

WEEK1

# R BASICS

# TOPICS

- Some R basics
- Dealing with R Packages

# BASIC R: IMPORTANT CONCEPTS

- "Running code" involves giving commands to R that are executed in the Console pane.
- You *can* type each line of code in the Console, but it is a much better idea to write a *draft of your code as you go* by using an R script.
- A script is just a text file that you save R code in.
- Use Cmd + Enter (Mac) or Ctrl + Enter (Windows) to run selected lines from your R script.

# BASIC R: IMPORTANT CONCEPTS

- Values are saved in *objects*, which have names.
  - Names are case-sensitive!
  - When creating objects, aim for short, meaningful names.
  - Style guides recommend names in all lowercase, with words separated by underscores (e.g., **my\_name**).
  - Valid names in R cannot start with a number or include the following special symbols: ^ ! \$ @ + - / \*
- Create new objects using the assignment operator (**<-** which will appear as **←** hereafter)

# BASIC R: IMPORTANT CONCEPTS

- You do things using operators and functions.
- Example operators: `+`, `←`
- Example functions: `c()`, `mean()`, `summary()`

# BASIC R: OPERATORS

## ASSIGNMENT OPERATORS

OPERATOR	DESCRIPTION
←	ASSIGN A VALUE TO A NAME
=	SAME BUT MORE LIMITED (DON'T USE FOR NOW)

```
my_name ← "Fernando Campos"  
my_height ← 182
```

Tip: use RStudio shortcut (⌘ + - in macOS, Alt + - in Windows)

# BASIC R: OPERATORS

## ARITHMETIC OPERATORS

OPERATOR	DESCRIPTION
+	ADDITION
-	SUBTRACTION
*	MULTIPLICATION
/	DIVISION
^	EXPONENTIATION

```
2 + 4
2 - 4
2 * 4
2 / 4
2 ^ 4
```

# BASIC R: OPERATORS

## COMPARISON OPERATORS

OPERATOR	DESCRIPTION
<	LESS THAN
<=	LESS THAN OR EQUAL TO
>	GREATER THAN
>=	GREATER THAN OR EQUAL TO
==	EXACTLY EQUAL TO
!=	NOT EQUAL TO



# BASIC R: OPERATORS

## COMPARISON OPERATORS

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# What kind of values will be returned?

2 < 4

2 >= 4

2 == 4

2 != 4

# BASIC R: OPERATORS

## LOGICAL OPERATORS

OPERATOR	DESCRIPTION
!	NOT
	OR
&	AND

```
!TRUE
```

```
TRUE | FALSE
```

```
TRUE & FALSE
```

```
(1 < 5) & (7 > 1)
```

```
my_name ← "Fernando Campos"
```

```
my_height ← 182
```

```
(my_height > 190) | (my_name == "Fernando Campos")
```

# BASIC R: IMPORTANT CONCEPTS

- R comes with many built-in functions, and packages provide additional specialized functions.
- Data that you pass into a function is called the function's argument.
- Some arguments are optional, some are required. Optional arguments have a default value if none is specified.
- Arguments have names, which you *can* (but usually should not) omit.
- Nested functions are evaluated inside to outside.

```
round(3.1415)
round(x = 3.1415, digits = 2)
round(mean(1:6), digits = 0)
```

# BASIC R: IMPORTANT CONCEPTS

- R uses *element-wise execution*
  - An operation on an object with multiple element is applied to each element in the set.
  - When both objects have multiple elements, they elements are matched up by position and the operations are applied separately to each pair.

