A Template for Two or One-Column Vignettes

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Your abstract will be typeset here, and used by default a visually distinctive font. An abstract should explain to the general reader the major contributions of the article.

one | two | optional | keywords | here

Introduction. This *pinp is not PNAS* template started when the introduction to Rcpp by Eddelbuettel and Balamuta (2017) was converted into this updated Rcpp Introduction vignette. It is based on the pnas_article template of the wonderful rticles package by Allaire *et al.* (2017b). The conversion from markdown to latex is facilitated by rmarkdown (Allaire *et al.*, 2017a) and knitr (Xie, 2017). The underlying LaTeX macros are from pnas.org.

The remainder of the document carries over from the corresponding pnas_article template document. but has been edited and updated to our use case. A few specific tips follow. In general, for fine-tuning some knowledge of LaTeX is helpful.

Author Affiliations. Per common academic best practice, you can include your department, institution, and complete address, with the ZIP/postal code, for each author. Use lower case letters to match authors with institutions, as shown in the example. Authors with an ORCID ID may supply this information at submission.

Document Options. We support several options via the YAML header

- Setting a DOI or URL footer, for example for the CRAN package URL, which is placed in the bottom-left footer of the title page and even pages;
- Setting a footer label, for example *YourPackage Vignette* stating your package, which is placed in the bottom-right footer on odd pages;
- Setting a free-form author field used on the inside footer;
- Optional *Draft* watermark to be added to each page;
- Line of custom text in subtitle (`date_subtitle`) suitable to give publication info of the draft, e.g. journal name in a post-print.

References. Here we differ from PNAS and suggest natbib. References will appear in author-year form. Use `\citet{}`, `\citep{}`, etc as usual.

We default to the `jss.bst` style. To switch to a different bibliography style, please use `biblio-style: style` in the YAML header.

Inline R Code. The PNAS sample included a fixed PNG image here, but this document prefers to show the results and embedding of *R* code.

```
library(ggplot2)
```

```
#  Warning: package 'ggplot2' was built under R version
```
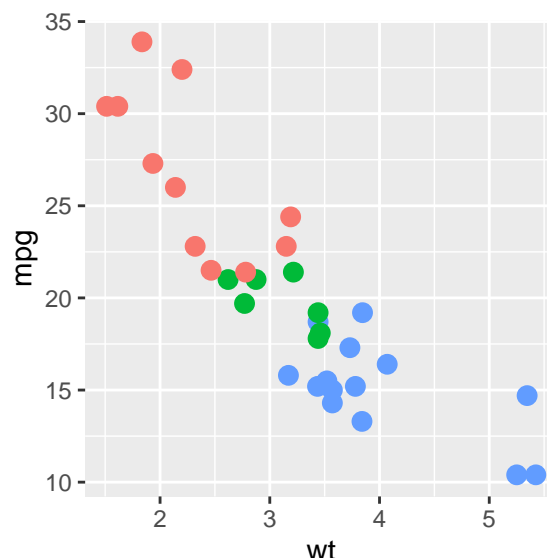

Fig. 1. Narrow ggplot2 figure

```
ggplot(mtcars, aes(wt, mpg)) +
    geom_point(size=3, aes(colour=factor(cyl))) +
    theme(legend.position="none")
```

Here we use a standard knitr bloc with explicit options for

- figure width and height (`fig.width`, `fig.height`), both set to three inches;
- whether the code is shown (`echo=TRUE`); and
- the caption (`fig.cap`) as shown above.

Digital Figures. Markdown, Pandoc and LaTeX support `.eps` and `.pdf` files.

Figures and Tables should be labelled and referenced in the standard way using the `\label{}` and `\ref{}` commands.

The R examples above show how to insert a column-wide figure. To insert a figure wider than one column, please use the `\begin{figure*}...\end{figure*}` environment.

One (roundabout) way of doing this is to *not* actually plot a figure, but to save it in a file as the following segment shows:

```
library(ggplot2)
```

```
#  Warning: package 'ggplot2' was built under R version 3.5.3
```

```
p <- ggplot(data = midwest,
        mapping = aes(x = area,
                    fill = state,
                    color = state)) +
    geom_density(alpha = 0.3)
```

```
## save to file
suppressMessages(ggsave("densities.pdf", p))
```

This file is then included via standard LaTeX commands.

