zztable1_nextgen: Advanced Publication-Ready Summary Tables

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Contents

1 Introduction

The `zztable1_nextgen` package provides a next-generation architecture for creating publication-ready summary tables (commonly called "Table 1") used in biomedical research and clinical trials. This vignette demonstrates the key features and capabilities of the package.

1.1 Key Features

- **Lazy Evaluation Architecture**: Fast blueprint creation with computation on demand
- **Journal-Specific Theming**: NEJM, Lancet, JAMA, BMJ formatting styles
- **Advanced Footnote System**: Variable-specific, column-specific, and general footnotes with superscript markers
- **Multiple Output Formats**: Console, LaTeX, and HTML output with proper column headers
- **Flexible Statistics**: Built-in and custom summary statistics
- **Stratified Analysis**: Support for subgroup analyses
- **Full Compatibility**: Same interface as original zztable1 package
- **R Markdown Integration**: Automatic format detection for seamless PDF/HTML output

1.2 Installation and Setup

```r
# Development version (when available)
# devtools::install_github("user/zztable1_nextgen")

# For this vignette, source the development file
source("zztable1_nextgen.R")
```

2 Basic Usage

2.1 Simple Summary Tables

Let's start with a basic example using the mtcars dataset:

```r
# Prepare data
data(mtcars)
mtcars$transmission <- factor(
  ifelse(mtcars$am == 1, "Manual", "Automatic"),
  levels = c("Automatic", "Manual")
)
mtcars$engine_type <- factor(
  ifelse(mtcars$vs == 1, "V-shaped", "Straight"),
  levels = c("Straight", "V-shaped")
)
```

```
# Create basic summary table
bp_basic <- table1(transmission ~ mpg + hp + wt, data = mtcars)

# Display the table
display_table(bp_basic, mtcars)
```

mpg 17.1 (3.8) 24.4 (6.2) 3e-04
hp 160.3 (53.9) 126.8 (84.1) 0.1798
wt 3.8 (0.8) 2.4 (0.6) 0

2.2 Adding Statistical Tests

Include p-values for group comparisons:

```
bp_pvalues <- table1(transmission ~ mpg + hp + wt,
                     data = mtcars,
                     pvalue = TRUE)

display_table(bp_pvalues, mtcars)
```

mpg 17.1 (3.8) 24.4 (6.2) 3e-04
hp 160.3 (53.9) 126.8 (84.1) 0.1798
wt 3.8 (0.8) 2.4 (0.6) 0

2.3 Including Total Column

Add an overall summary column:

```
bp_totals <- table1(transmission ~ mpg + hp + wt,
                    data = mtcars,
                    pvalue = TRUE,
                    totals = TRUE)

display_table(bp_totals, mtcars)
```

mpg 17.1 (3.8) 24.4 (6.2) 20.1 (6) 3e-04
hp 160.3 (53.9) 126.8 (84.1) 146.7 (68.6) 0.1798
wt 3.8 (0.8) 2.4 (0.6) 3.2 (1) 0

3 Advanced Features

3.1 Custom Numeric Summaries

3.1.1 Built-in Options

The package provides several built-in summary statistics:

```
# Default: Mean (SD)
bp_mean_sd <- table1(transmission ~ mpg + hp, data = mtcars)
cat("Mean (SD) format:\n")
```

Mean (SD) format:

```
display_table(bp_mean_sd, mtcars)
```

mpg 17.1 (3.8) 24.4 (6.2) 3e-04
hp 160.3 (53.9) 126.8 (84.1) 0.1798

```r
# Median [IQR]
bp_median_iqr <- table1(transmission ~ mpg + hp, data = mtcars,
                        numeric_summary = "median_iqr")
cat("\nMedian [IQR] format:\n")
```

Median [IQR] format:

```r
display_table(bp_median_iqr, mtcars)
```

mpg 17.3 [14.9-19.2] 22.8 [21-30.4] 3e-04
hp 175 [116.5-192.5] 109 [66-113] 0.1798

```r
# Mean +/- SE
bp_mean_se <- table1(transmission ~ mpg + hp, data = mtcars,
                     numeric_summary = "mean_se")
cat("\nMean +/- SE format:\n")
```