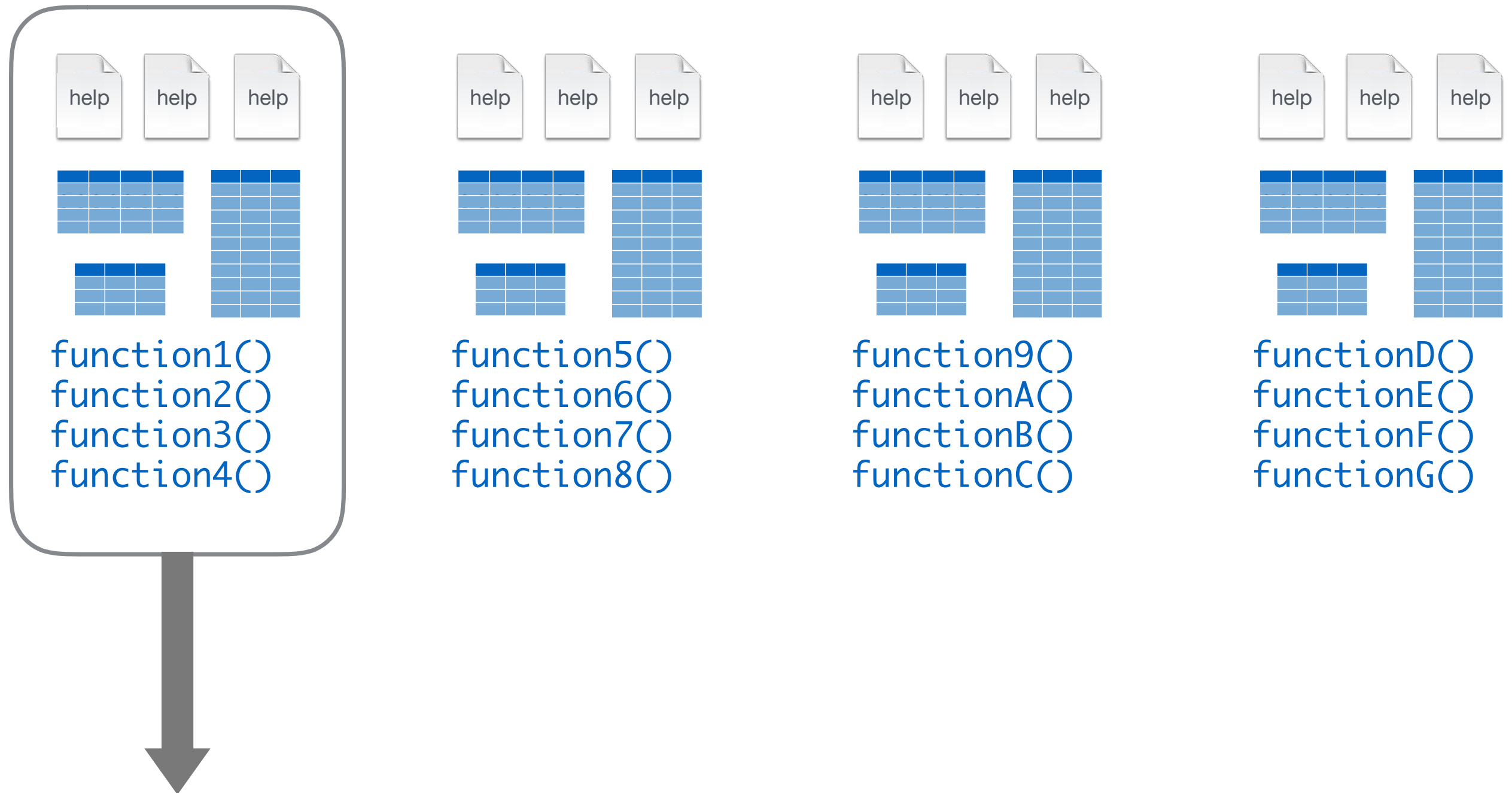
```
dice ← 1:6  
dice * 10  
dice * dice
```

# BASIC R: IMPORTANT CONCEPTS

- Comments (lines that R does not try to evaluate) start with #
- Good code includes lots of comments!
- Computers are stupid: R can't guess what you want to do. Attention to detail is important!

