THINKR

Development workflow at ThinkR

PROPRE, DataOps and DevOps workflows

Who am I?

Sébastien ROCHETTE
@statnmap

Data Scientist, R expert, R trainer

- https://statnmap.com
- https://thinkr.fr (teaching)
- https://rtask.thinkr.fr (consulting)
- https://github.com/ThinkR-open
- https://twitter.com/thinkr_fr

Reproducible Analytical Pipelines

Share pipelines for others to reproduce outputs

Named PROPRE in French ("PROcessus de Publications REproductibles")

- Allows productions to be reproducible
- Same idea as sharing analyses through publications
- Makes analyses accessible
- Gives users confidence in the production
- Efficiency of workflows with "click" reduction

> Note that pipelines can be citable (DOI - Zenodo)
> More about PROPRE (FR): https://rdes_dreal.gitlab.io/propre/index.html

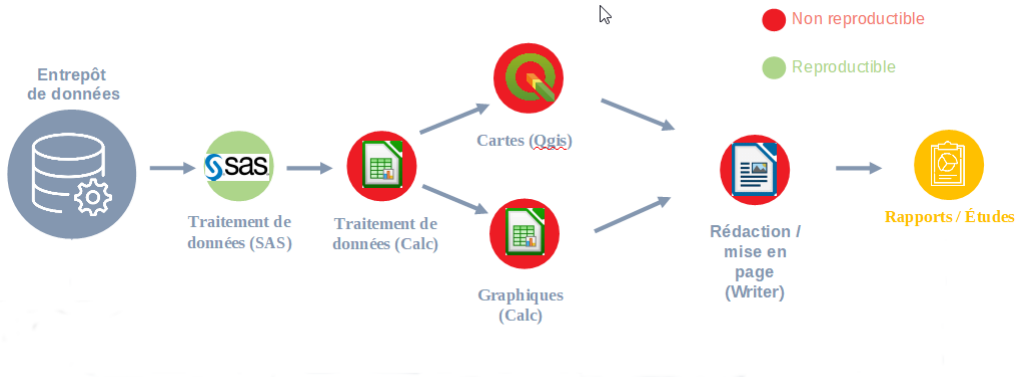
ThinkR uses RAP

Private and open-source projects

- Clients/Users can take over the development after delivery
- Verify if it works as you asked, in every details
- Document features with words for non-coders
- Robust to new fonctionnalities
- Re-usable for new datasets or updates

From data to analyses

An integrated workflow



From data to analyses

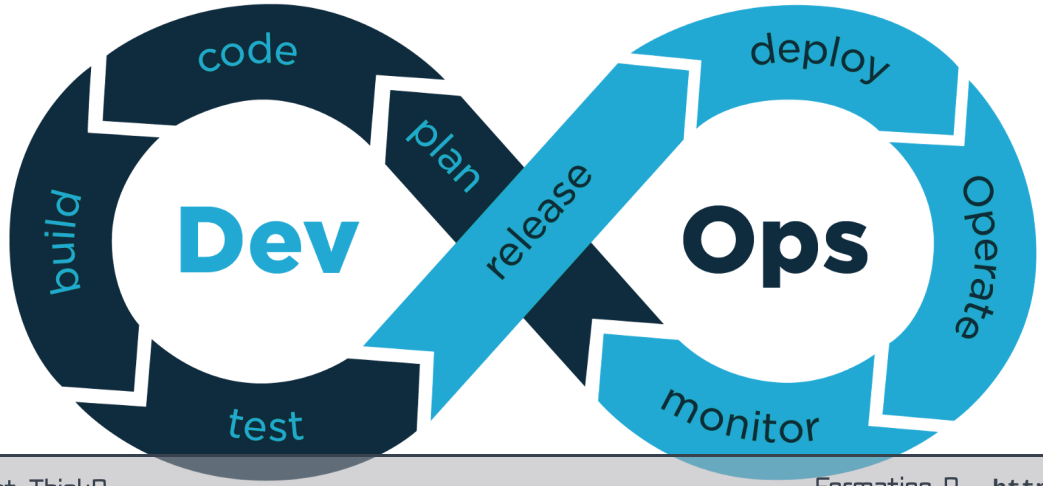
An integrated workflow

- Everything is code
- Avoid user guides explaining where to click
  - Give sense to human tasks
- Anyone can launch the process
  - Trainees, PhDs, new collaborators, ...
- Give confidence in the outputs, increase potential use
- Requires stability in the data format and content

