

Creating LaTeX Tables and Cropped PDFs from Dataframes

Ronald (Ryy) G. Thomas

Introduction

The `zztab2fig` package provides a streamlined workflow to transform R objects into publication-ready LaTeX tables and generate cropped PDF outputs. With built-in options for styling, directory management, and verbose logging, the package is ideal for researchers, analysts, and data scientists who need professional table outputs for reports, presentations, or publications.

What's New in v0.2.0

Version 0.2.0 introduced substantial enhancements:

- **S3 method dispatch:** `t2f()` now works directly with `lm`, `glm`, `anova`, `aov`, `htest`, `matrix`, and `table` objects
- **Theme system:** Built-in themes for NEJM, APA, Nature, and minimal styles
- **t2f_regression()**: Side-by-side regression model comparison tables
- **Advanced formatting:** Table footnotes, spanning headers, multi-row cells, and decimal alignment via `siunitx`
- **Caption and label support:** LaTeX captions with short captions and cross-reference labels

For detailed coverage of these features, see the companion vignettes:

- *Quickstart Guide* - Concise reference for common operations
- *Object Types and Themes* - S3 methods and theme demonstrations
- *Advanced Features* - Footnotes, headers, alignment, and placement helpers
- *Why zztab2fig?* - Practical comparison with `pander`

This vignette covers the foundational workflow and customization options.

Installation

The package can be installed from CRAN or directly from GitHub if hosted there.

```
# Install from CRAN
#install.packages("zztab2fig")

# Or install from GitHub
# devtools::install_github("yourusername/zztab2fig")
```

Load the package:

```
library(zztab2fig)
# Load dplyr for data manipulation examples
library(dplyr)
```

Key Functions

`t2f()`

The primary function for converting R objects to LaTeX tables. In v0.2.0, `t2f()` is an S3 generic with methods for data frames, matrices, tables, and statistical objects.

Core Arguments

- `x`: Object to convert (data frame, matrix, lm, glm, etc.)
- `filename`: Base name for output files. Defaults to the object name.
- `sub_dir`: Output subdirectory. Default: "output".
- `scolor`: LaTeX color for row shading (e.g., "blue!10"). Default: "blue!10".
- `verbose`: Print progress messages. Default: FALSE.
- `extra_packages`: List of LaTeX package specifications.
- `document_class`: LaTeX document class. Default: "article".

New Parameters (v0.2.0)

- `caption`: LaTeX table caption.
- `caption_short`: Short caption for List of Tables.
- `label`: LaTeX label for cross-referencing.
- `align`: Column alignment vector or list (supports siunitx).
- `longtable`: Enable multi-page tables. Default: FALSE.
- `crop`: Crop PDF output. Default: TRUE.
- `crop_margin`: Margin size in points. Default: 10.
- `theme`: Theme name ("nejm", "apa", "nature", "minimal") or `t2f_theme` object.
- `footnote`: A `t2f_footnote` object for table footnotes.
- `header_above`: A `t2f_header_above` object for spanning column headers.
- `collapse_rows`: A `t2fCollapse_rows` object for multi-row cells.

Returns

Invisibly returns the path to the generated PDF file.

LaTeX Package Helper Functions

The package provides convenient R functions to generate LaTeX package specifications:

`geometry()`

Configures page layout and margins:

```
geometry(margin = "5mm", paper = "a4paper", landscape = TRUE)
```

`babel()`

Adds language support:

```
babel("spanish") # for Spanish language support
```

`fontspec()`

Configures custom fonts (requires XeLaTeX or LuaLaTeX):

```
fontspec(main_font = "Times New Roman", sans_font = "Arial")
```

Helper Functions

See the full vignette for detailed descriptions of helper functions like `sanitize_column_names()`, `sanitize_table_cells()`, and `create_latex_table()`.

Example Workflow

Step 1: Prepare Your Data

Load a dataframe, e.g., the `mtcars` dataset:

```
data(mtcars)
```

Step 2: Generate the LaTeX Table and PDF

```
t2f(  
  df = mtcars,  
  filename = "mtcars_table",  
  sub_dir = "tables",  
  scolor = "blue!10",  
  verbose = TRUE  
)
```

Step 3: Advanced Usage with Custom LaTeX Packages

```
# Create a table with custom margins and language support  
t2f(  
  df = mtcars,  
  filename = "mtcars_custom",  
  sub_dir = "tables",  
  extra_packages = list(  
    geometry(margin = "5mm", paper = "a4paper"),  
    babel("spanish")  
,  
  verbose = TRUE  
)  
  
# Wide table with landscape orientation  
t2f(  
  df = mtcars,  
  filename = "mtcars_wide",  
  extra_packages = list(  
    geometry(margin = "3mm", landscape = TRUE)  
)  
)
```

Step 4: Inspect the Outputs

Navigate to the `tables` subdirectory to find:
- `mtcars_table.tex`: The LaTeX source file.
- `mtcars_table.pdf`: The compiled PDF.
- `mtcars_table_cropped.pdf`: The cropped PDF.

