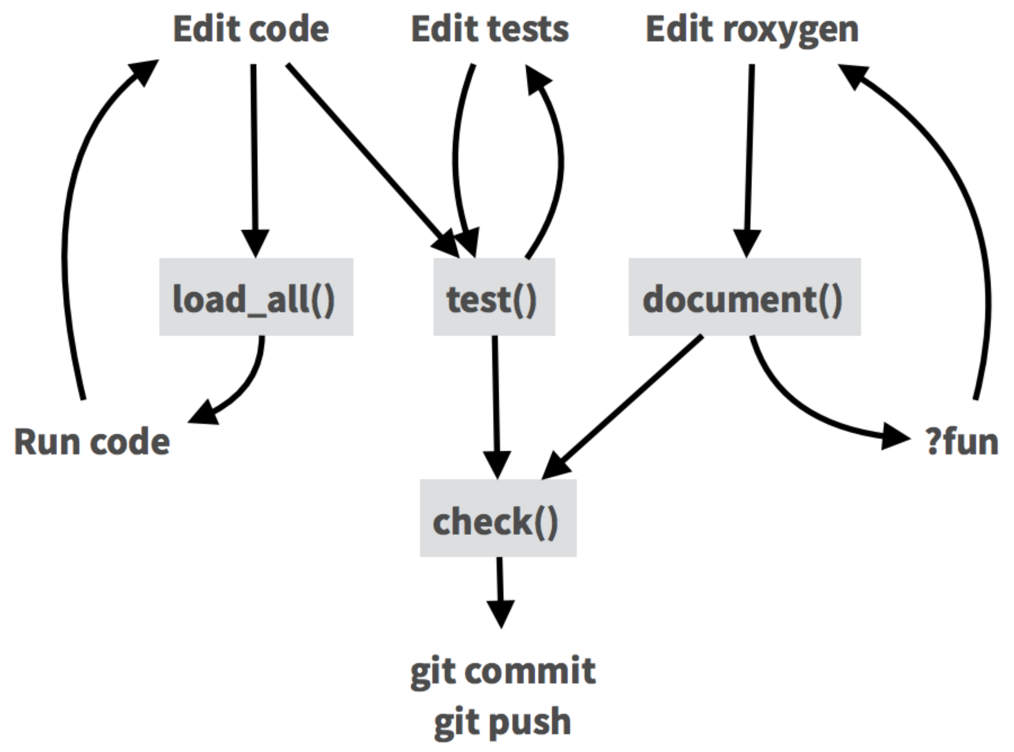
Continuous development: The virtuous circle of writing/documenting/testing

Physalia course 2023

Instructor: Jacques Serizay

Package development workflow



- **load_all()** (Ctrl/Cmd + Shift + L) — Load code
- **document()** (Ctrl/Cmd + Shift + D) — Rebuild docs and NAMESPACE
- **test()** (Ctrl/Cmd + Shift + T) — Run tests
- **check()** (Ctrl/Cmd + Shift + E) — Check complete package

https://raw.githubusercontent.com/rstudio/cheatsheets/main/package-development.pdf

Package development workflow

```
> devtools::create_package()
> usethis::use_readme_md()
> usethis::use_news_md()
> usethis::use_gpl3_license()
```

```
myPackage/
    DESCRIPTION
    README.md
    NAMESPACE
    NEWS
    LICENSE
```

Package development workflow

Write functions

```
> devtools::load_all()
```

```
myPackage/
    R/
        functions.R
        utils.R
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```

Package development workflow

Write functions

Document functions
- Arguments
- Imports
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Package development workflow

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Package development workflow

Write functions

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Test functions

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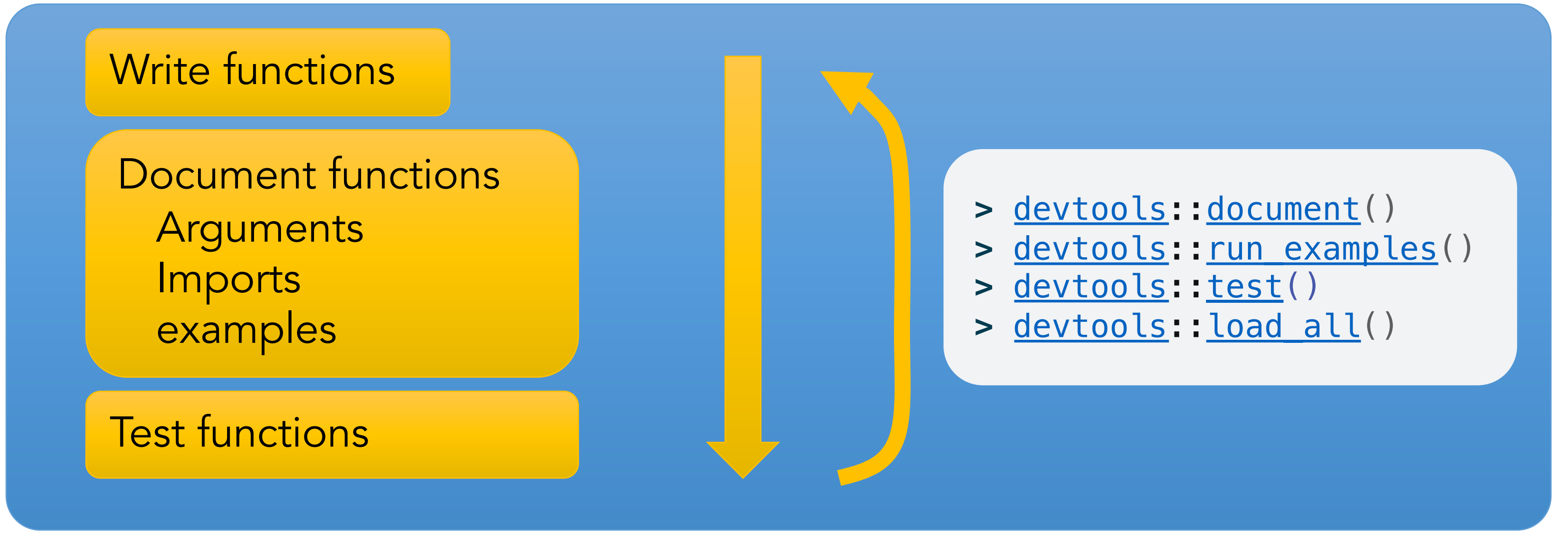
Package development workflow



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> devtools::document()
> devtools::run_examples()
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```
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```