Use Case: Process PROPRE

Coaching of a public organization

- Yearly analysis of public data
  - Regional specificities
- DataOps / DevOps approach
  - Data producers
  - R developers
  - Data analysts
  - Users, decision-makers
- Open-source: https://gitlab.com/rdes_dreal/propre.rpls



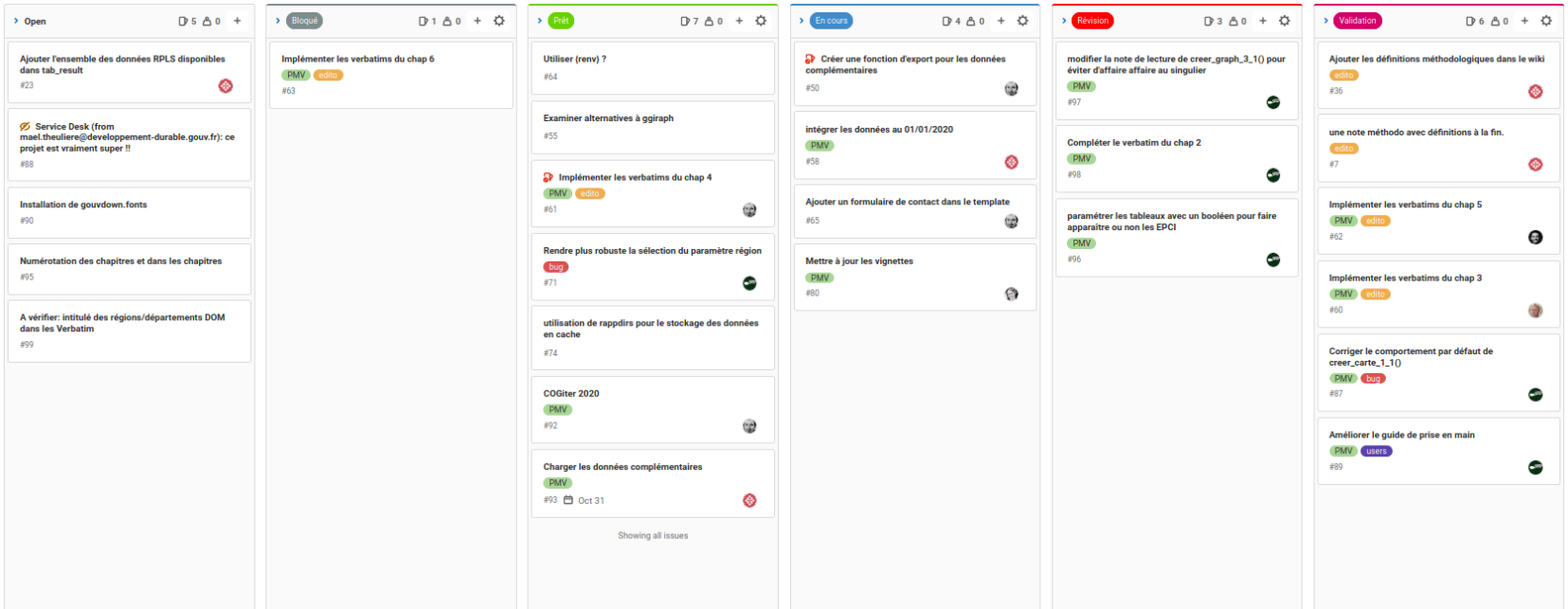
DevOps steps for production

Step	Dev	Ops
1. Infrastructure	Versionning Communication Monitoring	Collaboration
2. Design - UI	Propose output appearance HTML, PDF, Shiny	Define Validate
3. Prototype	Independent core developments Analysis, Graphs, Tables Documentation	Validate each output
4. Build	Combine prototypes and UI	Validate pages / sections
5. Strengthen	Reproducible examples Version control Unit tests Docker	Validate tests
6. Deploy	Send in production	Test complete outputs
Repeat 3:6	Develop, document, test, propose	Test, feedbacks, validation