Feature Demonstrations

Basic Table Generation

The simplest usage creates a standard LaTeX table:

```
library(zztab2fig)

# Basic table with default settings
data(iris)
small_iris <- head(iris, 8)

result <- t2f(small_iris,
               filename = "basic_iris",
               sub_dir = "basic_output",
               verbose = TRUE)
cat("Generated files in:", dirname(result))

## Generated files in: basic_output
```

This creates: - `basic_output/basic_iris.tex`: LaTeX source file - `basic_output/basic_iris.pdf`: Full PDF - `basic_output/basic_iris_cropped.pdf`: Cropped PDF for inclusion

Here's the table content that was generated:

Table 1: Basic Iris Dataset Table (as displayed in R)

Sepal.Length	Sepal.Width	Petal.Length	Petal.Width	Species
5.1	3.5	1.4	0.2	setosa
4.9	3.0	1.4	0.2	setosa
4.7	3.2	1.3	0.2	setosa
4.6	3.1	1.5	0.2	setosa
5.0	3.6	1.4	0.2	setosa
5.4	3.9	1.7	0.4	setosa
4.6	3.4	1.4	0.3	setosa
5.0	3.4	1.5	0.2	setosa

And here's the actual LaTeX-generated PDF table produced by `zztab2fig`:

Custom Colors and Styling

Control table appearance with different color schemes. Here's a comparison:

```
# Create a sample dataset
color_demo_data <- head(mtcars[, c("mpg", "cyl", "hp", "wt")], 6)

# Generate tables with different colors
t2f(color_demo_data,
     filename = "blue_table",
     sub_dir = "color_demo",
     scolor = "blue!12")

t2f(color_demo_data,
     filename = "green_table",
     sub_dir = "color_demo",
     scolor = "green!15")
```

Sepal_Length	Sepal_Width	Petal_Length	Petal_Width	Species
5.1	3.5	1.4	0.2	setosa
4.9	3.0	1.4	0.2	setosa
4.7	3.2	1.3	0.2	setosa
4.6	3.1	1.5	0.2	setosa
5.0	3.6	1.4	0.2	setosa
5.4	3.9	1.7	0.4	setosa
4.6	3.4	1.4	0.3	setosa
5.0	3.4	1.5	0.2	setosa

Figure 1: LaTeX Table Generated by zztab2fig

Original data:

Table 2: Sample Data for Color Demonstration

	mpg	cyl	hp	wt
Mazda RX4	21.0	6	110	2.620
Mazda RX4 Wag	21.0	6	110	2.875
Datsun 710	22.8	4	93	2.320
Hornet 4 Drive	21.4	6	110	3.215
Hornet Sportabout	18.7	8	175	3.440
Valiant	18.1	6	105	3.460

Blue-styled LaTeX table (scolor = “blue!12”):

	mpg	cyl	hp	wt
Mazda RX4	21.0	6	110	2.620
Mazda RX4 Wag	21.0	6	110	2.875
Datsun 710	22.8	4	93	2.320
Hornet 4 Drive	21.4	6	110	3.215
Hornet Sportabout	18.7	8	175	3.440
Valiant	18.1	6	105	3.460

Figure 2: Blue-styled LaTeX Table

Green-styled LaTeX table (scolor = “green!15”):

Available color options include: blue!10, green!20, red!15, gray!25, purple!12, orange!18, yellow!30, etc. The number after ! controls intensity (lower = lighter).

	mpg	cyl	hp	wt
Mazda RX4	21.0	6	110	2.620
Mazda RX4 Wag	21.0	6	110	2.875
Datsun 710	22.8	4	93	2.320
Hornet 4 Drive	21.4	6	110	3.215
Hornet Sportabout	18.7	8	175	3.440
Valiant	18.1	6	105	3.460

