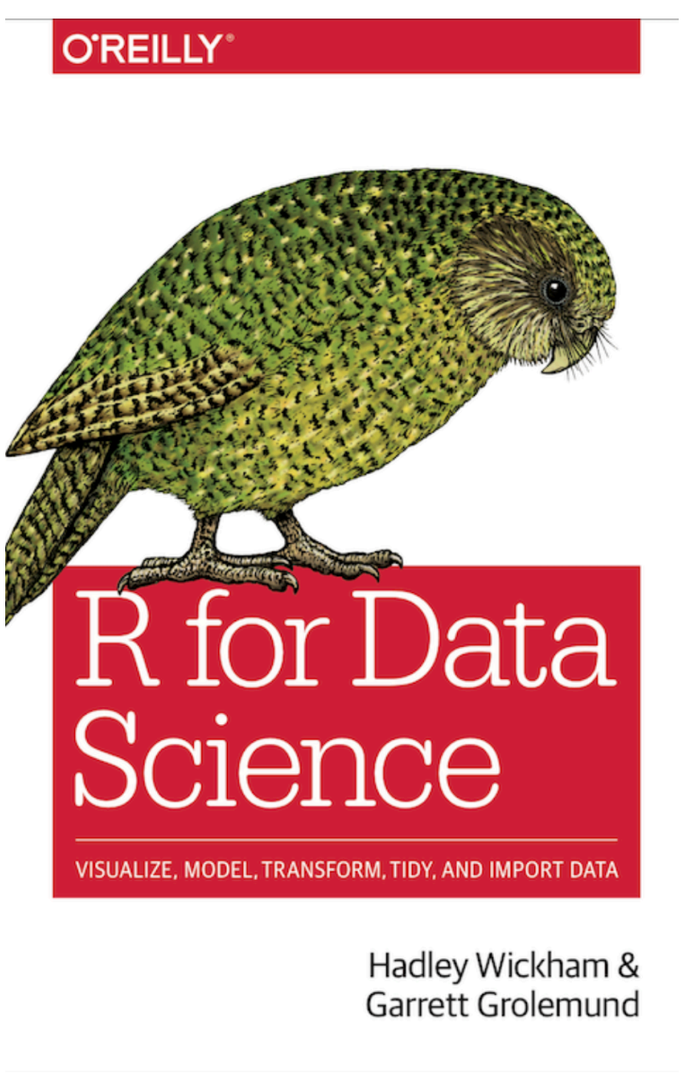
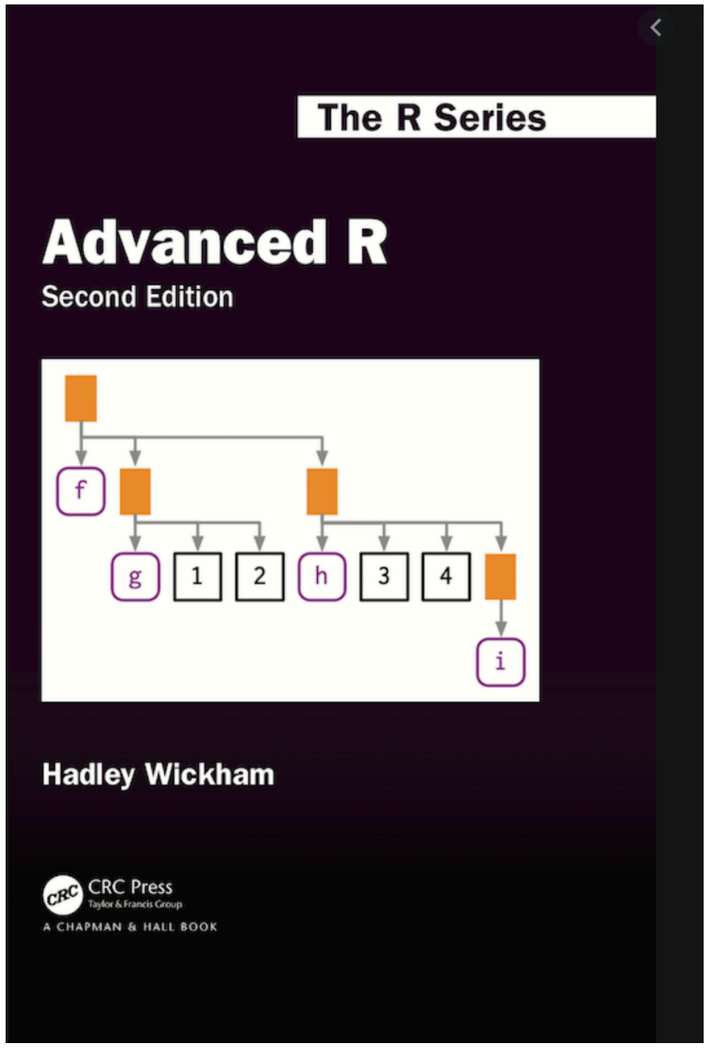
Functions