```
Git commit
Github push
```

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myPackage/
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Document functions
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- examples

Test functions

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Add example data

```
Git commit
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```

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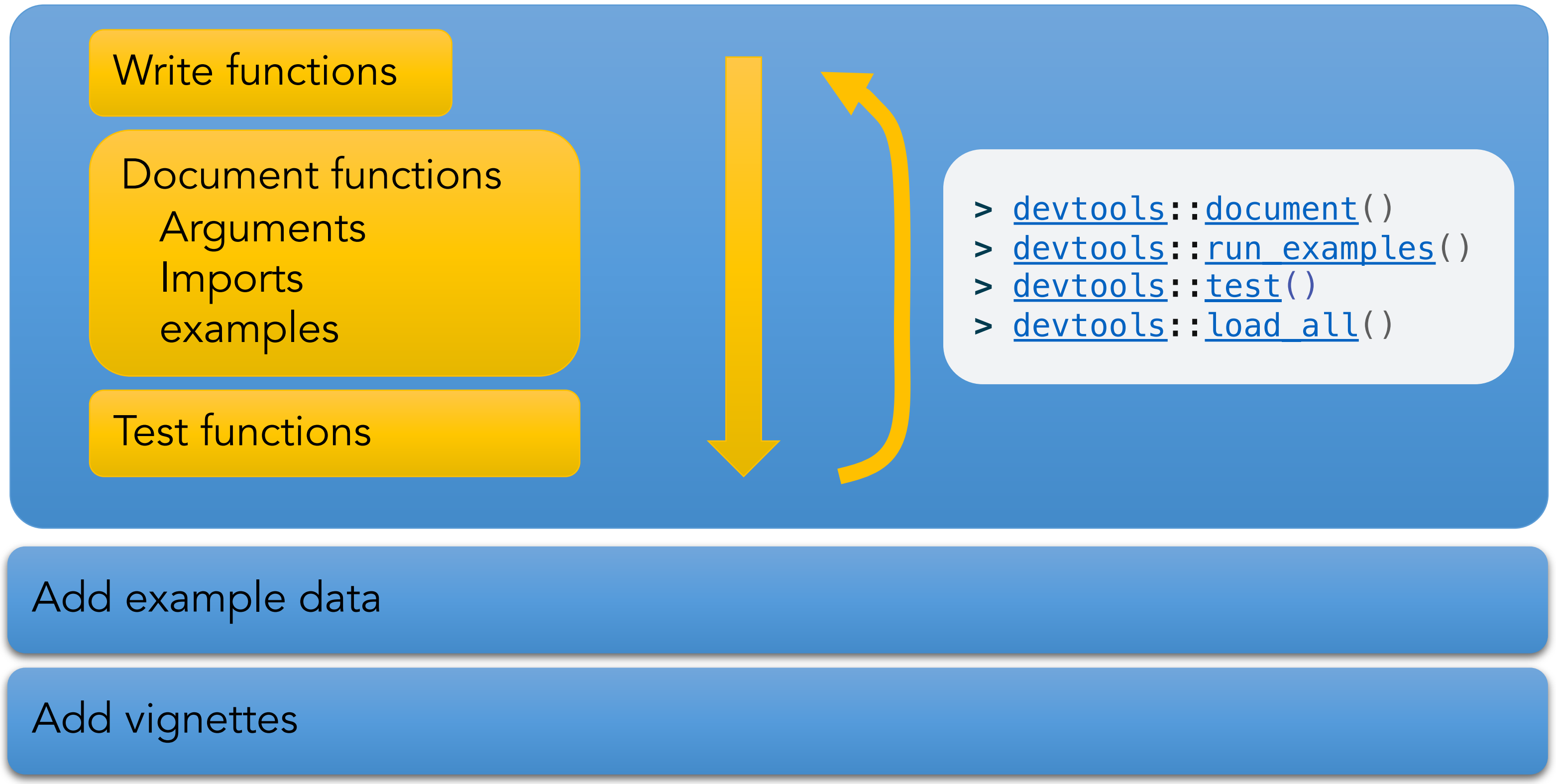

