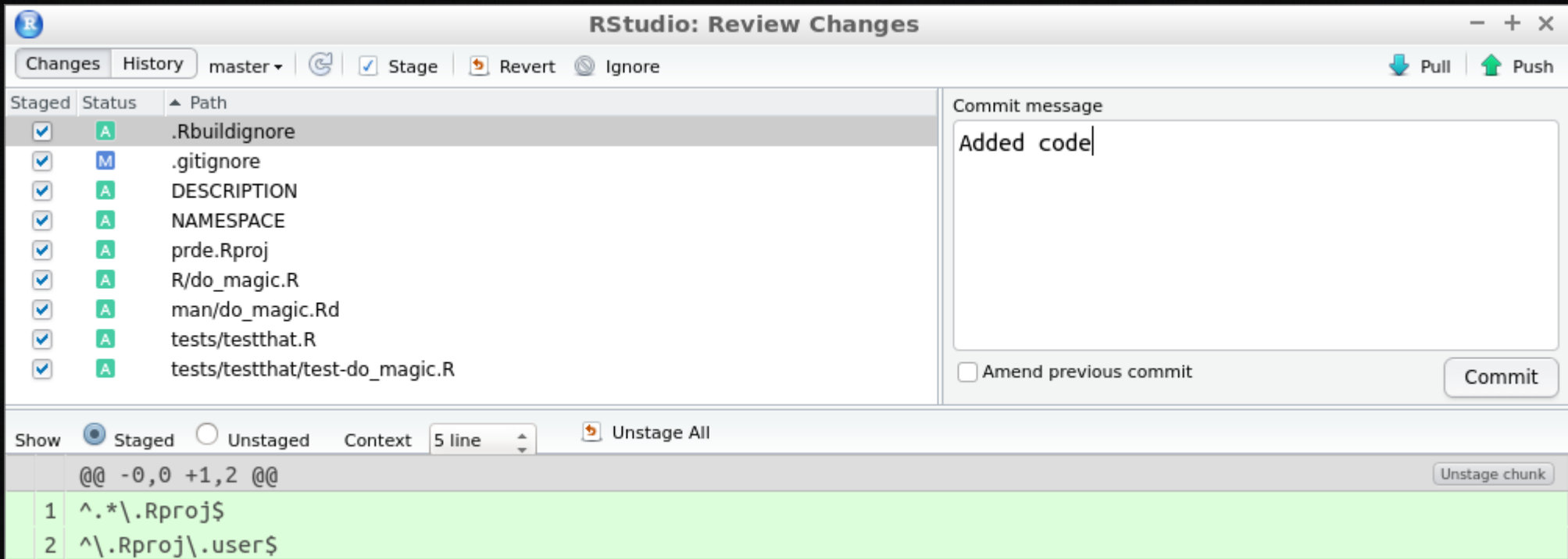


Stage



Commit

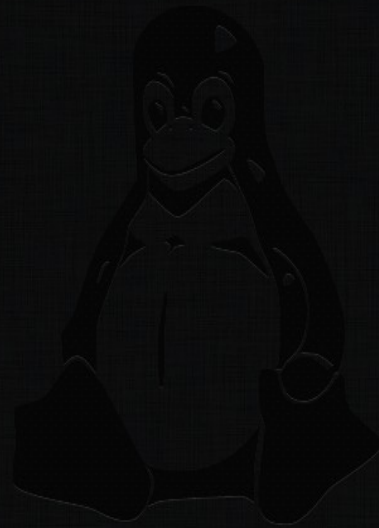
# Push to GitHub



then push!