Figure 3: Green-styled LaTeX Table

Landscape Orientation

```
# Landscape mode for very wide tables
t2f(mtcars,
  filename = "landscape_mtcars",
  extra_packages = list(
    geometry(margin = "5mm", landscape = TRUE)
  ))
```

Custom Paper Sizes

```
# A4 paper with specific margins
t2f(small_iris,
  filename = "a4_table",
  extra_packages = list(
    geometry(paper = "a4paper", margin = "10mm")
  ))

# Letter paper
t2f(small_iris,
  filename = "letter_table",
  extra_packages = list(
    geometry(paper = "letterpaper", margin = "0.75in")
  ))
```

Advanced Use Cases

Multilingual Documents

Create tables with proper language support:

```

# Spanish language support
spanish_data <- data.frame(
  "Producto" = c("Café", "Té", "Azúcar"),
  "Precio" = c("$2.50", "$1.80", "$0.75"),
  "Disponible" = c("Sí", "Sí", "No"),
  stringsAsFactors = FALSE
)

t2f(spanish_data,
  filename = "tabla_espanol",
  extra_packages = list(
    babel("spanish")
  ))

# French with custom margins
french_data <- data.frame(
  "Produit" = c("Café", "Thé", "Sucre"),
  "Prix" = c("2,50€", "1,80€", "0,75€"),
  stringsAsFactors = FALSE
)

t2f(french_data,
  filename = "tableau_francais",
  extra_packages = list(
    babel("french"),
    geometry(margin = "8mm")
))

```

Document Classes

Different document classes for specific purposes:

```

# Minimal document class (less overhead)
t2f(small_iris,
  filename = "minimal_table",
  document_class = "minimal",
  extra_packages = list(
    geometry(margin = "5mm")
))

# Article class with custom formatting
t2f(small_iris,
  filename = "article_table",
  document_class = "article")

```

Complex Layouts

Combine multiple LaTeX packages for sophisticated layouts:

```

# Professional report-style table
report_data <- mtcars[1:10, c("mpg", "cyl", "disp", "hp", "wt")]

t2f(report_data,
  filename = "professional_table",

```

```

scolor = "blue!8",
extra_packages = list(
  geometry(margin = "15mm", paper = "a4paper"),
  "\\usepackage{microtype}", # Better typography
  "\\usepackage{array}"      # Enhanced table formatting
))

# Conference poster table (large, landscape)
t2f(mtcars,
  filename = "poster_table",
  scolor = "blue!12",
  extra_packages = list(
    geometry(
      paper = "a3paper",
      margin = "10mm",
      landscape = TRUE
    )
))

```

Data Processing Workflows

Working with dplyr

```

library(dplyr)

# Summary statistics table
summary_stats <- mtcars %>%
  group_by(cyl) %>%
  summarise(
    Count = n(),
    Mean MPG = round(mean(mpg), 2),
    Mean HP = round(mean(hp), 1),
    .groups = "drop"
  )

t2f(summary_stats,
  filename = "cylinder_summary",
  scolor = "green!12")

# Top performers table
top_mpg <- mtcars %>%
  arrange(desc(mpg)) %>%
  slice_head(n = 8) %>%
  select(mpg, cyl, hp, wt)

t2f(top_mpg,
  filename = "fuel_efficient_cars",
  scolor = "blue!15")

```

Handling Special Characters

The package automatically sanitizes LaTeX special characters:

```

# Data with special characters
special_data <- data.frame(
  "Category" = c("R&D", "Sales", "Marketing"),
  "Budget%" = c("25%", "40%", "35%"),
  "Cost$" = c("$50K", "$80K", "$70K"),
  "Notes#" = c("Priority #1", "High #2", "Medium #3"),
  stringsAsFactors = FALSE
)

t2f(special_data,
  filename = "special_chars_demo",
  scolor = "orange!15")

```

Batch Processing

Generate multiple tables efficiently:

```

# Process multiple datasets
datasets <- list(
  cars = mtcars[1:10, 1:5],
  flowers = iris[1:10, ],
  trees = trees[1:10, ]
)

# Generate all tables with consistent styling
for (name in names(datasets)) {
  t2f(datasets[[name]],
    filename = paste0("batch_", name),
    scolor = "blue!10",
    sub_dir = "batch_output")
}

# Or using lapply
lapply(names(datasets), function(name) {
  t2f(datasets[[name]],
    filename = name,
    sub_dir = paste0("dataset_", name))
})