More on Engineering Production-Grade Shiny Apps

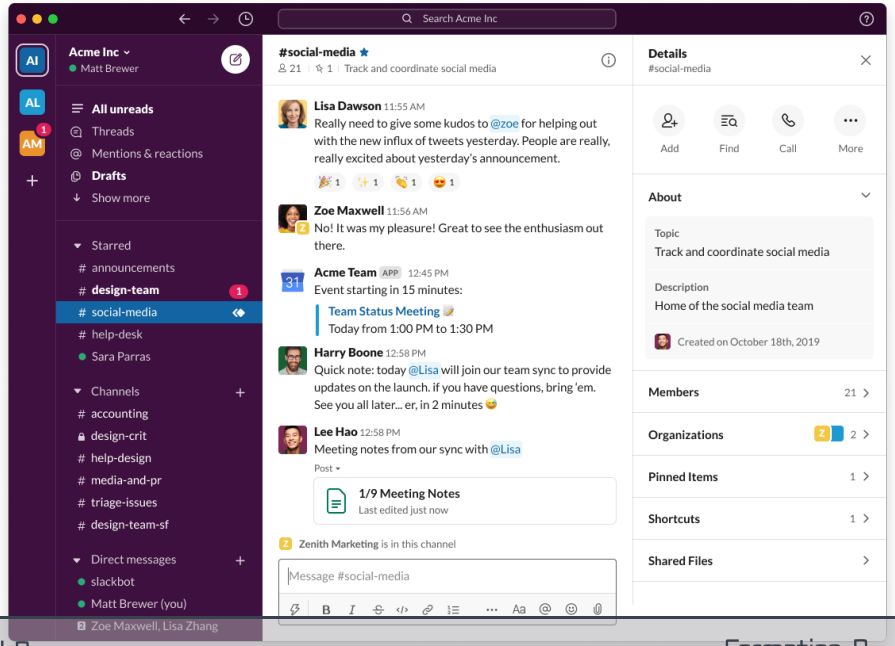
1. Infrastructure : set collaboration

- Roles from data to users
- *git* & GitLab project (RPLS)
- Kanban project monitoring (RPLS)



1. Infrastructure : set collaboration

- Roles from data to users
- *git* & GitLab project (RPLS)
- Kanban project monitoring (RPLS)
- Asynchronous communication (chat, issues)
- Meetings



2. Design - UI : define output formats

Questions

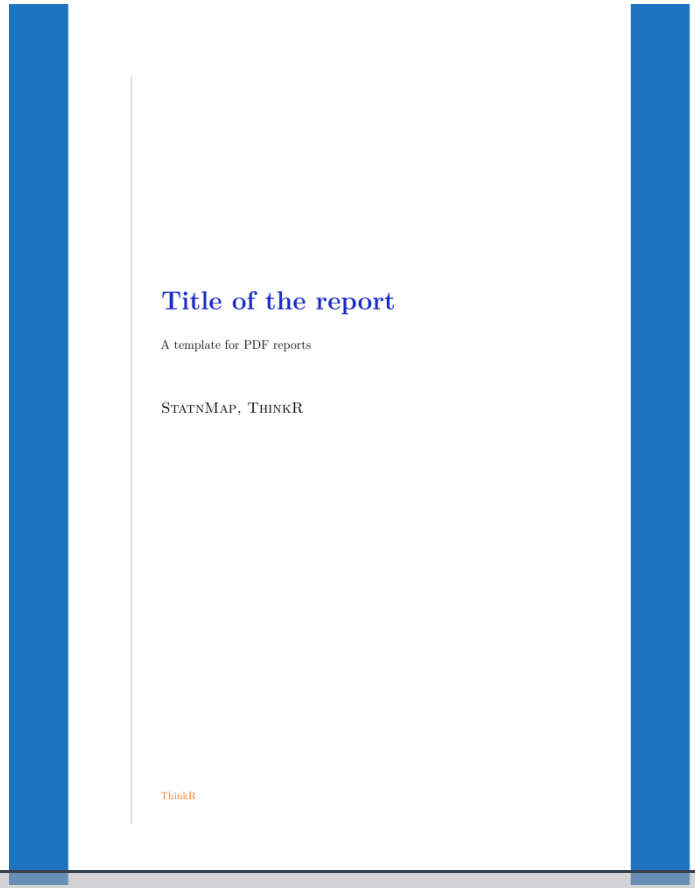
- Who is the public / target?
- What do they do with the outputs?
- What do they need?
  - Text, figures, tables
  - Interactivity
  - Download
  - Print, presentation
  - Monthly, yearly updates
- How important is the appearance vs content?
- How will they participate in the content?
  - Tests
  - Proof reading
  - Texts and analyses
  - Word, markdown, git

Propositions

- Data analysis reports
  - HTML page, HTML book, website, PDF document, ...
- Shiny application
  - One page, Multiple pages, Dashboard, ...