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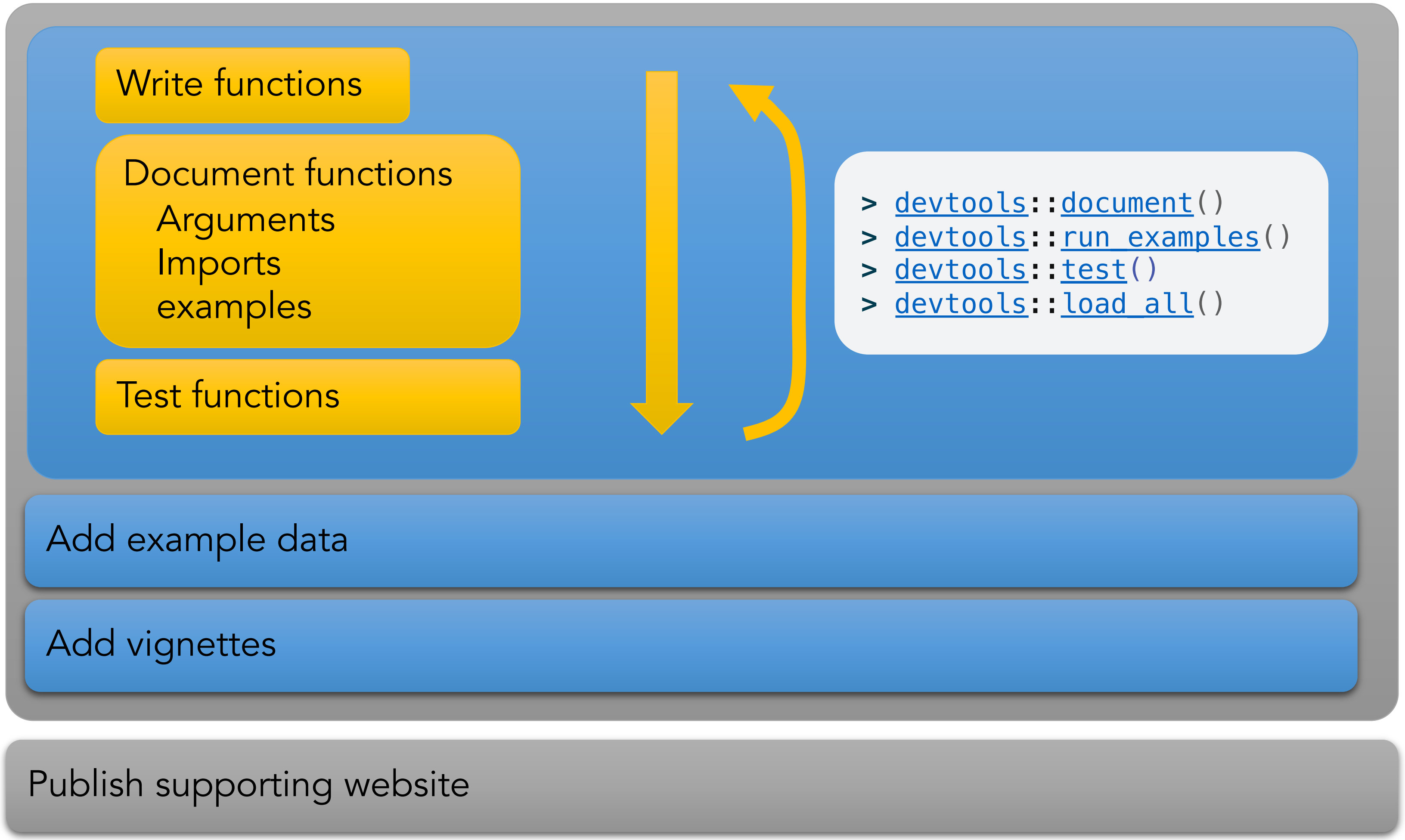