```

Integration Strategies

With R Markdown

Include generated PDFs in R Markdown documents. Here's a working example:

```

library(dplyr)
library(zztab2fig)

# Generate summary statistics table
summary_data <- mtcars %>%
  group_by(cyl) %>%
  summarise(
    Count = n(),
    Mean MPG = round(mean(mpg), 1),
    Mean HP = round(mean(hp), 0),

```

```

    .groups = "drop"
)

# Create the table
result_path <- t2f(summary_data, "vignette_demo", sub_dir = "tables")
cat("Table generated at:", result_path)

## Table generated at: tables/vignette_demo_cropped.pdf

```

The table is now saved as a PDF that can be included in documents or presentations.

Here's what the data looks like in R:

Table 3: Summary Data (as displayed in R)

cyl	Count	Mean MPG	Mean HP
4	11	26.7	83
6	7	19.7	122
8	14	15.1	209

And here's the professional LaTeX table generated by `t2f()`:

cyl	Count	Mean MPG	Mean HP
4	11	26.7	83
6	7	19.7	122
8	14	15.1	209

Figure 4: Professional LaTeX Table from `t2f()`

With LaTeX Documents

Use generated `.tex` files in larger documents:

```

\documentclass{article}
\usepackage{graphicx}

\begin{document}
\section{Data Analysis}

```

The following table shows our results:

```

\input{tables/results.tex}

\end{document}

```

With Shiny Applications

```
# In server.R
output$download_table <- downloadHandler(
  filename = "analysis_table.pdf",
  content = function(file) {
    # Generate table
    result <- t2f(processed_data(),
                  filename = "shiny_table",
                  sub_dir = tempdir())
    file.copy(result, file)
  }
)
```

Troubleshooting & Best Practices

Common Installation Issues

Error: pdflatex or pdfcrop not found

Solution by Platform: - **Ubuntu/Debian:** sudo apt-get install texlive texlive-extra-utils
- **macOS:** Install MacTeX from <https://www.tug.org/mactex/> - **Windows:** Install MiKTeX from <https://miktex.org/> - **Conda:** conda install -c conda-forge texlive-core

Verify Installation:

```
pdflatex --version
pdfcrop --version
```

LaTeX Compilation Errors

The package now provides detailed error messages when LaTeX compilation fails:

```
# If this fails, you'll get specific error information
problematic_data <- data.frame(
  "Bad\\Column" = 1:3, # Unescaped backslash
  stringsAsFactors = FALSE
)

# The error message will show LaTeX log details
t2f(problematic_data, "test_error")
```

Debugging Steps: 1. Check the generated .tex file for syntax errors 2. Look at the .log file in the output directory
3. Test the .tex file manually with pdflatex 4. Verify your data doesn't contain problematic characters

Performance Tips

For Large Tables

```
# Memory-efficient processing for large datasets
large_data <- data.frame(
  matrix(rnorm(10000), ncol = 10)
)

# Use minimal document class to reduce overhead
```

```
t2f(large_data,
  filename = "large_table",
  document_class = "minimal",
  extra_packages = list(
    geometry(margin = "2mm", landscape = TRUE)
  ))
```

Batch Processing Optimization

```
# Process multiple tables efficiently
# datasets <- list(...) # Your actual datasets here

# Set up common directory first
output_dir <- "batch_tables"
dir.create(output_dir, showWarnings = FALSE)

# Use consistent settings to avoid repeated LaTeX compilation setup
common_settings <- list(
  sub_dir = output_dir,
  scolor = "blue!10",
  verbose = FALSE # Reduce console output for batch processing
)

# Process with do.call to avoid repetitive code
lapply(names(datasets), function(name) {
  do.call(t2f, c(list(df = datasets[[name]]), filename = name), common_settings))
})
```

Best Practices

Data Preparation

```
library(dplyr)
library(stringr)

# Clean your data before table generation
prepare_table_data <- function(df) {
  df %>%
    # Round numeric columns appropriately
    mutate(across(where(is.numeric), ~ round(.x, 2))) %>%
    # Handle NA values
    mutate(across(everything(), ~ ifelse(is.na(.x), "-", as.character(.x)))) %>%
    # Ensure reasonable column names
    rename_with(~ gsub("\\.", " ", .x)) %>%
    # Limit precision for display
    mutate(across(where(is.character), ~ str_trunc(.x, 20)))
}

clean_data <- prepare_table_data(messy_data)
t2f(clean_data, filename = "clean_table")
```