2. Design - UI : define output formats

Data analysis reports with random text and images

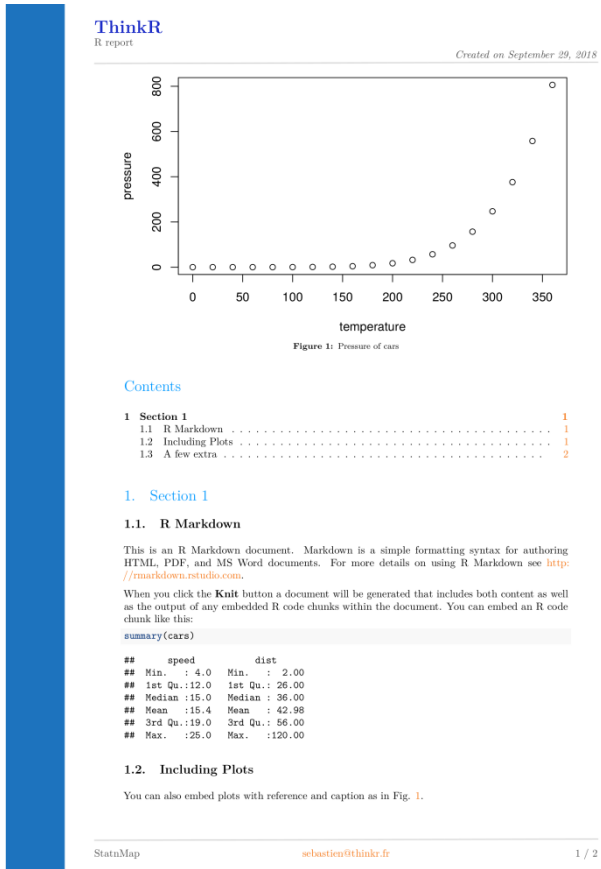


Title of the report

A template for PDF reports

StatnMap, ThinkR

ThinkR



ThinkR

R report

Created on September 29, 2018

Figure 1: Pressure of cars

Contents

1. Section 1

1.1. R Markdown

This is an R Markdown document. Markdown is a simple formatting syntax for authoring HTML, PDF, and MS Word documents. For more details on using R Markdown see http://rmarkdown.rstudio.com.

When you click the **Knit** button a document will be generated that includes both content as well as the output of any embedded R code chunks within the document. You can embed an R code chunk like this:

```
summary(cars)
```

```
##      speed           dist
##  Min.   : 4.0   Min.   :  2.00
##  1st Qu.:12.0   1st Qu.: 26.00
##  Median :15.0   Median : 36.00
##  Mean   :15.4   Mean   : 42.98
##  3rd Qu.:19.0   3rd Qu.: 56.00
##  Max.   :25.0   Max.   :120.00
```

1.2. Including Plots

You can also embed plots with reference and caption as in Fig. 1.

StatnMap sebastien@thinkr.fr 1 / 2

2. Design - UI : define output formats

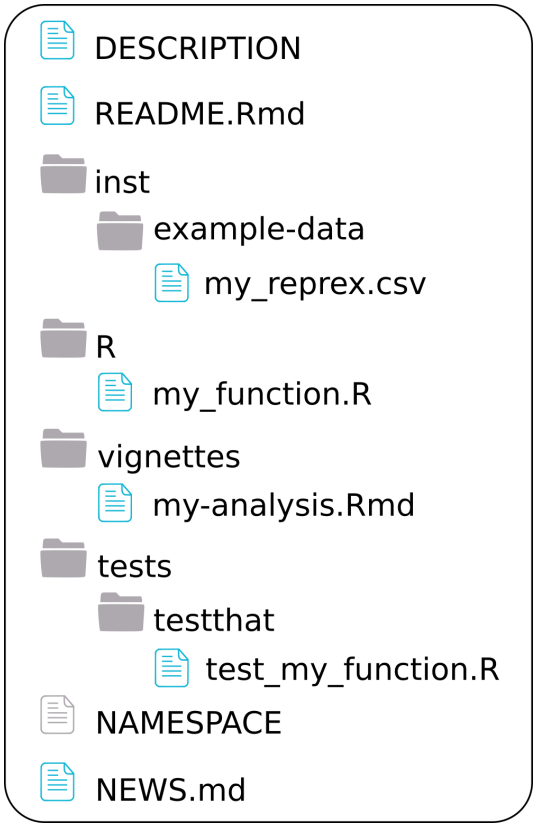
Shiny dashboard with random text and images