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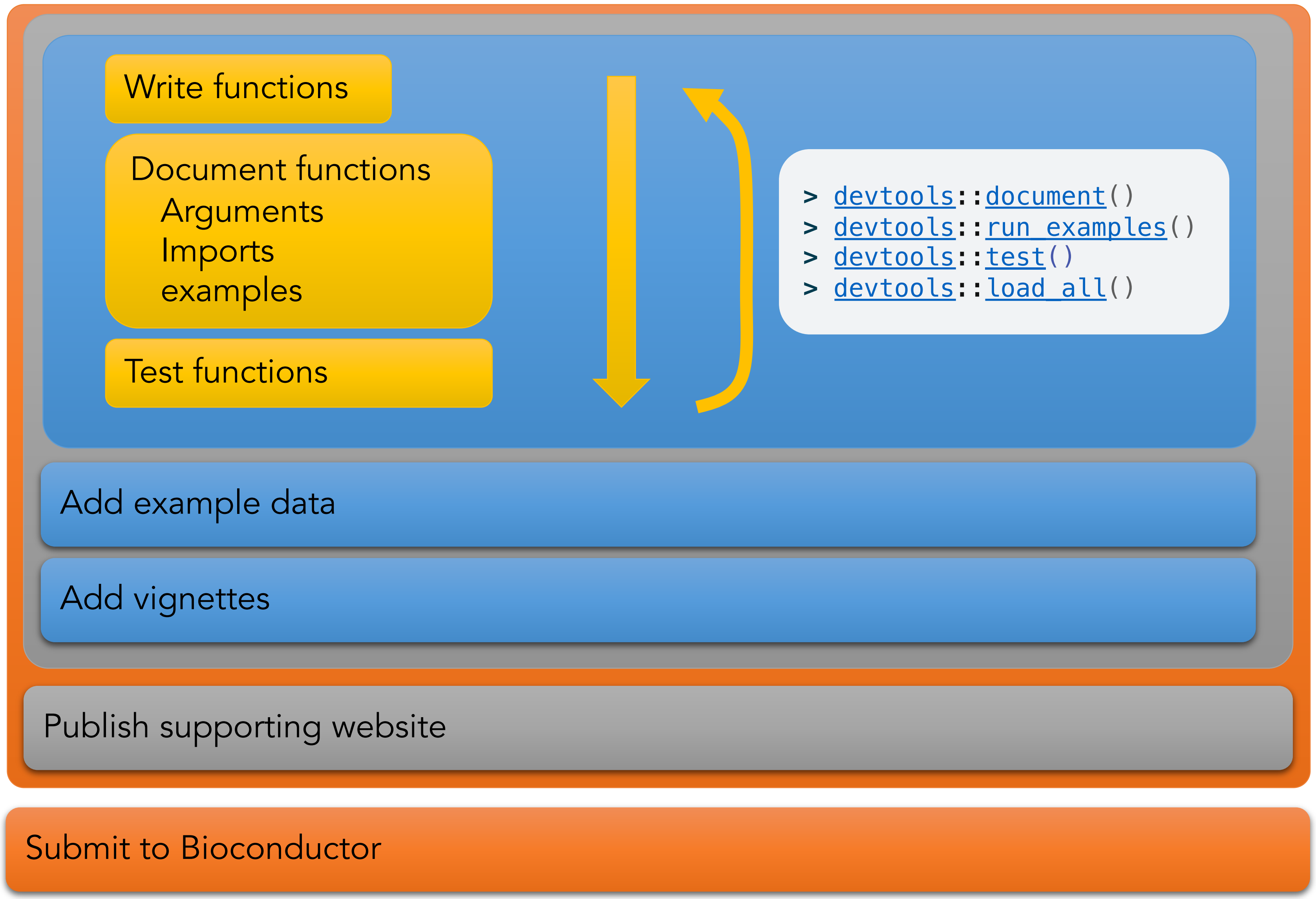
    _pkgdown.yml
```

Package development workflow



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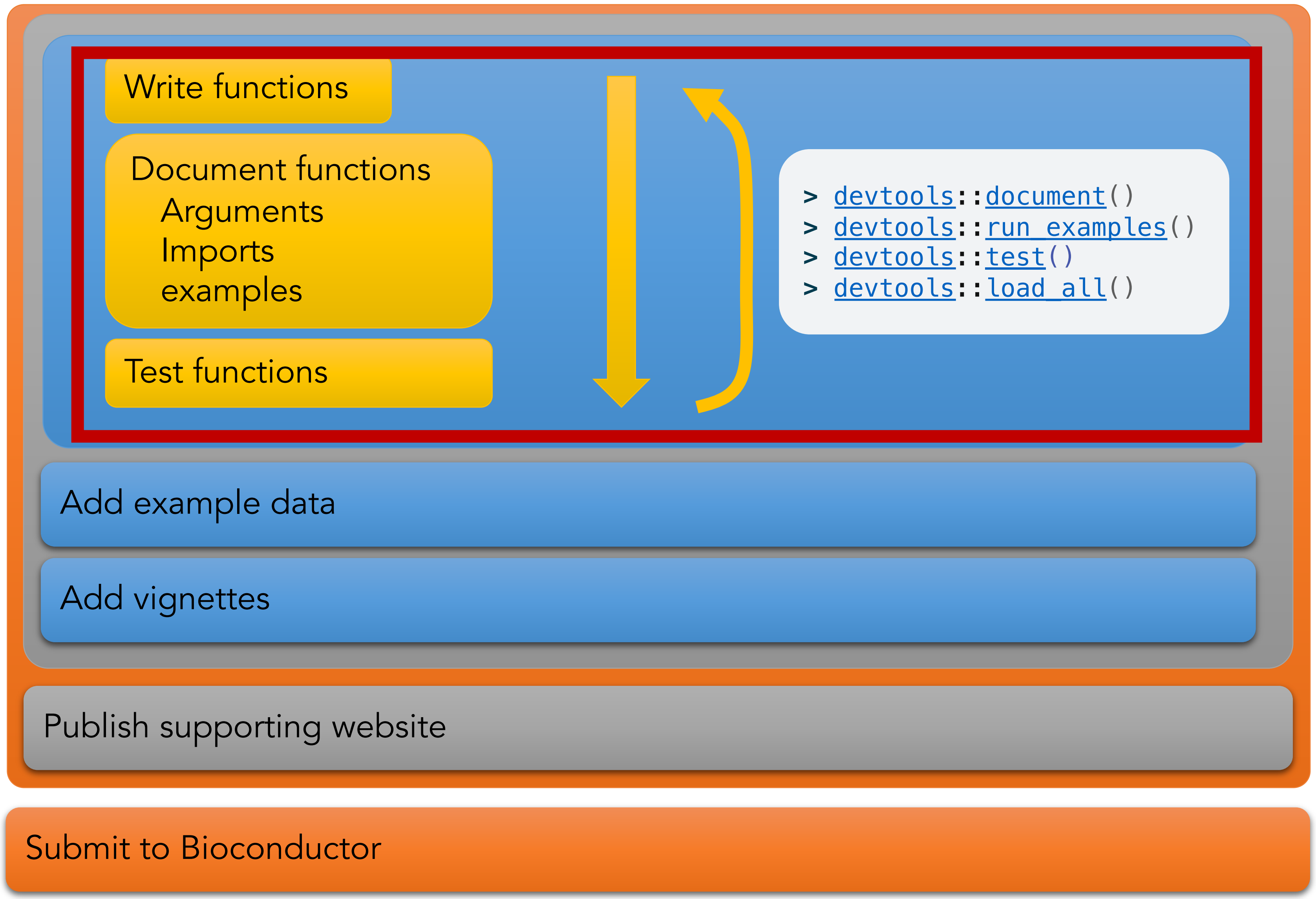
Bioconductor
OPEN SOURCE SOFTWARE FOR BIOINFORMATICS

Package development workflow



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Bioconductor
OPEN SOURCE SOFTWARE FOR BIOINFORMATICS

How to write functions

Write functions