# Demo

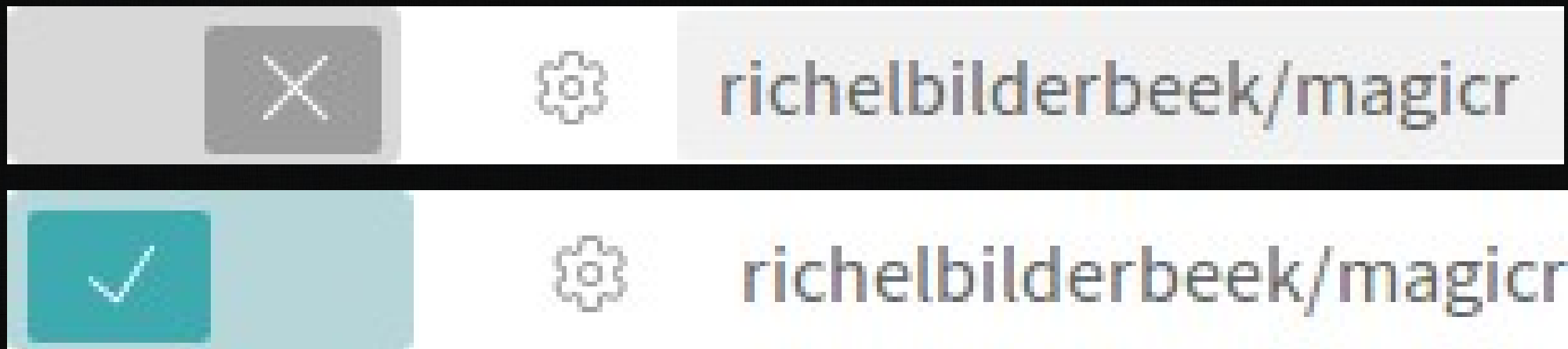
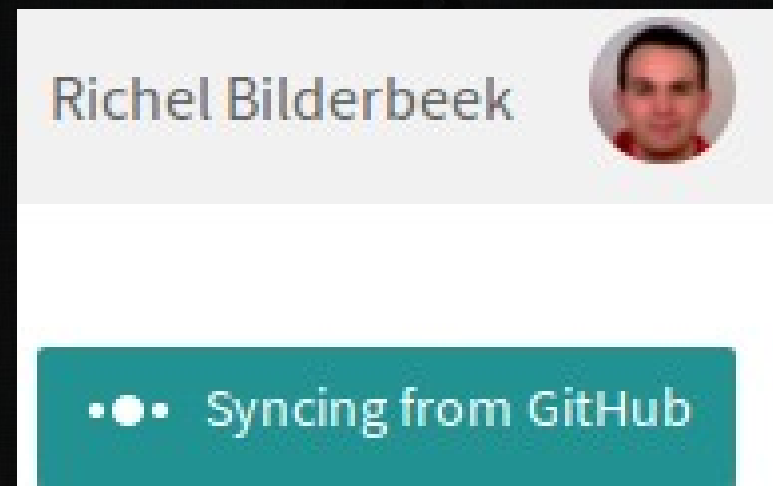
- Put the package on GitHub





# Activate Travis CI

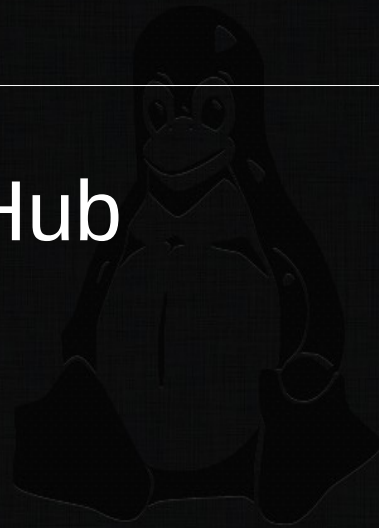
- <https://travis-ci.org/>



# Add file .travis.yml to root of package

```
language: r  
cache: packages
```

- Then push to GitHub
- Then wait ...