3. Prototype - Strengthen - R package

Documentation & tests: the heart of R packages

3. Prototype - Strengthen - R package

Where do we document?



- `DESCRIPTION`: What? Who? How?
- `README.Rmd` : Presented on GitLab. What? How to install? How to use (reproducible example) ?
- `R/` : Fonctions with documentation for each parameter and reproducible examples
- `vignettes/` : Developer / User guides with plain text and reproducible examples
- `NEWS.md` : List of main modifications between versions

3. Prototype - Strengthen - R package

How do we document vignettes? "Rmd first" development

What we write

my-analysis.Rmd | DATASET.R

Knit | Run

```
Load all necessary package for the analysis
```{r, message=FALSE}
library(userproject)
library(dplyr)
library(ggplot2)
library(here)
library(readr)
```

Read a client database

Dataset has been built using package {fakir} available on Github with `remotes::install_github("ThinkR-open/fakir")`. It is saved as a CSV file in this project.

```{r, message=FALSE}
dataset_path <- system.file("example-data/clients.csv", package = "userproject")
clients <- read_csv(dataset_path)
```

Table by department

- Create a function to filter on a particular department

```{r}
filter_by_dpt <- function(x, dpt) {
    filter(x, id_dpt == dpt)
}
# Examples
filter_by_dpt(clients, dpt = 11)
```

- Write a test for function `filter_by_dpt`

Read a client database ?

R Markdown

What you read

Load packages

Load all necessary package for the analysis

```
library(userproject)
library(dplyr)
library(ggplot2)
library(here)
library(readr)
```

Read a client database

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}
# Examples
filter_by_dpt(clients, dpt = 11)
```

```
## # A tibble: 10 x 16
##    num_client first last  job     age region id_dpt departement cb_provider
##         <dbl> <chr> <chr> <chr> <dbl> <chr>  <chr>  <chr>       <chr>
##  1         95 Cora… Glei… Hort…    NA Langu… 11     Aude        VISA 13 di…
##  2        108 Jay   Hane… Seis…    22 Langu… 11     Aude        Maestro
##  3        112 Dana  Dool… Scie…    29 Langu… 11     Aude        JCB 15 dig…
##  4        232 Marc… Roma… Conf…    19 Langu… 11     Aude        Discover
##  5        266 Mrs.  KiaM… Air …    22 Langu… 11     Aude        JCB 15 dig…
##  6        303 Demo  Will… Admi…    18 Langu… 11     Aude        VISA 16 di…
##  7        390 Mira… Jerde Acco…    40 <NA>   11     Aude        Discover
##  8        433 Neve… Ledn… Prod…    [illegible]
```
```

3. Prototype - Strengthen - R package

How do we document functions? {roxygen2} and reproducible example

What we write

my-analysis.Rmd | dev_history.R | filter_by_dpt.R

Source on Save | Run

```
#' Filter by department
#'
#' @param x dataframe with column named id_dpt
#' @param dpt department number
#'
#' @return a filtered dataframe
#'
#' @importFrom dplyr filter
#' @export
#'
#' @examples
#' dataset_path <- system.file("example-data/clients.csv",
#'     package = "userproject")
#' clients <- readr::read_csv(dataset_path)
#' filter_by_dpt(clients, dpt = 11)
filter_by_dpt <- function(x, dpt) {
  filter(x, id_dpt == dpt)
}
```

What you read

Filter by department

Contents

- Arguments
- Value
- Examples

Filter by department

```
filter_by_dpt(x, dpt)
```

Arguments

x	dataframe with column named id_dpt
dpt	department number

Value

a filtered dataframe

Examples