```r
myfun <- function(arg1, arg2, ...) {


   ## Internal checkups
   if (...) {
      stop("There has been an error. Aborting now.")
   }


    ## Internal processing steps
    step1 <- ...(arg1)
    step2 <- ...(step1)
    step3 <- ...(step2, arg2)


    ## Computing and returning result
    res <- list(step3, ...(arg2), ...)
    return(res)


}
```

How to write functions

Write functions

- Always put .R files containing functions in R/. The easiest to create these files is to run `use_r(”…”)`.

`source(“.”)` and `load_all(“.”)` do not behave the same way: while `source` dumps all .R files found in directory and recursively, `load_all(“.”)` specifically reads in .R files from R/ folder.

How to write functions

Write functions

- Prefer many short functions over a single massive function. Bioconductor advises functions shorter than 100 lines.

Functions are <u>immensely</u> easier to test/debug this way.

Documenting functions

Document functions
- Arguments
- Imports
- examples

“Roxygen” function documentation works by adding @tags before your function, such as:
- @title
- @description
- @details
- @params
- @returns
- @imports
- @export
- @examples

```r
#' @title
#' Paste of vector elements
#'
#' @description
#’ `myPaste` returns a string and a numerical value
#’ pasted together.
#'
#' @details
#' This is a generic function: methods can be
#' defined for it directly or via the
#' [Summary()] group generic. For this to work
#' properly, the arguments `...` should be
#' unnamed, and dispatch is on the first
#' argument.
#'
#' @param arg1 character A character string.
#' @param arg2 numeric A numerical value to append
#' to the character string provided in \code{arg1}.
#'
#' @returns character A string with \code{arg1} and
#' \code{arg2} pasted together
#'
#' @importFrom glue glue
#'
#' @export
#'
#' @examples
#' myPaste("Jacques' cat is ", 3)

myPaste <- function(arg1, arg2) {

   ## Internal checkups
   if (!is.character(arg1) | !is.numeric(arg2)) {
      stop("There has been an error. Aborting now.")
   }

   ## Internal processing steps
   res <- glue::glue(arg1, arg2)

   ## Return result
   return(res)

}
```

https://cran.r-project.org/web/packages/roxygen2/vignettes/rd.html

Documenting functions

Document functions
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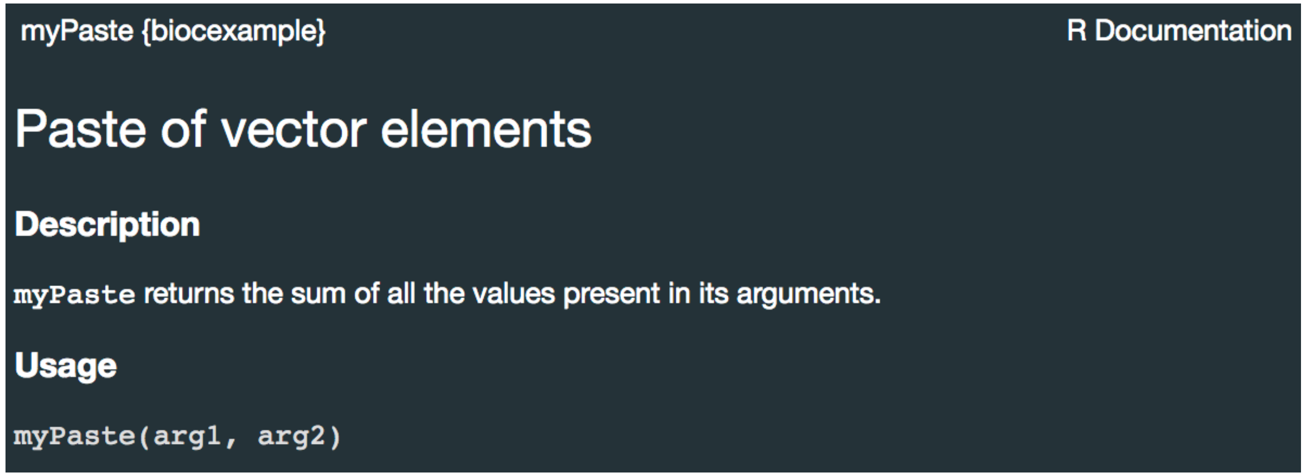
```
devtools::document()
```

```
#' @title
#' Paste of vector elements
#'
#' @description
#' `myPaste` returns a string and a numerical #'
value pasted together.


myPaste <- function(arg1, arg2) {
  ...
}
```



myPaste {biocexample} R Documentation

Paste of vector elements

Description

`myPaste` returns the sum of all the values present in its arguments.

Usage

