A Gentle Introduction to `purrr`

Yingqi Jing

July 21, 2025

Contents

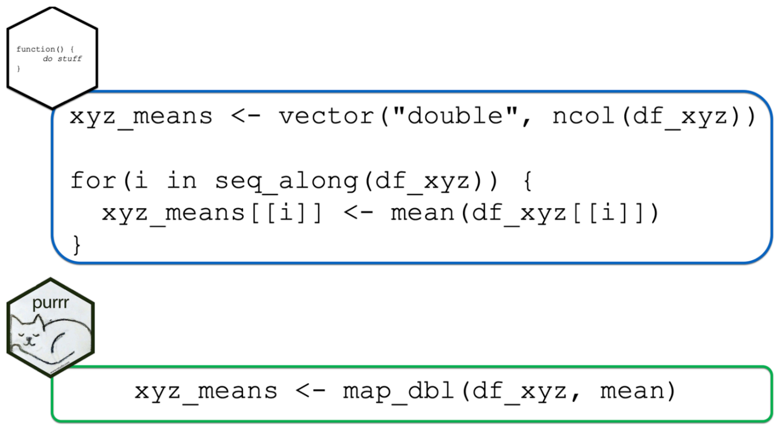
List of Figures

List of Tables

1 Introduction

The purrr package in R provides a powerful set of tools for working with lists and vectors in a functional programming style. Functions like `map()`, `map_lgl()`, `map_chr()`, `map_int()`, and `map_dbl()` allow you to iterate over elements cleanly and efficiently—offering a more readable and pipe-friendly alternative to `for` loops and `lapply()`.

For example, here is a comparison of using a `for` loop versus `purrr::map_dbl()`:



```
xyz_means <- vector("double", ncol(df_xyz))

for(i in seq_along(df_xyz)) {
  xyz_means[[i]] <- mean(df_xyz[[i]])
}
```

```
xyz_means <- map_dbl(df_xyz, mean)
```

Figure 1: Comparison between for loops and map dbl functions

The `map` family contains a number of type-specific variants. While `map()` returns a list and supports varying return types and lengths, its variants ensure a consistent output format:

Function	Output Type
`map()`	List
`map_dbl()`	Double / numeric vector
`map_int()`	Integer vector
`map_lgl()`	Logical vector
`map_chr()`	Character vector
`map_dfr()`	Data frame (row bind)
`map_dfc()`	Data frame (col bind)

2 Select Elements

```r
list_abc <- list(a = c(1, 2), b = c(3, 4, 5), c = c("m", "n"))
```

Example 1: Select elements by name or index

```r
# Recommended: using subset
list_abc %>% .[c("a", "b")]  # or .[1:2]

# Using magrittr::extract
list_abc %>% magrittr::extract(c("a", "c"))

# Base R style
list_abc[c("a", "b")]
```

```
$a
[1] 1 2

$b
[1] 3 4 5

$a
[1] 1 2

$c
[1] "m" "n"

$a
[1] 1 2

$b
[1] 3 4 5
```

3 Filter Elements

Example 2: Filter based on conditions

```r
# Keep elements with length 2
list_abc %>% keep(~ length(.x) == 2)
```

```r
# Discard character vectors
list_abc %>% discard(is.character)

# Drop NULL elements
list_abc %>% append(list(d = NULL)) %>% compact()
```

```
$a
[1] 1 2

$c
[1] "m" "n"

$a
[1] 1 2

$b
[1] 3 4 5

$a
[1] 1 2

$b
[1] 3 4 5

$c
[1] "m" "n"
```

Example 3: Slice elements inside the list

```r
# First element from each
list_abc %>% map(1)

# First two elements from each
list_abc %>% map(~ .x[1:2])
```

```
$a
[1] 1

$b
[1] 3
```

```
$c
[1] "m"

$a
[1] 1 2

$b
[1] 3 4

$c
[1] "m" "n"
```

4 Modify Elements

Example 4: Modify with conditions

```r
# Add 1 to numeric elements
list_abc %>% keep(is.numeric) %>% modify(~ .x + 1)

# Modify if numeric, leave others unchanged
list_abc %>% modify_if(is.numeric, ~ .x + 1)

# Modify elements at positions 1 and 2
list_abc %>% modify_at(1:2, ~ .x + 10)
```

```
$a
[1] 2 3

$b
[1] 4 5 6

$a
[1] 2 3

$b
[1] 4 5 6

$c
[1] "m" "n"

$a
```

```
[1] 11 12

$b
[1] 13 14 15

$c
[1] "m" "n"
```

5 Combine Lists

Example 5: Combine multiple lists

```r
a <- list(a = 1:2)
b <- list(b = 3:4)
c <- list(c = 5:6)

# Append b to a
a %>% append(b)

# Prepend b to a
a %>% prepend(b)

# Splice multiple lists together
a %>%
  splice(b, c) %>%
  set_names(c("A", "B", "C"))  # or use: set_names(toupper)
```

```
$a
[1] 1 2

$b
[1] 3 4

$b
[1] 3 4

$a
[1] 1 2

$A
```

```
[1] 1 2

$B
[1] 3 4

$C
[1] 5 6
```

6 Summarize Elements

Example 6: Reduce to a single result

```r
list_abc <- list(a = 1:2, b = 3:4, c = 5:6)

# Element-wise sum
list_abc %>% reduce(`+`)

# Element-wise multiplication
list_abc %>% reduce(`*`)
```

```
[1]  9 12
[1] 15 48
```

Example 7: Reduce by groups

```r
list_abc <- list(a = 1:2, b = 3:4, c = 5:6)

# Group-wise summation: first two together, third separately
list(1:2, 3) %>% map(~ reduce(list_abc[.x], `+`))
```

```
[[1]]
[1] 4 6

[[2]]
[1] 5 6
```

7 Further Reading & Resources

- purrr Cheat Sheet (RStudio)
- Using the purrr Package (r4epi)
- purrr extras — Stanford DCL
- purrr for Parallelism — Stanford DCL