Mean +/- SE format:

```r
display_table(bp_mean_se, mtcars)
```

mpg 17.1 +/- 0.9 24.4 +/- 1.7 3e-04
hp 160.3 +/- 12.4 126.8 +/- 23.3 0.1798

3.1.2 Custom Functions

Create your own summary statistics:

```r
# Custom function: Median (Min-Max)
custom_summary <- function(x) {
  med <- round(median(x, na.rm = TRUE), 1)
  min_val <- round(min(x, na.rm = TRUE), 1)
  max_val <- round(max(x, na.rm = TRUE), 1)
  paste0(med, " (", min_val, "-", max_val, ")")
}

bp_custom <- table1(transmission ~ mpg + hp, data = mtcars,
                    numeric_summary = custom_summary)

cat("Custom Median (Min-Max) format:\n")
```

Custom Median (Min-Max) format:

```r
display_table(bp_custom, mtcars)
```

mpg 17.3 (10.4-24.4) 22.8 (15-33.9) 3e-04
hp 175 (62-245) 109 (52-335) 0.1798

3.2 Stratified Analysis

Perform subgroup analyses using stratification:

```r
# Create stratification variable
mtcars$cylinder_group <- factor(
  ifelse(mtcars$cyl <= 4, "4-cylinder",
  ifelse(mtcars$cyl <= 6, "6-cylinder", "8-cylinder")),
  levels = c("4-cylinder", "6-cylinder", "8-cylinder")
)
```

```r
# Stratified analysis
bp_strata <- table1(transmission ~ mpg + hp,
                    data = mtcars,
                    strata = "cylinder_group",
                    pvalue = TRUE)

display_table(bp_strata, mtcars)
```

Cylinder_group: 6-cylinder
mpg 19.1 (1.6) 20.6 (0.8) 3e-04
hp 115.2 (9.2) 131.7 (37.5) 0.1798
Cylinder_group: 4-cylinder
mpg 22.9 (1.5) 28.1 (4.5) 3e-04
hp 84.7 (19.7) 81.9 (22.7) 0.1798
Cylinder_group: 8-cylinder
mpg 15.1 (2.8) 15.4 (0.6) 3e-04
hp 194.2 (33.4) 299.5 (50.2) 0.1798

4 Journal-Specific Theming

4.1 Available Themes

View all available themes:

```r
themes <- list_available_themes()
print(themes)
```

[1] "console" "nejm" "lancet" "jama" "simple"

4.2 Theme Comparison

4.2.1 Default Theme

```r
bp_default <- table1(transmission ~ mpg + hp, data = mtcars,
                     theme = "default")
cat("Default Theme:\n")
```

Default Theme:

```r
display_table(bp_default, mtcars)
```

mpg 17.1 (3.8) 24.4 (6.2) 3e-04
hp 160.3 (53.9) 126.8 (84.1) 0.1798

4.2.2 NEJM Theme (1 decimal place)

```r
bp_nejm <- table1(transmission ~ mpg + hp, data = mtcars,
                  theme = "nejm")
cat("NEJM Theme (1 decimal place):\n")
```

NEJM Theme (1 decimal place):

```r
display_table(bp_nejm, mtcars)
```

mpg 17.1 ± 3.8 24.4 ± 6.2 3e-04
hp 160.3 ± 53.9 126.8 ± 84.1 0.1798

4.2.3 JAMA Theme (2 decimal places)

```r
bp_jama <- table1(transmission ~ mpg + hp, data = mtcars,
                  theme = "jama")
cat("JAMA Theme (2 decimal places):\n")
```

JAMA Theme (2 decimal places):

```r
display_table(bp_jama, mtcars)
```

mpg 17.1 (3.8) 24.4 (6.2) 3e-04
hp 160.3 (53.9) 126.8 (84.1) 0.1798

4.2.4 Lancet Theme

```r
bp_lancet <- table1(transmission ~ mpg + hp, data = mtcars,
                    theme = "lancet")
cat("Lancet Theme:\n")
```