```
dataset_path <- system.file("example-data/clients.csv",
    package = "userproject")
clients <- readr::read_csv(dataset_path, col_types = "dcccdcccccTddcdc")
filter_by_dpt(clients, dpt = 11)
#> # A tibble: 10 x 16
#>    num_client first last  job     age region id_dpt departement cb_provider
#>         <dbl> <chr> <chr> <chr> <dbl> <chr>  <chr>  <chr>       <chr>
#>  1         95 Cora… Glei… Hort…    NA Langu… 11     Aude        VISA 13 di…
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#>  5        266 Mrs.  KiaM… Air …    22 Langu… 11     Aude        JCB 15 dig…
#>  6        303 Demo… Will… Admi…    18 Langu… 11     Aude        VISA 16 di…
#>  7        390 Mira… Jerde Acco…    40 NA     11     Aude        Discover
#>  8        433 Neve… Ledn… Prod…    26 Langu… 11     Aude        Discover
#>  9        224 Desh… Hodk… Scie…    NA Langu… 11     Aude        Maestro
#> 10        371 Darr… Terr… Educ…    25 Langu… 11     Aude        Mastercard
#> # … with 7 more variables: name <chr>, entry_date <dttm>,
#> #   fidelity_points <dbl>, priority_encoded <dbl>, priority <chr>,
#> #   entry_year <dbl>, age_class <chr>
```
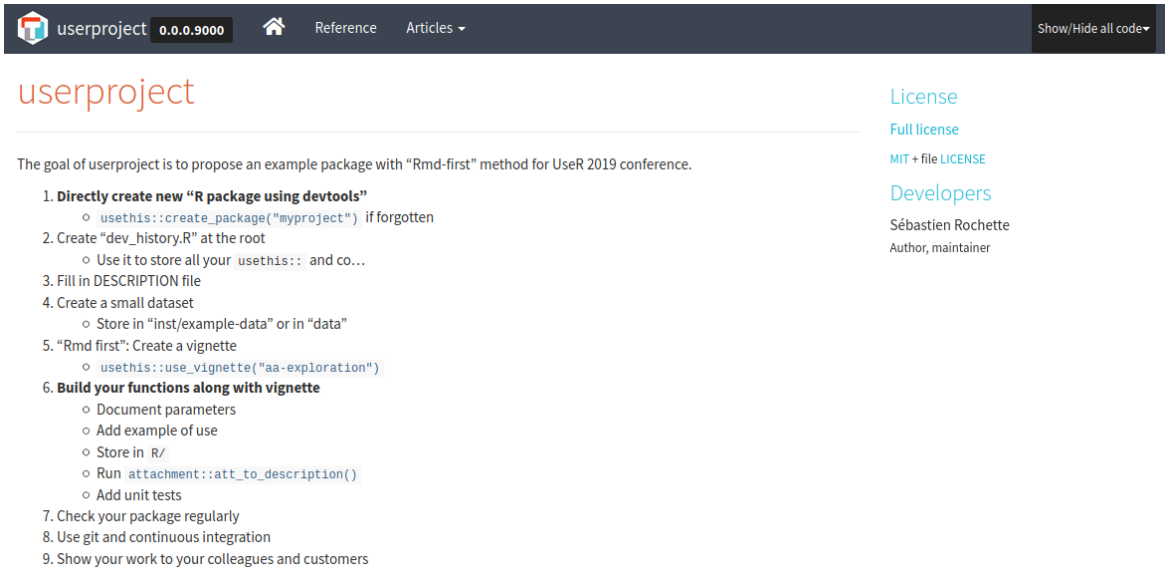

3. Prototype - Strengthen - R package

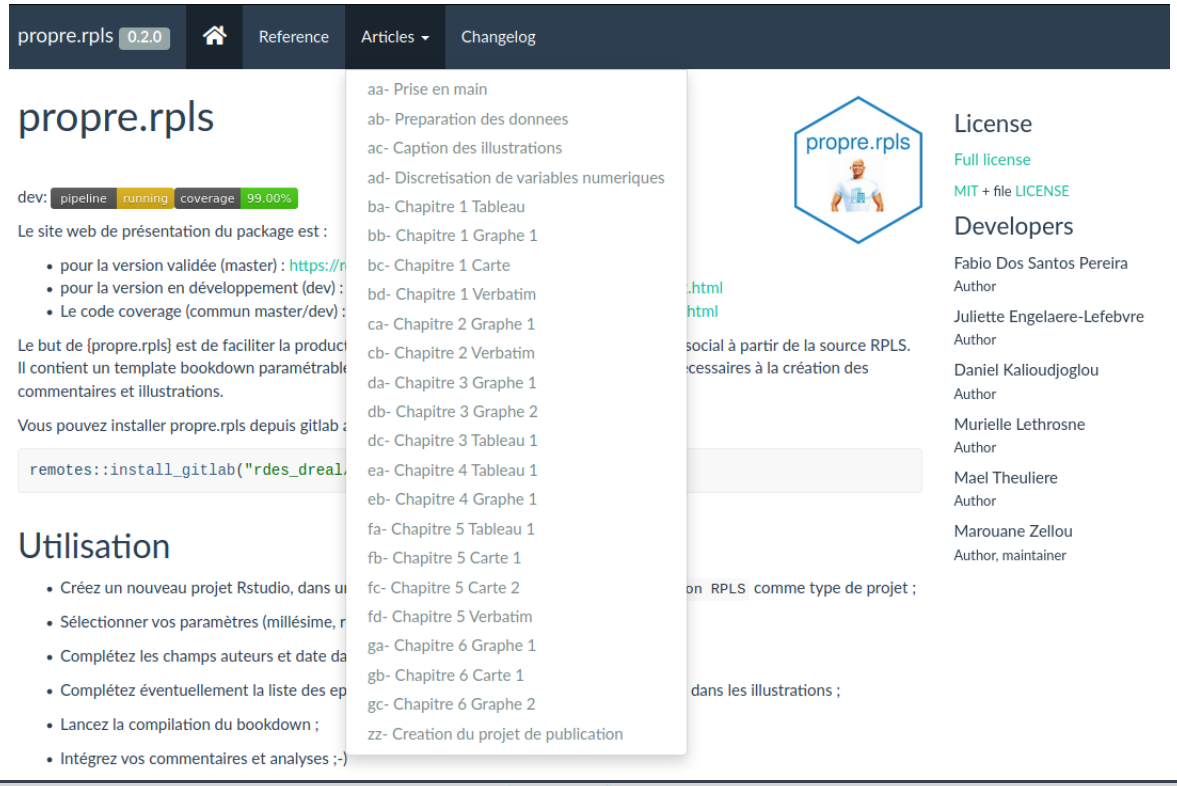
How do we share documentation? {pkgdown} website



3. Prototype - Strengthen - R package

How do we share documentation? {pkgdown} website

- 1 topic = 1 vignette = 1 validation (e.g. RPLS)



3. Prototype - Strengthen - R package

How do we document the development process? **ThinkR** tip

Classical package (RPLS)

`dev_history.R`