Consistent Styling

Create reusable style configurations:

```
# Define style presets
table_styles <- list(
  corporate = list(
    scolor = "blue!8",
    extra_packages = list(
      geometry(margin = "15mm", paper = "a4paper")
    )
  ),
  presentation = list(
    scolor = "blue!15",
    extra_packages = list(
      geometry(margin = "5mm", landscape = TRUE)
    )
  ),
  minimal = list(
    scolor = "gray!10",
    document_class = "minimal",
    extra_packages = list(geometry(margin = "3mm"))
  )
)

# Apply consistent styling
apply_style <- function(data, filename, style_name) {
  style <- table_styles[[style_name]]
  do.call(t2f, c(list(df = data, filename = filename), style))
}

# Usage
apply_style(mtcars, "corporate_mtcars", "corporate")
apply_style(iris, "presentation_iris", "presentation")
```

File Organization

```
# Organize outputs by project/analysis
project_name <- "quarterly_analysis"

# Create structured output directories
output_structure <- c(
  file.path(project_name, "tables"),
  file.path(project_name, "figures"),
  file.path(project_name, "temp")
)

sapply(output_structure, dir.create, recursive = TRUE, showWarnings = FALSE)

# Generate tables with organized structure
t2f(quarterly_data,
  filename = "q4_summary",
```

```
sub_dir = file.path(project_name, "tables"))
```

Advanced LaTeX Customization

Custom LaTeX Preambles

```
# For users comfortable with LaTeX
custom_preamble <- list(
  "\\usepackage{booktabs}",
  "\\usepackage{longtable}",
  "\\usepackage{microtype}",
  "\\renewcommand{\\arraystretch}{1.2}", # Increase row spacing
  "\\usepackage[table]{xcolor}"
)

# t2f(your_data,
#       filename = "custom_latex",
#       extra_packages = custom_preamble)
```

Integration with External LaTeX Templates

```
# Generate just the table content
# table_only_data <- your_data # Your actual data here

# Create table with minimal wrapper for inclusion
# t2f(table_only_data,
#       filename = "table_content",
#       document_class = "minimal",
#       extra_packages = list("\\usepackage{booktabs}"))

# Then include the generated .tex content in your main document
```

Real-World Examples

Academic Papers

```
# Create publication-ready tables
results_table <- data.frame(
  Model = c("Linear", "Quadratic", "Cubic"),
  R_squared = c(0.85, 0.92, 0.94),
  AIC = c(145.2, 138.7, 141.3),
  p_value = c("< 0.001", "< 0.001", "0.002"),
  stringsAsFactors = FALSE
)

# Academic journal formatting
t2f(results_table,
  filename = "model_comparison",
  scolor = "gray!8",
  extra_packages = list(
    geometry(margin = "20mm", paper = "letterpaper")
))
```

Business Reports

```
# Quarterly sales summary
sales_summary <- data.frame(
  Quarter = c("Q1", "Q2", "Q3", "Q4"),
  Revenue = c("$125K", "$143K", "$158K", "$171K"),
  Growth = c("-", "+14.4%", "+10.5%", "+8.2%"),
  Target = c("$120K", "$140K", "$155K", "$165K"),
  Status = c("Yes", "Yes", "Yes", "Yes"),
  stringsAsFactors = FALSE
)

t2f(sales_summary,
  filename = "quarterly_sales",
  scolor = "blue!10",
  extra_packages = list(
    geometry(margin = "12mm", paper = "a4paper")
  ))
)
```

Conference Presentations

```
# Large, readable table for presentations
key_findings <- mtcars[1:6, c("mpg", "cyl", "hp", "wt")]

t2f(key_findings,
  filename = "presentation_findings",
  scolor = "blue!15",
  extra_packages = list(
    geometry(
      margin = "8mm",
      paper = "a4paper",
      landscape = TRUE
    )
  ))
)
```

References

- **kableExtra**: A package for creating and styling LaTeX/HTML tables in R. CRAN link
- **pdflatex** and **pdfcrop**: Tools from TeX distributions like TeX Live and MiKTeX.
- **zzytab2fig**: GitHub link (if applicable).

Conclusion

The **zzytab2fig** package simplifies the process of creating professional-quality tables for publications and presentations. By combining R's data processing capabilities with LaTeX's typesetting power, the package bridges the gap between analysis and presentation, making it an essential tool for any data analyst or researcher.