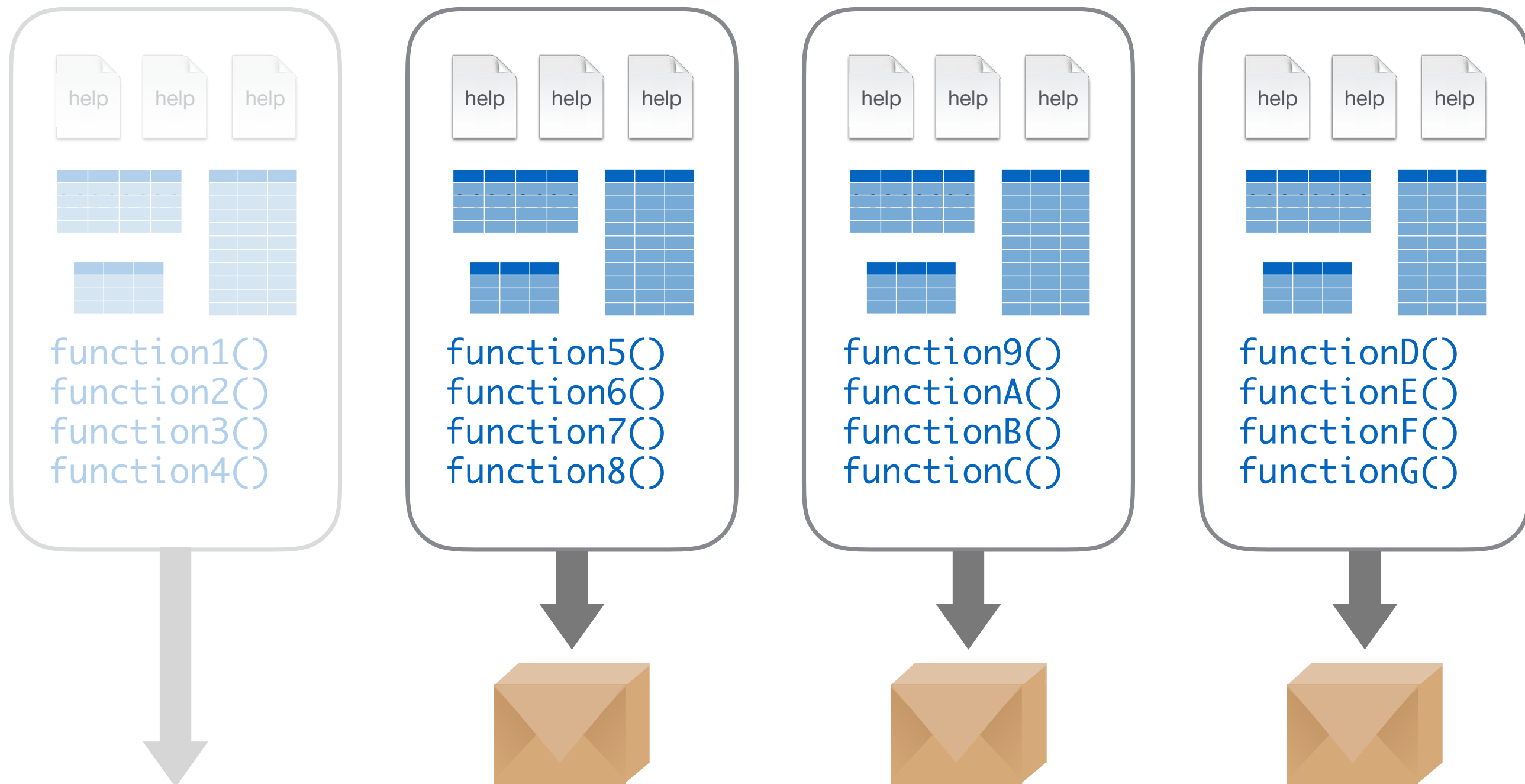
R PACKAGES

# R PACKAGES



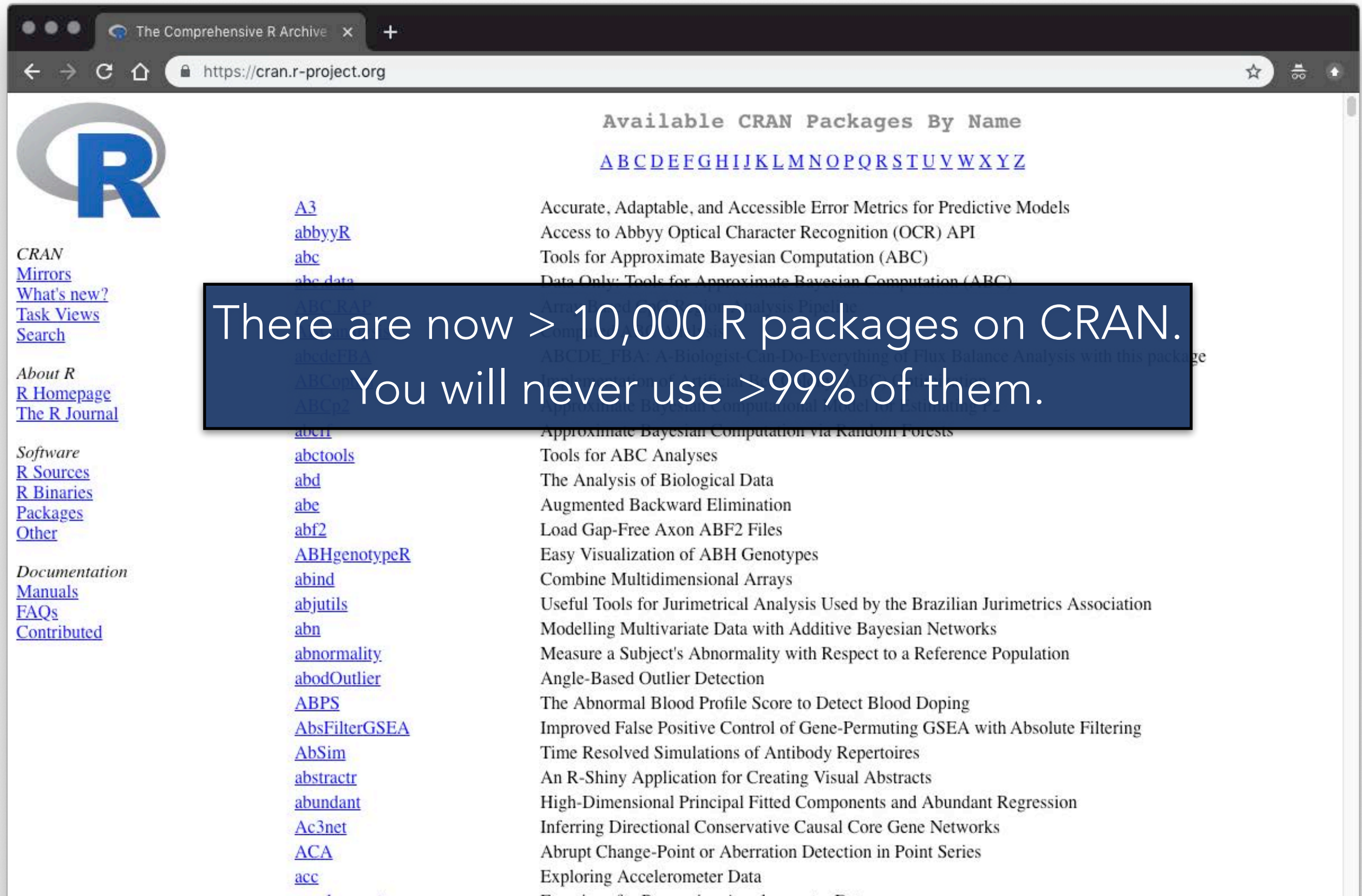
Base R

# R PACKAGES





# R PACKAGES



The screenshot shows the CRAN website with the following layout:

- Header:** "The Comprehensive R Archive" and "https://cran.r-project.org".
- Left Sidebar:**
  - CRAN logo
  - [Mirrors](#)
  - [What's new?](#)
  - [Task Views](#)
  - [Search](#)
  - [About R](#)
  - [R Homepage](#)
  - [The R Journal](#)
  - [Software](#)
  - [R Sources](#)
  - [R Binaries](#)
  - [Packages](#)
  - [Other](#)
  - [Documentation](#)
  - [Manuals](#)
  - [FAQs](#)
  - [Contributed](#)
- Main Content:**
  - Available CRAN Packages By Name**
  - ABCDEFGHIJKLMNOPQRSTUVWXYZ**
  - A3**: Accurate, Adaptable, and Accessible Error Metrics for Predictive Models
  - abbyyR**: Access to Abbyy Optical Character Recognition (OCR) API
  - abc**: Tools for Approximate Bayesian Computation (ABC)
  - abc.data**: Data Only: Tools for Approximate Bayesian Computation (ABC)
  - ABCRAP**: Array-Based R Analysis Pipeline
  - ABCD\_FBA**: A-Biologist-Can-Do-Everything of Flux Balance Analysis with this package
  - ABCo**: Approximate Bayesian Computation via Random Forests
  - ABCo2**: Tools for ABC Analyses
  - abcl**: The Analysis of Biological Data