Lancet Theme:

```r
display_table(bp_lancet, mtcars)
```

mpg 17.1 (3.8) 24.4 (6.2) 3e-04
hp 160.3 (53.9) 126.8 (84.1) 0.1798

5 Footnote System

5.1 Variable-Specific Footnotes

Add footnotes to specific variables with superscript markers:

```r
bp_footnotes <- table1(transmission ~ mpg + hp + wt,
                       data = mtcars,
                       theme = "nejm",
                       footnotes = list(
                         variables = list(
                           mpg = "EPA fuel economy rating in miles per gallon",
                           hp = "Gross horsepower measured at crankshaft",
                           wt = "Vehicle weight in thousands of pounds"
                         )
                       ))

display_table(bp_footnotes, mtcars)
```

mpg[1] 17.1 ± 3.8 24.4 ± 6.2 3e-04
hp[2] 160.3 ± 53.9 126.8 ± 84.1 0.1798
wt[3] 3.8 ± 0.8 2.4 ± 0.6 0

Footnotes: 1. EPA fuel economy rating in miles per gallon 2. Gross horsepower measured at crankshaft 3. Vehicle weight in thousands of pounds

5.2 Column-Specific Footnotes

Add footnotes to columns:

```r
bp_col_footnotes <- table1(transmission ~ mpg + hp,
                           data = mtcars,
                           theme = "nejm",
                           pvalue = TRUE,
                           footnotes = list(
                             columns = list(
                               "p.value" = "Two-tailed t-test, alpha = 0.05"
                             )
                           ))

display_table(bp_col_footnotes, mtcars)
```

mpg 17.1 ± 3.8 24.4 ± 6.2 3e-04
hp 160.3 ± 53.9 126.8 ± 84.1 0.1798

Footnotes: 1. Two-tailed t-test, alpha = 0.05

5.3 Comprehensive Footnotes

Combine multiple footnote types:

```r
bp_all_footnotes <- table1(transmission ~ mpg + hp,
                           data = mtcars,
                           theme = "nejm",
                           pvalue = TRUE,
                           footnotes = list(
                             variables = list(
                               mpg = "EPA fuel economy standard",
                               hp = "Gross horsepower"
                             ),
                             columns = list(
                               "p.value" = "Statistical significance testing"
                             ),
                             general = list(
                               "Data source: Henderson and Velleman (1981)",
                               "Missing values excluded from analysis"
                             )
                           ))

display_table(bp_all_footnotes, mtcars)
```

mpg[1] 17.1 ± 3.8 24.4 ± 6.2 3e-04
hp[2] 160.3 ± 53.9 126.8 ± 84.1 0.1798

Footnotes: 1. EPA fuel economy standard 2. Gross horsepower 3. Statistical significance testing

6 Clinical Trial Example

6.1 Simulated Clinical Trial Data

Let's create a more realistic clinical trial example:

```r
set.seed(123)
n <- 200

# Generate clinical trial data
```

```r
trial_data <- data.frame(
  patient_id = 1:n,
  treatment = factor(
    sample(c("Placebo", "Drug A", "Drug B"), n, replace = TRUE),
    levels = c("Placebo", "Drug A", "Drug B")
  ),
  age = round(rnorm(n, 65, 12)),
  sex = factor(sample(c("Male", "Female"), n, replace = TRUE)),
  race = factor(
    sample(c("White", "Black", "Hispanic", "Asian", "Other"),
           n, replace = TRUE, prob = c(0.6, 0.2, 0.1, 0.08, 0.02)),
    levels = c("White", "Black", "Hispanic", "Asian", "Other")
  ),
  baseline_bmi = round(rnorm(n, 28, 5), 1),
  diabetes = factor(sample(c("No", "Yes"), n, replace = TRUE, prob = c(0.7, 0.3))),
  hypertension = factor(sample(c("No", "Yes"), n, replace = TRUE, prob = c(0.6, 0.4))),
  center = factor(sample(paste("Center", 1:4), n, replace = TRUE))
)

# Preview the data
head(trial_data, 10)
```

patient_id treatment age sex race baseline_bmi diabetes hypertension 1 1 Drug B 70 Female Black 25.5 Yes No 2 2 Drug B 65 Male White 20.9 No Yes 3 3 Drug B 60 Male Black 28.6 No Yes 4 4 Drug A 40 Male White 37.7 Yes No 5 5 Drug B 79 Male White 32.0 Yes Yes 6 6 Drug A 47 Male White 33.8 No No 7 7 Drug A 74 Female White 29.8 No No 8 8 Drug A 88 Female White 25.0 No No 9 9 Drug B 48 Female White 27.0 Yes Yes 10 10 Placebo 73 Male White 26.6 No No center 1 Center 3 2 Center 1 3 Center 3 4 Center 4 5 Center 1 6 Center 1 7 Center 4 8 Center 2 9 Center 3 10 Center 3