```
myPaste(arg1, arg2)
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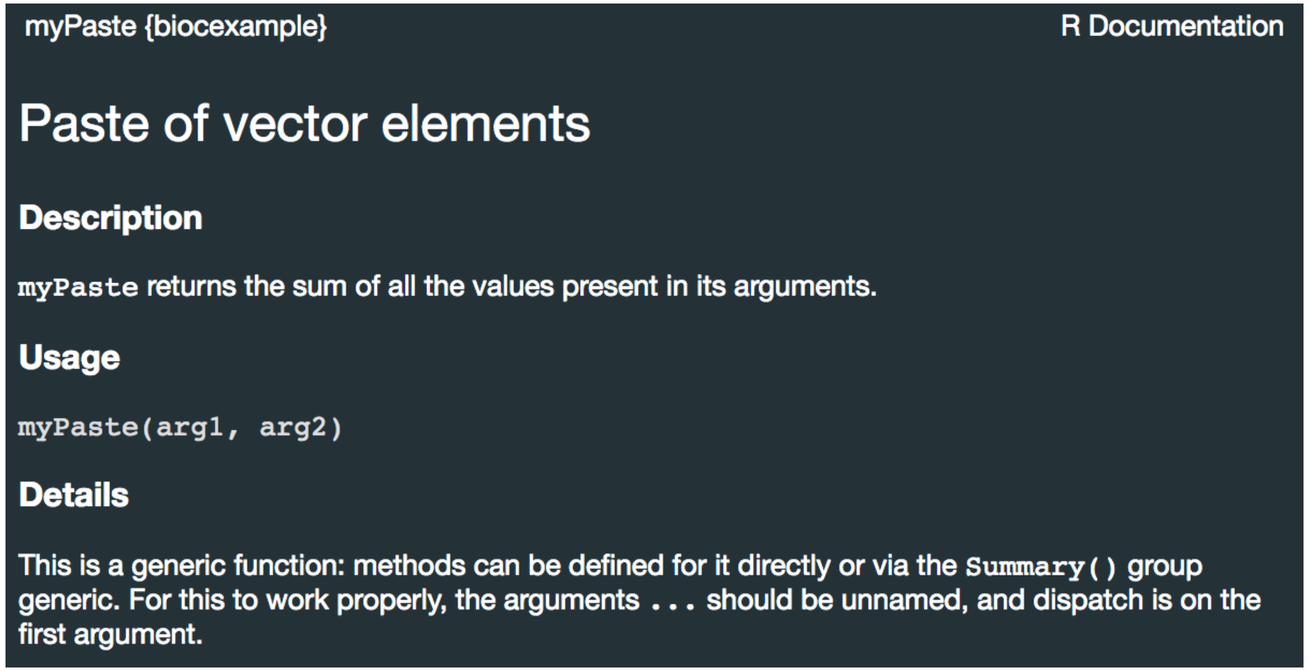
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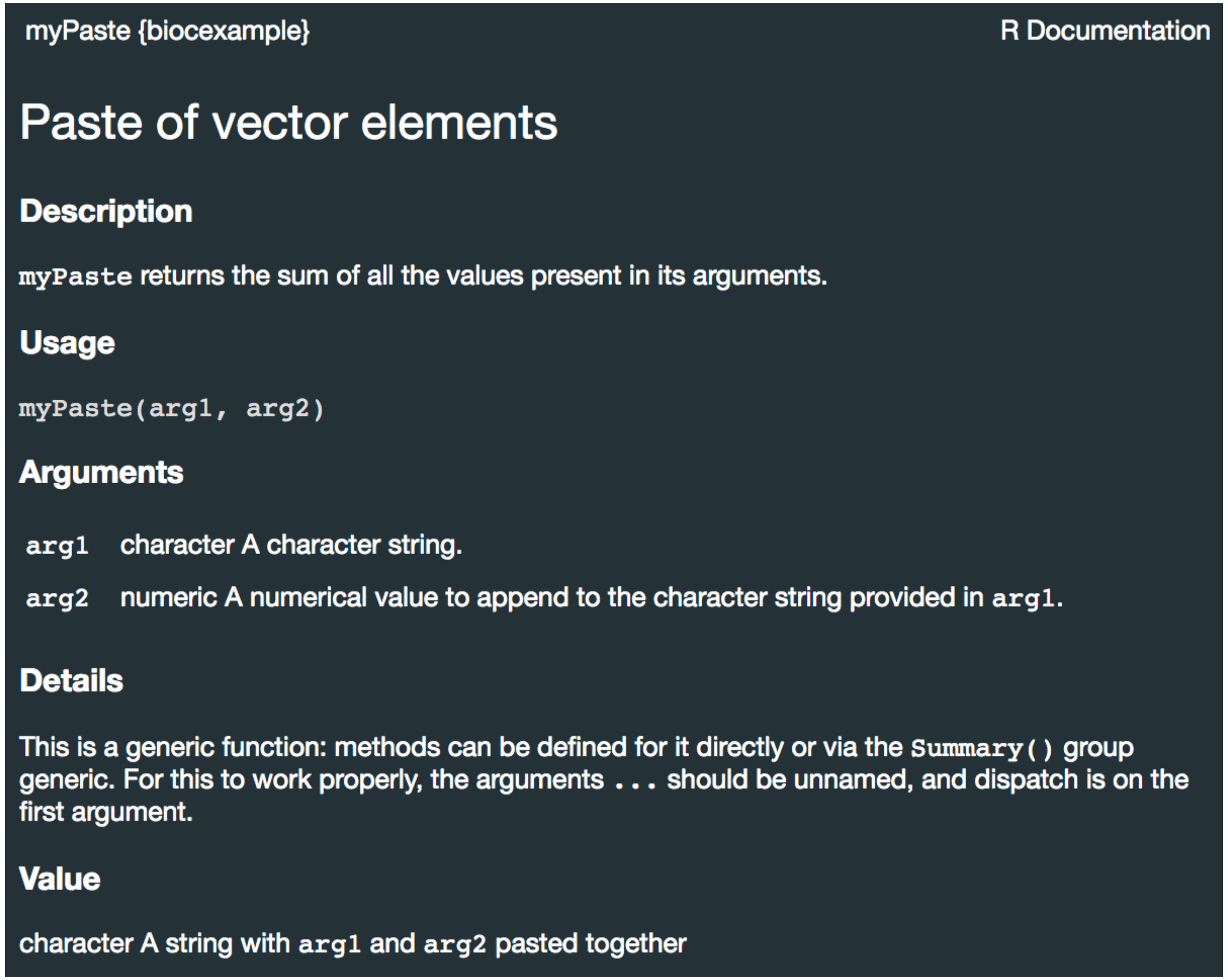
```



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#' @examples
#' myPaste("Jacques' cat is ", 3)