  - abctools**: Augmented Backward Elimination
  - abd**: Load Gap-Free Axon ABF2 Files
  - abe**: Easy Visualization of ABH Genotypes
  - abf2**: Combine Multidimensional Arrays
  - ABHgenotypeR**: Useful Tools for Jurimetrical Analysis Used by the Brazilian Jurimetrics Association
  - abind**: Modelling Multivariate Data with Additive Bayesian Networks
  - abjutils**: Measure a Subject's Abnormality with Respect to a Reference Population
  - abn**: Angle-Based Outlier Detection
  - abnormality**: The Abnormal Blood Profile Score to Detect Blood Doping
  - abodOutlier**: Improved False Positive Control of Gene-Permuting GSEA with Absolute Filtering
  - ABPS**: Time Resolved Simulations of Antibody Repertoires
  - AbsFilterGSEA**: An R-Shiny Application for Creating Visual Abstracts
  - AbSim**: High-Dimensional Principal Fitted Components and Abundant Regression
  - abstractr**: Inferring Directional Conservative Causal Core Gene Networks
  - abundant**: Abrupt Change-Point or Aberration Detection in Point Series
  - Ac3net**: Exploring Accelerometer Data
  - ACA**
  - acc**

# USING PACKAGES

**1**

```
install.packages("foo")
```

Downloads files to computer

**1 x per computer**

**2**

```
library("foo")
```

Loads package

**1 x per R Session**