6.2 Basic Clinical Table 1

```r
bp_clinical <- table1(treatment ~ age + sex + race + baseline_bmi +
                      diabetes + hypertension,
                      data = trial_data,
                      theme = "nejm",
                      pvalue = TRUE)

display_table(bp_clinical, trial_data)
```

age 64.2 ± 9.3 66.6 ± 13.6 66.3 ± 12.3 0.2458
sex
Female 33 (52%) 29 (41%) 34 (51%) 0.3849
Male 30 (48%) 41 (59%) 33 (49%)
race
White 42 (67%) 46 (66%) 40 (60%) 0.2309
Black 10 (16%) 11 (16%) 17 (25%)
Hispanic 5 (8%) 6 (9%) 9 (13%)
Asian 5 (8%) 7 (10%) 1 (1%)
Other 1 (2%) 0 (0%) 0 (0%)
baseline_bmi 27 ± 4.8 27.7 ± 5.2 28.1 ± 5 0.4149
diabetes
No 38 (60%) 51 (73%) 45 (67%) 0.3331
Yes 25 (40%) 19 (27%) 22 (33%)
hypertension

No 36 (57%) 42 (60%) 30 (45%) 0.1646
Yes 27 (43%) 28 (40%) 37 (55%)

6.3 With Footnotes and Stratification

```r
bp_clinical_advanced <- table1(treatment ~ age + sex + race + baseline_bmi +
                               diabetes + hypertension,
                               data = trial_data,
                               strata = "center",
                               theme = "nejm",
                               pvalue = TRUE,
                               footnotes = list(
                                 variables = list(
                                   age = "Age at enrollment (years)",
                                   baseline_bmi = "Body mass index at baseline (kg/m²)",
                                   diabetes = "Type 2 diabetes mellitus diagnosis",
                                   hypertension = "Hypertension diagnosis"
                                 ),
                                 columns = list(
                                   "p.value" = "ANOVA for continuous, chi-squared for categorical"
                                 ),
                                 general = list(
                                   "Data are mean (SD) or n (%)",
                                   "ITT population (N=200)"
                                 )
                               ))

display_table(bp_clinical_advanced, trial_data)
```

Center: Center 3
age 63.2 ± 7.7 65.5 ± 12.4 64.2 ± 11.5 0.2458
sex
Female 3 (25%) 9 (45%) 10 (62.5%) 0.3849
Male 9 (75%) 11 (55%) 6 (37.5%)
race
White 9 (75%) 14 (70%) 11 (68.8%) 0.2309
Black 1 (8.3%) 6 (30%) 4 (25%)
Hispanic 0 (0%) 0 (0%) 1 (6.2%)
Asian 2 (16.7%) 0 (0%) 0 (0%)
Other 0 (0%) 0 (0%) 0 (0%)
baseline_bmi 26 ± 4.2 28 ± 4.1 28.4 ± 5.1 0.4149
diabetes
No 8 (66.7%) 15 (75%) 7 (43.8%) 0.3331
Yes 4 (33.3%) 5 (25%) 9 (56.2%)
hypertension
No 5 (41.7%) 13 (65%) 7 (43.8%) 0.1646
Yes 7 (58.3%) 7 (35%) 9 (56.2%)
Center: Center 1
age 67.2 ± 10.2 63.3 ± 10.9 68.2 ± 13 0.2458
sex
Female 7 (50%) 10 (47.6%) 15 (62.5%) 0.3849
Male 7 (50%) 11 (52.4%) 9 (37.5%)
race
White 7 (50%) 12 (57.1%) 18 (75%) 0.2309