myPaste <- function(arg1, arg2) {
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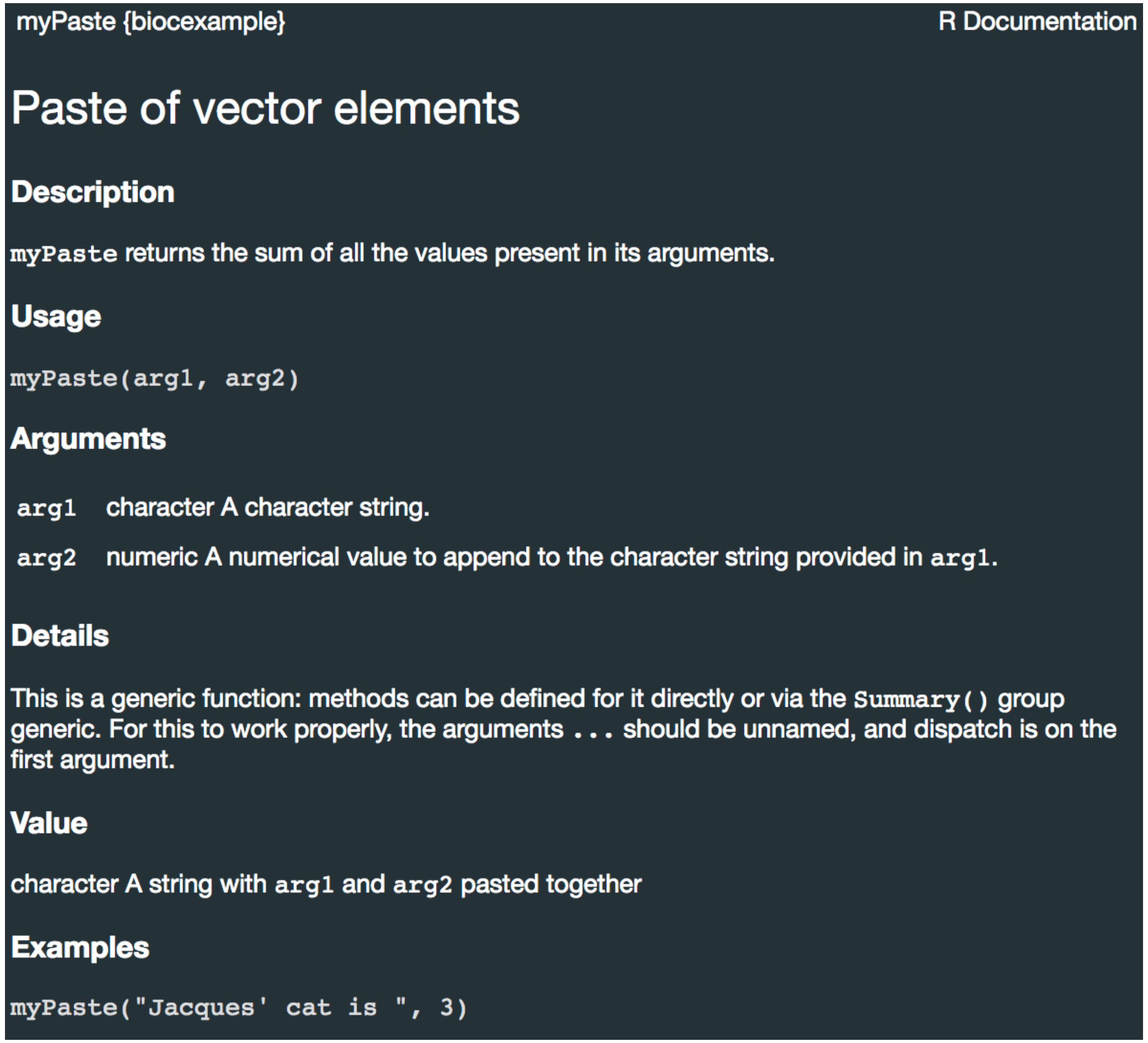

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   ## Internal processing steps
   res <- glue::glue(arg1, arg2)

   ## Return result
   return(res)

}
```