O'REILLY
R for Data Science
VISUALIZE, MODEL, TRANSFORM, TIDY, AND IMPORT DATA
Hadley Wickham &
Garrett Grolemund


The R Series
Advanced R
Second Edition
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i
Hadley Wickham
CRC Press
Taylor & Francis Group
A CHAPMAN & HALL BOOK

Outline

Function components

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Function components

body(), formals(), environment()

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Arguments

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Arguments

Intro to scoping

What is R?

R is an implementation of the S programming language, which was created 1976 by John Chambers at Bell Labs

R was created by Ross Ihaka and Robert Gentleman in 2000

Although R and S are slightly different, they share the same design principle:

> “[W]e wanted users to be able to begin in an interactive environment, where they did not consciously think of themselves as programming. Then as their needs became clearer and their sophistication increased, they should be able to slide gradually into programming, when the language and system aspects would become more important.”

R’s basic rules:

- Everything that exists is an object
- Everything that happens is a function call

Function Basics

What is a function?

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A function is an operator that takes in some objects and then returns some object

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2+2
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sum(c(1,2,3,4,5))
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```
sum(c(1,2,3,4,5))
```

```
f <- function(x) {
x^3
}
```

```
f(4)
```

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Defining a function:

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Function parts:

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Function parts:

```
formals(f)
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body(f)
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How does R see a function?

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Function Basics

Defining a function:

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f <- function(x) {
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How does R see a function?

```
str(f)
```

```
attributes(f)
```

Function parts:

```
formals(f)
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Function Basics

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sum
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`body(sum)` ⟶ `NULL`

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Ex: the `sum()` function

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body(sum) ⟶ NULL
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Ex: the `sum()` function

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body(sum) ⟶ NULL
formals(sum) ⟶ NULL
environment(sum) ⟶ NULL
```

Function Arguments

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```
ggplot(data, mapping = aes(), ..., environment = parent.frame())
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function name

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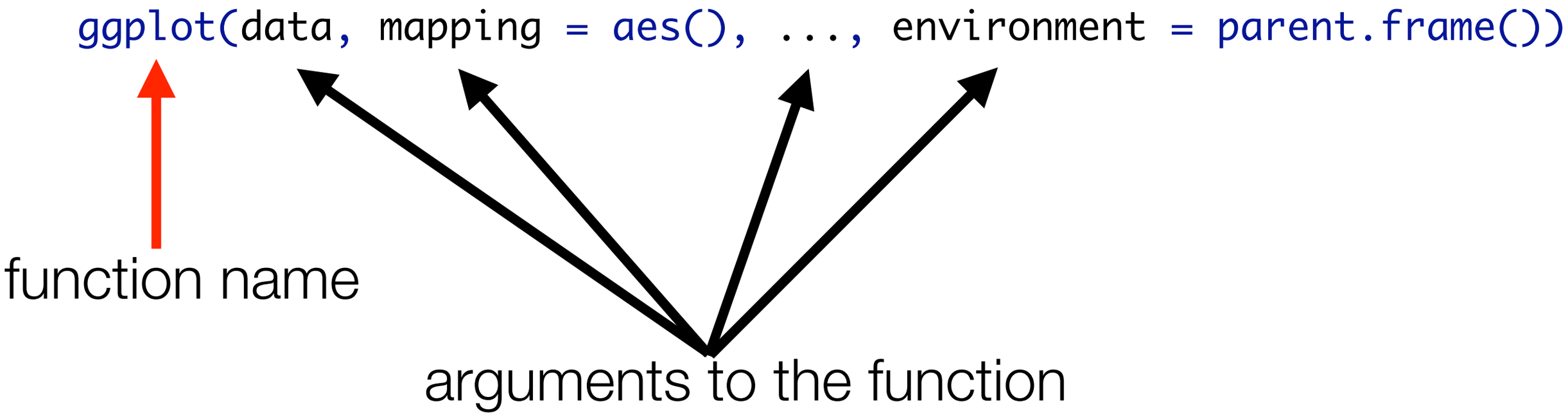