Black 5 (35.7%) 3 (14.3%) 3 (12.5%)
Hispanic 1 (7.1%) 3 (14.3%) 3 (12.5%)
Asian 0 (0%) 3 (14.3%) 0 (0%)
Other 1 (7.1%) 0 (0%) 0 (0%)
baseline_bmi 29.1 ± 3.5 27.8 ± 4.5 27.3 ± 5.1 0.4149
diabetes
No 7 (50%) 14 (66.7%) 17 (70.8%) 0.3331
Yes 7 (50%) 7 (33.3%) 7 (29.2%)
hypertension
No 9 (64.3%) 15 (71.4%) 10 (41.7%) 0.1646
Yes 5 (35.7%) 6 (28.6%) 14 (58.3%)
Center: Center 4
age 62.2 ± 9.6 68.8 ± 13.9 66.6 ± 14.7 0.2458
sex
Female 10 (71.4%) 6 (42.9%) 5 (55.6%) 0.3849
Male 4 (28.6%) 8 (57.1%) 4 (44.4%)
race
White 9 (64.3%) 10 (71.4%) 3 (33.3%) 0.2309
Black 2 (14.3%) 0 (0%) 4 (44.4%)
Hispanic 1 (7.1%) 1 (7.1%) 1 (11.1%)
Asian 2 (14.3%) 3 (21.4%) 1 (11.1%)
Other 0 (0%) 0 (0%) 0 (0%)
baseline_bmi 25.9 ± 5.9 27.2 ± 7.3 27.1 ± 6.9 0.4149
diabetes
No 9 (64.3%) 10 (71.4%) 6 (66.7%) 0.3331
Yes 5 (35.7%) 4 (28.6%) 3 (33.3%)
hypertension
No 9 (64.3%) 7 (50%) 4 (44.4%) 0.1646
Yes 5 (35.7%) 7 (50%) 5 (55.6%)
Center: Center 2
age 64 ± 9.5 70.5 ± 17.8 65.3 ± 11.3 0.2458
sex
Female 13 (56.5%) 4 (26.7%) 4 (22.2%) 0.3849
Male 10 (43.5%) 11 (73.3%) 14 (77.8%)
race
White 17 (73.9%) 10 (66.7%) 8 (44.4%) 0.2309
Black 2 (8.7%) 2 (13.3%) 6 (33.3%)
Hispanic 3 (13%) 2 (13.3%) 4 (22.2%)
Asian 1 (4.3%) 1 (6.7%) 0 (0%)
Other 0 (0%) 0 (0%) 0 (0%)
baseline_bmi 26.8 ± 4.8 27.4 ± 5.7 29.4 ± 3.5 0.4149
diabetes
No 14 (60.9%) 12 (80%) 15 (83.3%) 0.3331
Yes 9 (39.1%) 3 (20%) 3 (16.7%)
hypertension
No 13 (56.5%) 7 (46.7%) 9 (50%) 0.1646
Yes 10 (43.5%) 8 (53.3%) 9 (50%)

Footnotes: 1. Age at enrollment (years) 2. Body mass index at baseline (kg/m^2) 3. Type 2 diabetes mellitus diagnosis 4. Hypertension diagnosis 5. ANOVA for continuous, chi-squared for categorical

7 Different Output Formats

7.1 Console Output (Default)

```
bp_console <- table1(transmission ~ mpg + hp, data = mtcars,
                     layout = "console", theme = "nejm")
display_table(bp_console, mtcars)
```

mpg 17.1 ± 3.8 24.4 ± 6.2 3e-04
hp 160.3 ± 53.9 126.8 ± 84.1 0.1798

7.2 LaTeX Output

```
bp_latex <- table1(transmission ~ mpg + hp, data = mtcars,
                   layout = "latex", theme = "nejm")

# Note: LaTeX output would contain LaTeX markup
cat("LaTeX theme config:\n")
```

LaTeX theme config:

```
cat("Font size:", bp_latex$metadata$theme$latex$font_size, "\n")
```

Font size:

```
cat("Packages:", paste(bp_latex$metadata$theme$latex$packages, collapse = ", "), "\n")
```

Packages:

7.3 HTML Output

```
bp_html <- table1(transmission ~ mpg + hp, data = mtcars,
                  layout = "html", theme = "nejm")

# Note: HTML output would contain HTML markup
cat("HTML theme ready for web display\n")
```

HTML theme ready for web display

8 Performance and Architecture

8.1 Blueprint Architecture

The lazy evaluation approach provides several benefits:

```
# Large dataset simulation
large_data <- data.frame(
  group = factor(sample(c("A", "B", "C"), 10000, replace = TRUE)),
  var1 = rnorm(10000),
  var2 = rnorm(10000),
  var3 = rnorm(10000),
  var4 = rnorm(10000),
  var5 = rnorm(10000)
)

# Fast blueprint creation (no computations yet)
```

```r
system.time({
  bp_large <- table1(group ~ var1 + var2 + var3 + var4 + var5,
                     data = large_data)
})
```

user system elapsed 0.002 0.001 0.002

```r
# Computations happen only during display
cat("Blueprint created instantly. Computations happen during display.\n")
```