Typeset Code (But Do Not Run It). We can also just show code.

```
xx <- faithful[,"eruptions"]
fit <- density(xx)
plot(fit)
```

This simply used a pandoc bloc started and ended by three backticks, with `r` as the language choice. Similarly, *many* other languages can be typeset directly simply by relying on pandoc.

Single column equations. Authors may use 1- or 2-column equations in their article, according to their preference.

To allow an equation to span both columns, options are to use the `\begin{figure*}...\end{figure*}` environment mentioned above for figures. The `\begin{widetext}...\end{widetext}` environment as shown in equation 1 below is deprecated, but LaTeX commands `\onecolumn` and `\twocolumn` work fine.

Please note that this option may run into problems with floats and footnotes, as mentioned in the cuted package documentation. In the case of problems with footnotes, it may be possible to correct the situation using commands `\footnotemark` and `\footnotetext`.

$$
\begin{aligned}
(x+y)^3 &= (x+y)(x+y)^2 \\
&= (x+y)(x^2+2xy+y^2) \\
&= x^3 + 3x^2y + 3xy^3 + x^3.
\end{aligned}
\qquad [1]
$$

References

Allaire J, Cheng J, Xie Y, McPherson J, Chang W, Allen J, Wickham H, Atkins A, Hyndman R, Arslan R (2017a). *rmarkdown: Dynamic Documents for R*. R package version 1.6, URL https://CRAN.R-project.org/package=rmarkdown.

Allaire J, R Foundation, Wickham H, Journal of Statistical Software, Xie Y, Vaidyanathan R, Association for Computing Machinery, Boettiger C, Elsevier, Broman K, Mueller K, Quast B, Pruim R, Marwick B, Wickham C, Keyes O, Yu M (2017b). *rticles: Article Formats for R Markdown*. R package version 0.4.1, URL https://CRAN.R-project.org/package=rticles.

Eddelbuettel D, Balamuta JJ (2017). "Extending *R* with *C++*: A Brief Introduction to *Rcpp*." *PeerJ Preprints*, **5**, e3188v1. ISSN 2167-9843. doi:10.7287/peerj.preprints.3188v1. URL https://doi.org/10.7287/peerj.preprints.3188v1.

Xie Y (2017). *knitr: A General-Purpose Package for Dynamic Report Generation in R*. R package version 1.17, URL https://yihui.name/knitr/.
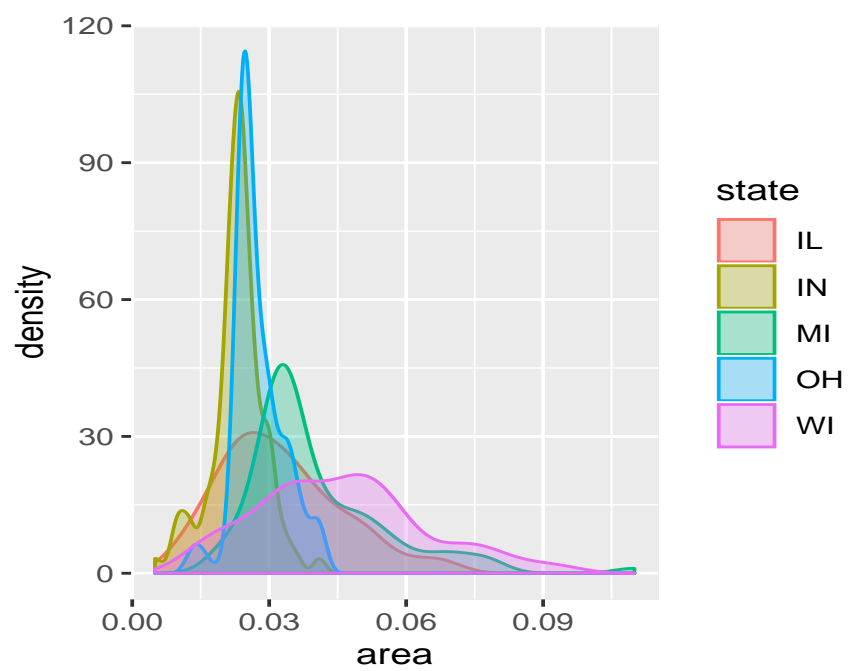
Fig. 2. Wide ggplot2 figure