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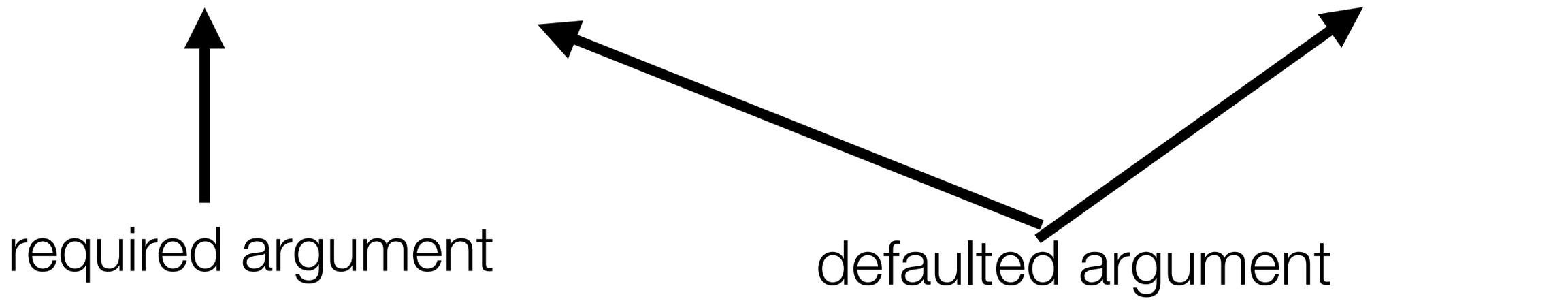

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rnorm(10)
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[1]  0.7002779  1.0693103  0.5427495  0.3072563  1.2381663
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```

n is required because there is no way of knowing how many draws you want.

mean and standard deviation are defaulted to be the standard normal distribution $N(0,1)$

Function Arguments

R documentation can help you determine which arguments are required and which ones are defaulted:

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Normal {stats} R Documentation

The Normal Distribution

Description

Density, distribution function, quantile function and random generation for the normal distribution with mean equal to `mean` and standard deviation equal to `sd`.

Usage

```
dnorm(x, mean = 0, sd = 1, log = FALSE)
pnorm(q, mean = 0, sd = 1, lower.tail = TRUE, log.p = FALSE)
qnorm(p, mean = 0, sd = 1, lower.tail = TRUE, log.p = FALSE)
rnorm(n, mean = 0, sd = 1)
```

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How are arguments matched in R?

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```
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```

```
f(0, l = 3, scale = 2)
```

```
[1] 3 2 0
```

Function Arguments

R's argument name matching rules:

1. By exact name
2. By partial name
3. By Position

```
f <- function(location, scale, shape) {
       c(location, scale, shape)
}
```

```
f(1,2,3)
```

```
[1] 1 2 3
```

```
f(scale = 1, 3, 2)
```

```
[1] 3 1 2
```

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```
[1] 105.6643
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```
sum(1,2,3,4,5,6,7,8,9,10, 15:20)
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     }
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```
f(1,2, mean = 100, sd = 5)
```

→ `[1] 105.6643`

```
sum(1,2,3,4,5,6,7,8,9,10, 15:20)
```

→ `[1] 160`

Scoping in R

Scoping defines the range of functionality for a variable

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```
x <- 5
x <- function(x) x^2
f <- function(x) x(x)
x <- function(x) x - 1
f(2)
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f(2)
```

```
[1] 1
```

lexical scoping

R has a systematic set of rules for looking up the values of variables that may be defined differently in different places

Real world analogy Problem : I need to find my keys

1. Check the room I am currently in
2. Check the room I was in last
3. Check yesterday's pants' pockets
4. Check the living room table
5. Check the dining room table
6. Getting desperate: check the kitchen
7. Desperate : check the bathroom
8. Give up: have to stay home

R has a similar searching strategy

Credit: David Kahle

Scoping in R

R's rules

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1. Look inside the function
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4. Keep going up the "ladder" until you hit the top

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fun <- function(x) {
x + y
}
```

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fun(2)
```

```
Error in fun(2) : object 'y' not found
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Error in fun(2) : object 'y' not found
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fun(2)
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```
Error in fun(2) : object 'y' not found
```

```
y <- 5

fun(2)
```

```
[1] 7
```

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`+` <- function(x,y) {
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1+2
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```

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1+2
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```
Error in 1 + 2 : I will never add again!
```

```
sum(1:2)
```

```
`+` <- function(e1, e2){
if(runif(1) < 0.1){
sum(c(e1, e2, 1))
} else {
sum(c(e1, e2))
}
}
replicate(100, 1 + 1)
```