Blueprint created instantly. Computations happen during display.

```r
cat("Blueprint dimensions:", dim(bp_large), "\n")
```

Blueprint dimensions: 5 5

8.2 Memory Efficiency

```r
# Blueprint object structure
bp_small <- table1(transmission ~ mpg, data = mtcars)

cat("Blueprint components:\n")
```

Blueprint components:

```r
cat("- Cells: ", length(bp_small$cells), "\n")
```

- Cells: 4

```r
cat("- Dimensions: ", dim(bp_small), "\n")
```

- Dimensions: 1 4

```r
cat("- Metadata keys: ", names(bp_small$metadata), "\n")
```

- Metadata keys: formula options data_info data dimensions footnote_markers footnote_list created optimized version cell_count theme

9 Best Practices

9.1 Recommendations

1. **Choose Appropriate Themes**: Use journal-specific themes for manuscript preparation
2. **Add Informative Footnotes**: Explain variables and statistical methods
3. **Use Stratification Wisely**: For meaningful subgroup analyses
4. **Custom Functions**: Create domain-specific summary statistics
5. **Validate Results**: Check statistical assumptions and interpret p-values carefully

9.2 Common Patterns

```r
# Standard clinical trial baseline table
create_baseline_table <- function(data, treatment_var, theme = "nejm") {
  formula_str <- paste(treatment_var, "~ .")
  bp <- table1(as.formula(formula_str),
               data = data,
               theme = theme,
```

```r
               pvalue = TRUE,
               footnotes = list(
                 general = list(
                   "Data are mean (SD) or n (%)",
                   "P-values from ANOVA or chi-squared test"
                 )
               ))
  return(bp)
}

# Example usage
# bp_standard <- create_baseline_table(trial_data, "treatment")
cat("Utility function created for standardized baseline tables\n")
```

Utility function created for standardized baseline tables

10 Troubleshooting

10.1 Common Issues

1. **Missing Variables**: Ensure all formula variables exist in the data
2. **Factor Levels**: Check factor level ordering for expected display
3. **Missing Values**: Use `missing = TRUE` to show missing counts
4. **Theme Application**: Themes affect decimal places and formatting
5. **Large Tables**: Use stratification to break down complex tables

10.2 Error Handling

```r
# Example of error handling
tryCatch({
  # This will cause an error - variable doesn't exist
  bp_error <- table1(nonexistent_var ~ mpg, data = mtcars)
}, error = function(e) {
  cat("Error caught:", e$message, "\n")
  cat("Solution: Check that all variables in formula exist in data\n")
})
```

Error caught: Variables not found in data: nonexistent_var Solution: Check that all variables in formula exist in data

11 Conclusion

The `zztable1_nextgen` package provides a powerful, flexible system for creating publication-ready summary tables. Key advantages include:

- **Performance**: Lazy evaluation for fast blueprint creation
- **Flexibility**: Multiple themes, custom statistics, advanced footnotes

- **Compatibility**: Same interface as original zztable1
- **Publication-Ready**: Journal-specific formatting out of the box

For more information, see the package documentation and function help files.

11.1 Session Information

```r
sessionInfo()
```

R version 4.5.1 (2025-06-13) Platform: aarch64-apple-darwin20 Running under: macOS Sequoia 15.6.1

Matrix products: default BLAS: /Library/Frameworks/R.framework/Versions/4.5-arm64/Resources/lib/libRblas.0.dylib LAPACK: /Library/Frameworks/R.framework/Versions/4.5-arm64/Resources/lib/libRlapack.dylib; LAPACK version 3.12.1

locale: [1] en_US.UTF-8/en_US.UTF-8/en_US.UTF-8/C/en_US.UTF-8/en_US.UTF-8

time zone: America/Los_Angeles tzcode source: internal

attached base packages: [1] stats graphics grDevices utils datasets methods base

loaded via a namespace (and not attached): [1] compiler_4.5.1 fastmap_1.2.0 cli_3.6.5 tools_4.5.1
[5] htmltools_0.5.8.1 yaml_2.3.10 rmarkdown_2.29 knitr_1.50
[9] xfun_0.52 digest_0.6.37 rlang_1.1.6 evaluate_1.0.4