# Using RMarkdown for reproducible and neat documents

Your name here
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## Contents

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# Overview

This document showcases how to create and use `RMarkdown` documents.

# You can easily create headings. This is a first order heading.

## Then move down in heading order size

### Like this subheading

#### And this fourth order heading

You can write in **bold** and *italicised* text (in **two** different *ways*).

You can write in-line `code` if you want to differentiate between when you are typing normally or highlighting `model parameters`, for example.

Equations like this $t' = \gamma(t - vx/c^2)$, to appear within text lines.

Create links to your website.

Make footnotes[1].

Insert line breaks between text like this, which works best in large slabs of text

Insert a horizontal line break using five asterisks ('*****')

The raw Rmd file also has the code for inserting user comments.

(There is also a page break here. Best seen in PDF. Check the raw Rmd file to see the code)

[1] Here is the footnote you created earlier, automatically formatted

## Define equations

Accordingly, we write the eigenfunction of a spinless particle as the superposition of plane wave states of momentum ($\pi$) and energy ($E_j$) having amplitudes $a(\pi, E_j)$ (from [1]).

$$\phi n(r,t) = \sum_{i,j} a(p_i, E_j) e^{\frac{i}{h}(p_i \cdot r - E_j t)}$$

## Embed images/gifs:

## Create, alter, and embed plots

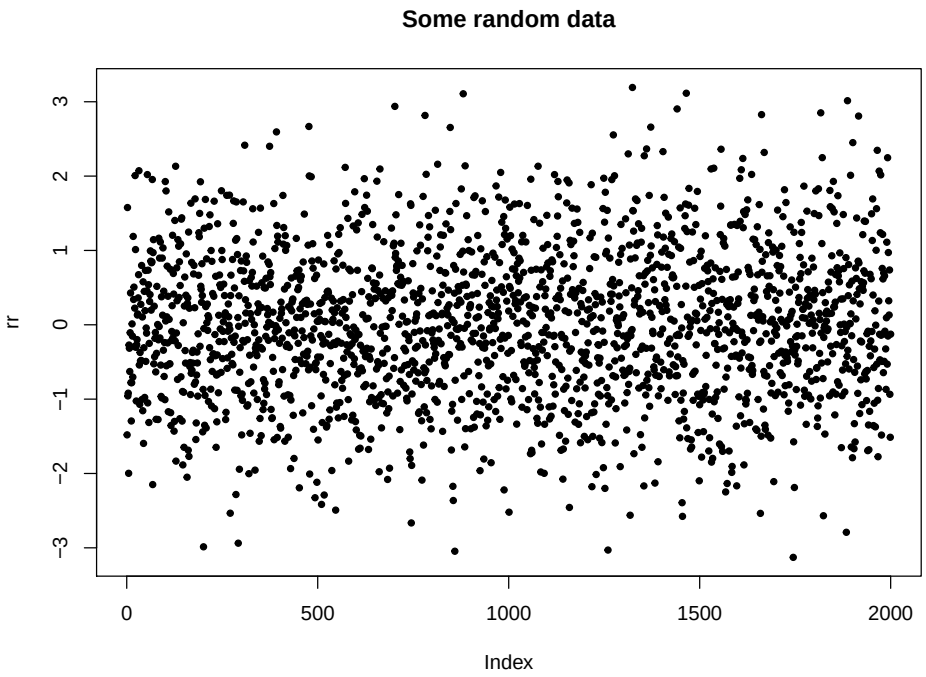



Figure 1. Example of a stock plot embedded into a PDF from RMarkdown.

### Show plots with associated code

```
suppressWarnings(require(viridis))
bm <- 0
par(las = 1, bty = "n")
xlim <- c(-5, 5)
ylim <- c(0, 0.5)
set.seed(12)
N <- 2000
rr <- rnorm(N)
rr2 <- rnorm(N^2)
rr3 <- rnorm(N + 0.3)
rrd <- density(rr)
rrd2 <- density(rr2)
rrd3 <- density(rr3)
main <- paste0(N, " points but plot better")
xlab <- "Points in space"
if (bm == 1) {
    layout(matrix(c(rep(1,
        3), 2:4), 2, 3, byrow = TRUE))
    sc <- 1
    plot(rr, las = 1, bty = "n",
        col = adjustcolor(viridis(N),
            0.5), pch = 20,
        cex = runif(10, 1,
            5), main = main,
        xlab = xlab)
    for (r in list(rrd, rrd2,
        rrd3)) {
        plot(r, xlim = xlim,
            ylim = ylim, main = "")
        polygon(r, col = adjustcolor(viridis(250)[sc],
            0.5), border = viridis(250)[sc])
        sc <- sc + 100
    }
} else {
    par(mfrow = c(1, 1))
    plot(rr, las = 1, bty = "n",
        col = adjustcolor(viridis(N),
            0.5), pch = 20,
        cex = runif(10, 1,
            5), main = main,
        xlab = xlab)
}
```