# Success

richelbilderbeek / prde

Unwatch 1 Star 0 Fork 0

Code Issues 0 Pull requests 0 Projects 0 Wiki Pulse Graphs Settings

Professional R Development Example — Edit

3 commits 1 branch 0 releases 1 contributor GPL-3.0

Branch: master New pull request Create new file Upload files Find file Clone or download

richelbilderbeek Build badges 1 Latest commit 11052f1 5 hours ago

R	Go Travis	5 hours ago
man	Go Travis	5 hours ago
tests	Go Travis	5 hours ago
.Rbuildignore	Go Travis	5 hours ago
.gitignore	Initial commit	6 hours ago
.travis.yml	Go Travis	5 hours ago
Codecov.png	Build badges	5 hours ago
DESCRIPTION	Go Travis	5 hours ago
LICENSE	Initial commit	6 hours ago
NAMESPACE	Go Travis	5 hours ago
README.md	Build badges	5 hours ago
TravisCI.png	Build badges	5 hours ago

richelbilderbeek / magicr  build passing

Current Branches Build History Pull Requests

More options

✓ master Go Travis

🔄 #1 passed

🔄 Restart build

🔗 Commit 54bdc7c

🕒 Elapsed time 5 min 42 sec

🔗 Compare 5a60ac8..54bdc7c

📅 about a minute ago

 richelbilderbeek authored and committed



# Demo

- Activate Travis CI
- (do not wait until the build has finished)




# Activate other tools

```
language: r
cache: packages

r_github_packages:
  - jimhester/lintr
  - jimhester/covr
  - MangoTheCat/goodpractice

after_success:
  - Rscript -e 'lintr::lint_package()'
  - Rscript -e 'library(covr); codecov()'
  - Rscript -e 'library(goodpractice); gp()'
```



- Then push to GitHub
- Then wait ...

# Demo

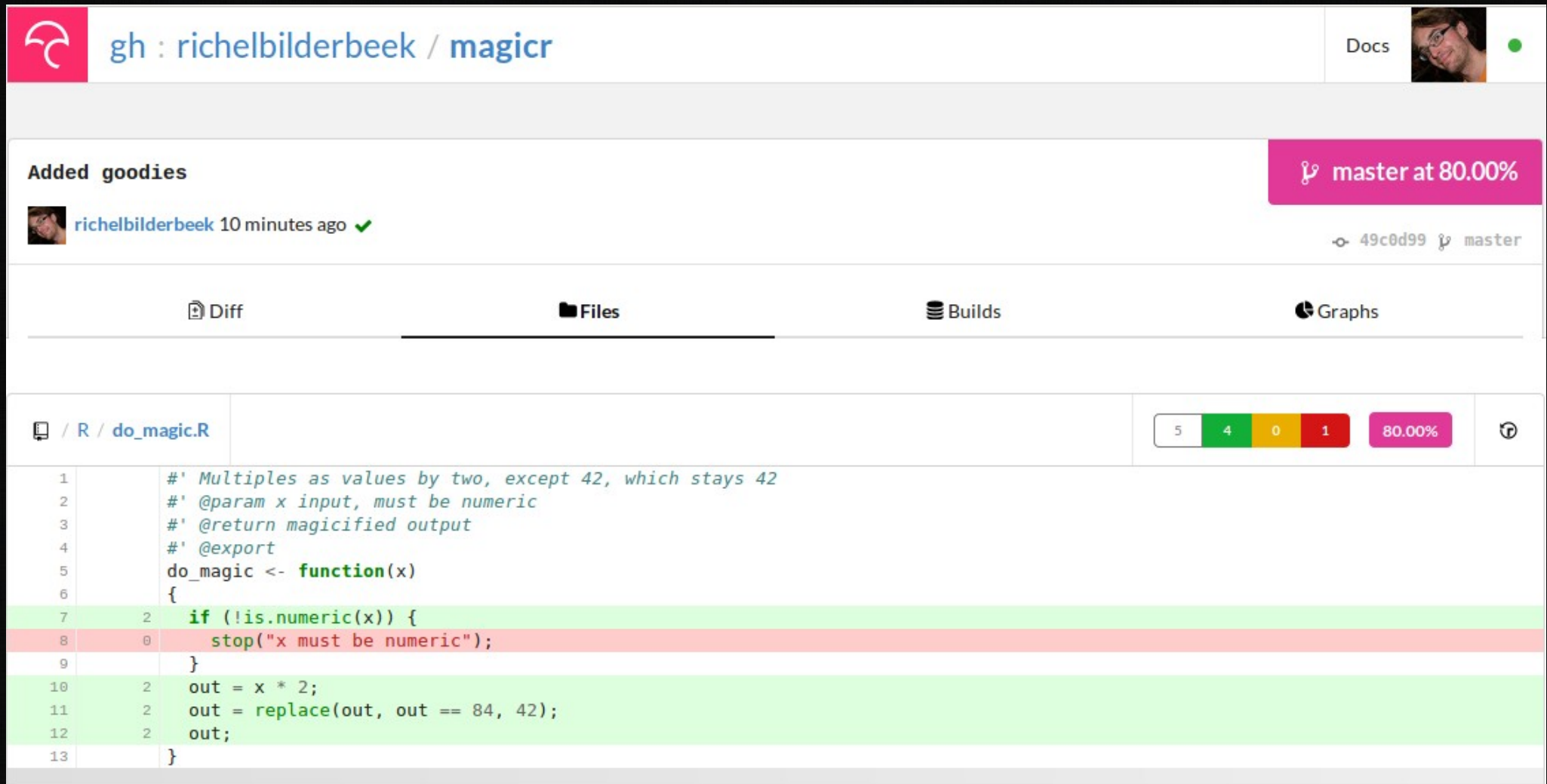
- Modify .travis.yml
- Push
- (do not wait until Travis CI is finished)