```
# Hide dev_history from build
usethis::use_build_ignore("dev_history.R")

# Add a raw dataset
usethis::use_data_raw()

# Licence
usethis::use_mit_license("ThinkR")

# Use git
usethis::use_git_ignore("*.Rproj")
usethis::use_git()
usethis::use_readme_md()

# Create Rmd file
usethis::use_rmarkdown_template("my-analysis")
```

{golem} package ({tidytuesday201942})

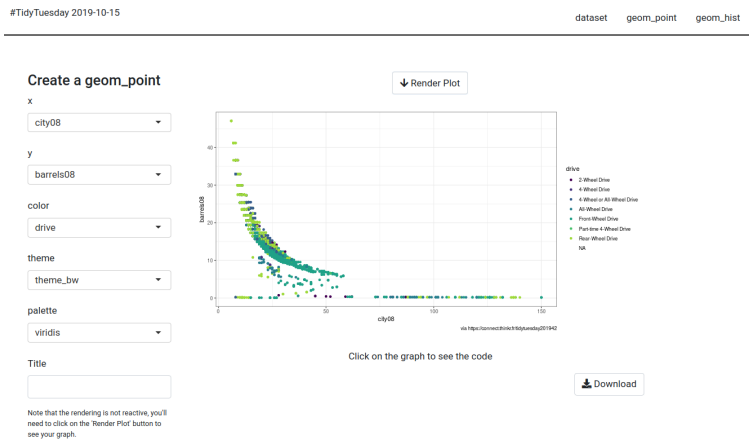
```
#> dev
#> ├── 01_start.R
#> ├── 02_dev.R
#> ├── 03_deploy.R
#> ├── deliverables.R
#> └── run_dev.R
```