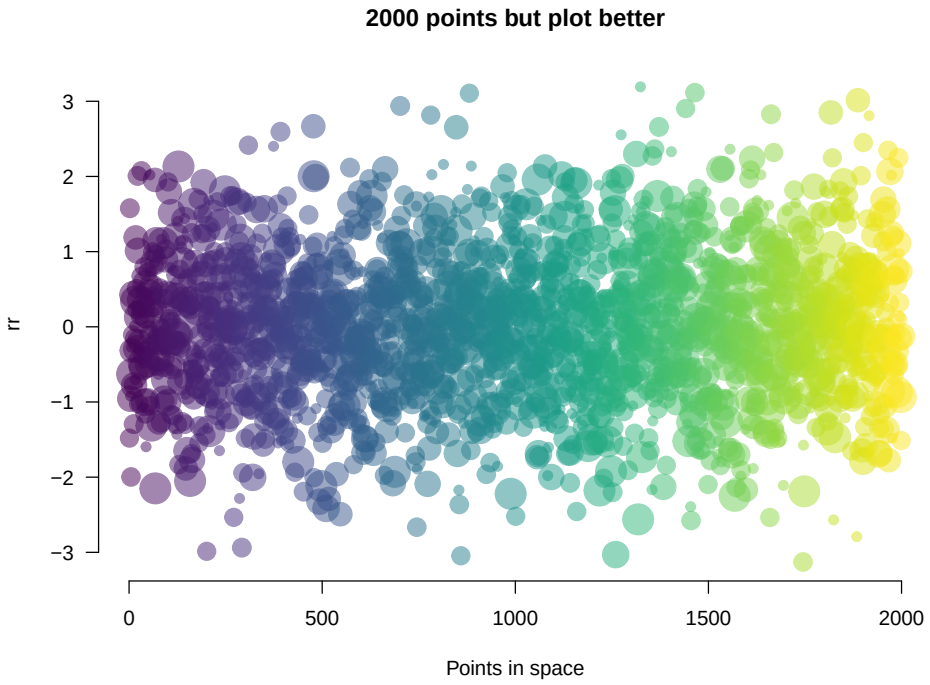



Figure 2. Example of a plot with improved graphics and its associated code embedded into the output document from RMarkdown.

## And tables

Table 1. Definitions of model parameters for individual hosts and **parasites**. Dimensions and units: -, dimensionless; cm, centimetres; J, Joules; L, length.

| Parameter | Definition | Dimension(unit) |
|---|---|---|
| $L$ | structural length | cm |
| $ee$ | scaled reserve density | J ($cm^3$) |
| $D$ | host development | — |
| $RH$ | energy in reproduction buffer | J |

## Use buttons or tabs for sub-chapters

### Chapter 1

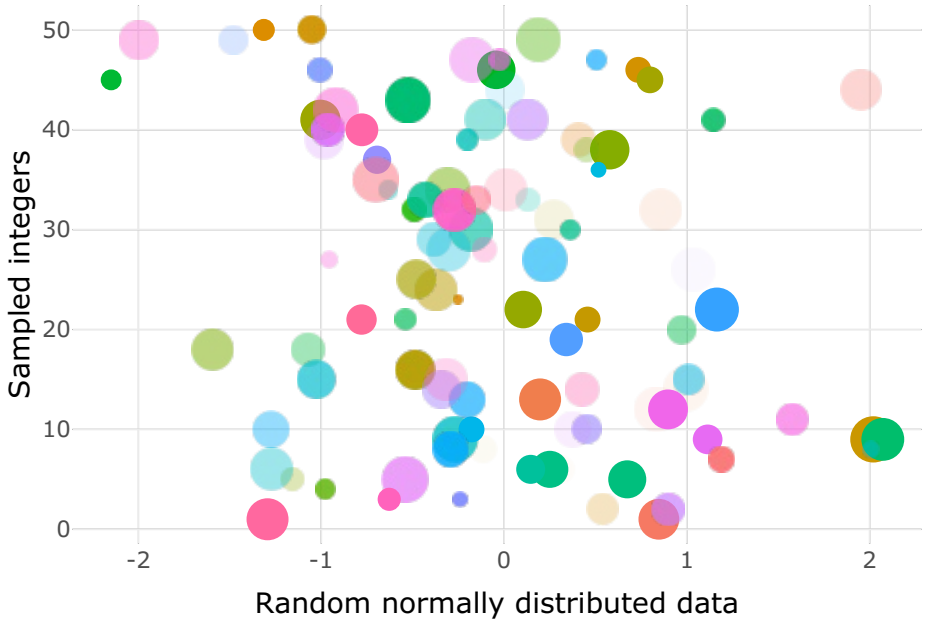
. . . . .