# Results: code coverage

- <https://codecov.io/>



# Results: linter

```
▼ 1784 $ Rscript -e 'lintr::lint_package()' after success
1785 R/do_magic.R:6:1: style: Opening curly braces should never go on their own line and should always be followed by a new line.
1786 {
1787 ^
1788 R/do_magic.R:10:7: style: Use <-, not =, for assignment.
1789   out = x * 2;
1790   ^
1791 R/do_magic.R:11:7: style: Use <-, not =, for assignment.
1792   out = replace(out, out == 84, 42);
1793   ^
1794
```



lintr-bot commented on 49c0d99 an hour ago



R/do\_magic.R:6:1: style: Opening curly braces should never go on their own line and should always be followed by a new line.

```
{
^
```


R/do\_magic.R:10:7: style: Use <-, not =, for assignment.


```
out = x * 2;
  ^
```

R/do\_magic.R:11:7: style: Use <-, not =, for assignment.


```
out = replace(out, out == 84, 42);
  ^
```

# Results: code coverage

 gh : richelbilderbeek / magicr

Docs 

Added goodies

 richelbilderbeek 10 minutes ago ✓

49c0d99 master

master at 80.00%

Diff Files Builds Graphs

/ R / do\_magic.R

5 4 0 1 80.00%

```
1      #' Multiplies as values by two, except 42, which stays 42
2      #' @param x input, must be numeric
3      #' @return magicified output
4      #' @export
5      do_magic <- function(x)
6      {
7          2 if (!is.numeric(x)) {
8              0 stop("x must be numeric");
9          }
10         2 out = x * 2;
11         2 out = replace(out, out == 84, 42);
12         2 out;
13     }
```







# Results: goodpractice

It is good practice to

- \* omit trailing semicolons from code lines. They are not needed and most R coding standards forbid them



# My experiences

- Due to this setup, I have
  - Responded to bugs faster 
  - Found and removed dead code 
  - Learned a professional R coding standard
  - Reduced complexity of working code
  - Learned new things
  - Indirectly teach collaborators/students the same lessons

# Conclusion

- It is doable to follow all good practices in three Good Steps:
  - Follow a package structure
  - Put that package on GitHub
  - Add Travis CI and other tools
- I think this setup is useful for
  - R newbies
  - R pros





# Professional R development

Richel Bilderbeek 

<http://www.github.com/richelbilderbeek/PresentationsAboutR>