```
## Fill the DESCRIPTION ----
## Add meta data about your application
golem::fill_desc(
  pkg_name = "my.shiny.app", # The Name
of the package containing the App
  pkg_title = "The Shiny App", # The
Title of the package containing the App
  pkg_description = "A Shiny application
to explore data.", # The Description of
the package containing the App
```

4. Build - Produce desired output

- Data analysis reports
  - Include validated functions in the desired report
  - Present completed document for validation (*e.g.* Engineering Production-Grade Shiny Apps)

- Shiny applications
  - Include validated functions in the backend
  - Link backend with frontend
  - Present the interface on our platform (*e.g.* {tidytuesday201942})



5. Strengthen - Test robustness - Unit tests

- Test that each function returns what it is supposed to (RPLS)
- Test that new functionnalities do not break earlier ones

What we write

```
test_that("dataprep fonctionne", {

indicateurs_rpls <-
dataprep(nom_reg="Pays de la Loire",
epci_list = c("244400404", "244400644"))

testthat::expect_is(indicateurs_rpls,
"data.frame")
testthat::expect_true(ncol(indicateurs_rpl
 == ncol(tab_result) + 1 + 1 + 2)
})
```

What you read

propre.rpls coverage - 99.31%

Files | R/creer_verbatim_2.R

File	Lines	Relevant	Covered	Missed	Hits / Line	Coverage
R/creer_verbatim_2.R	94	54	54	0	3	100.00%
R/creer_tableau_3_1.R	105	54	54	0	1	100.00%
R/creer_tableau_1_1.R	84	40	40	0	1	100.00%
R/creer_tableau_4_1.R	83	38	38	0	1	100.00%
R/creer_graphe_3_1.R	86	37	37	0	1	100.00%
R/creer_graphe_3_2.R	78	35	35	0	1	100.00%
R/creer_graphe_6_1.R	85	32	32	0	1	100.00%
R/creer_verbatim_1.R	73	32	32	0	1	100.00%
R/creer_graphe_6_2.R	76	32	32	0	1	100.00%
R/creer_graphe_2_1.R	78	32	32	0	1	100.00%
R/creer_tableau_5_1.R	80	31	31	0	1	100.00%

5. Strengthen - Test robustness - Continuous integration

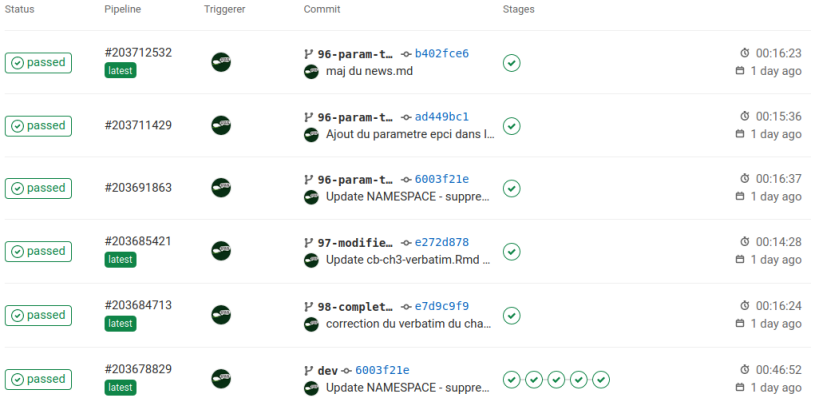
- Docker container for automatic check
- Docker container for development with RStudio server and {renv} : {devindocker}

What we write

```
usethis::use_gitlab_ci()
usethis::use_github_actions()
```

```
image: rocker/geospatial

stages:
  - build
  - test
  - pkgdown
  - pkgdown-move
  - deploy

building:
  stage: build
  script:
    - Rscript -e 'remotes::install_deps(dependencies = TRUE)'
    - Rscript -e 'devtools::check()'
```

What you read



6. Deploy - Send in production

- Data analysis reports
  - Deliver final report
  - Possibility to deliver proofs of quality: {testdown}, {gitdown}, {pkgdown}
- Shiny applications
  - Deliver Docker container
  - Possibility to deliver production steps
  - Possibility to install on your server

DevOps steps for production

Reminder of clients / users mission

Step	Dev	Ops
1. Infrastructure	Versionning Communication Monitoring	Collaboration
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Repeat 3:6	Develop, document, test, propose	Test, feedbacks, validation