*Then you can add whatever you want here* like you would normally write in the `Rmd` file.

. . . . .

### Chapter 2 (with new code)

Here's an Easter egg for you ...




### More tables

Here's a new way of creating tables using the `DT` package

Show 5 entries Search:

Table 1. The 'mtcars' dataset presented in a datatable. Try editing the columns and cells.

| | mpg | cyl | disp | hp | drat | wt | qsec | vs | am | gear | carb |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | All | All | All | All | All | All | All | All | All | All | All |
| Mazda RX4 | 21 | 6 | 160 | 110 | 3.9 | 2.62 | 16.46 | 0 | 1 | 4 | 4 |
| Mazda RX4 Wag | 21 | 6 | 160 | 110 | 3.9 | 2.875 | 17.02 | 0 | 1 | 4 | 4 |
| Datsun 710 | 22.8 | 4 | 108 | 93 | 3.85 | 2.32 | 18.61 | 1 | 1 | 4 | 1 |
| Hornet 4 Drive | 21.4 | 6 | 258 | 110 | 3.08 | 3.215 | 19.44 | 1 | 0 | 3 | 1 |
| Hornet Sportabout | 18.7 | 8 | 360 | 175 | 3.15 | 3.44 | 17.02 | 0 | 0 | 3 | 2 |

Showing 1 to 5 of 32 entries Previous 1 2 3 4 5 6 7 Next

## Embed code from different languages

### This is `R` code

```r
if (pck == 1) {
    p <- c("rJava", "RNetLogo")
    remove.packages(p)
    # then install rJava and
    # RNetLogo from source
    install.packages("rJava",
        repos = "https://cran.r-project.org/")
    install.packages("RNetLogo",
        repos = "https://cran.r-project.org/")
}
```

**shell/bash**

```
echo "Hello Bash!"
pwd # check working dir
git init # initialise git
```

### Octave (and MATLAB from the `RMatlab` package).

RMatlab documentation.

```
b = [4; 9; 2] # Column vector
A = [ 3 4 5;
```

```
      1 3 1;
      3 5 9 ]
x = A \ b     # Solve the system Ax = b
```

**HTML**

```
<!-- links-->
        <div class="footer">
            <a href="dd_feed.html"
            class="transition fade_in">
                Latest post
            </a>
                 
            <a href="dd_contact.html"
            class="transition fade_in">
                Contact
            </a>
                 
            <a href="dd_subscribe.html"
            class="transition fade_in">
                Subscribe
            </a>
        </div>
```

**CSS**

```
# custom code for the tabs in this file
.btn {
    border-width: 0 0px 0px 0px;
    font-weight: normal;
    text-transform: ;
}
.btn-default {
    color: #f08080;
    background-color: #ffffff;
    border-color: #ffffff;
}
```

**Javascript to access `html` and `css`**

```
$('.title').css('color', 'red')
```

**Python**

```
x = 'hello, python world!'
print(x.split(' '))
```

**Here's a complete list of available languages**

```
names(knitr::knit_engines$get())
```

```
##  [1] "awk"
##  [2] "bash"
##  [3] "coffee"
##  [4] "gawk"
##  [5] "groovy"
##  [6] "haskell"
##  [7] "lein"
##  [8] "mysql"
##  [9] "node"
## [10] "octave"
## [11] "perl"
## [12] "psql"
## [13] "Rscript"
## [14] "ruby"
## [15] "sas"
## [16] "scala"
## [17] "sed"
## [18] "sh"
## [19] "stata"
## [20] "zsh"
## [21] "highlight"
## [22] "Rcpp"
## [23] "tikz"
## [24] "dot"
## [25] "c"
## [26] "fortran"
## [27] "fortran95"
```

```
## [28] "asy"
## [29] "cat"
## [30] "asis"
## [31] "stan"
## [32] "block"
## [33] "block2"
## [34] "js"
## [35] "css"
## [36] "sql"
## [37] "go"
## [38] "python"
## [39] "julia"
## [40] "sass"
## [41] "scss"
```

# References

[1] Efthimiades, S., Physical meaning and derivation of Schrodinger and Dirac equations, Department of Natural Sciences, Fordham University, doi: d34464566.