Documenting functions

Document functions
  Arguments
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  examples

- Do not forget to `@export` the user-level functions!
- Internal functions (those that should not be used by regular users) should start with a dot (`.`).

```r
#' internal_check function
#'
#' This function is not meant to be used
#' interactively
#'
#' @param arg
#' @return logical

.check_fun <- function(arg) {
  if (...) return(TRUE)
}
```

```r
#' import function
#'
#' @param path
#' @return Value
#' @export

import <- function(path) {
  .check_fun()
  ...
}
```

Testing functions

Test functions

- Tests are implemented to make sure each fundamental brick of your package works, but also that the whole package in itself works (especially if there are many complex, nested functions)

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"Rien ne sert de courir, mieux vaut partir à point." (Slow and steady wins the race)

– The tortoise in that kid story

– But for real: Jean de la Fontaine

Testing functions

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```
> usethis::use_testthat()

✓ Setting active project to
'/Users/jacquesserizay/biocexample'
✓ Adding 'testthat' to Suggests field in
DESCRIPTION
✓ Setting Config/testthat/edition field
in DESCRIPTION to '3'
✓ Creating 'tests/testthat/'
✓ Writing 'tests/testthat.R'
• Call `use_test()` to initialize a
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```
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    name = ‘myPaste’
)
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```

Tests/testthat/test-myPaste.R

```
test_that("myPaste works", {
  expect_equal(
    myPaste("Jacques is ", 30),
    "Jacques is 30"
  )
})
```

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    "Jacques is 30"
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})
```
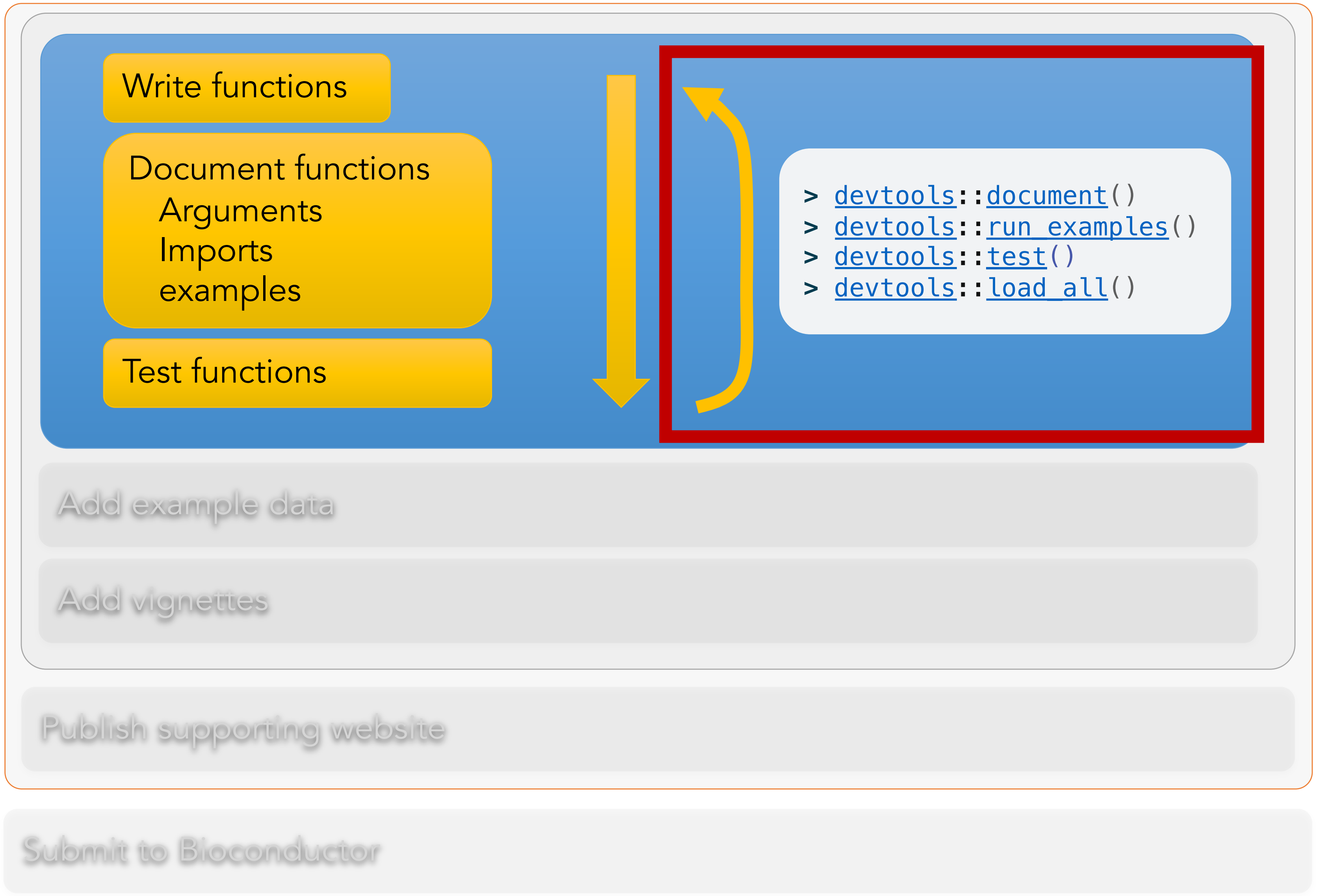

```
> devtools::test()

i Loading biocexample
i Testing biocexample
✓ | OK F W S | Context
✓ |  1 | myPaste [0.2 s]

══ Results ═══════════════════════
Duration: 0.2 s

[ FAIL 0 | WARN 0 | SKIP 0 | PASS 1 ]

Woot!
```

Rinse-and-repeat!!!



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Thorough checks

Tools to run longer, integrated checks:

- devtools::check()
- BiocCheck::BiocCheck()
- rcmdcheck:: rcmdcheck()