

# Packages

# Are you struggling?

How people think programming looks



How it really looks 90% of the time



# Plan for today

- Brief recap
- **Packages**

# Recap of using variables

- Most of the time, we want to do more than add, subtract, multiply etc.
- We want to act on our variables. We do this with operators & **functions**
  - *Each function* has a unique name
  - *Each function* requires some input, and the function can be modified using arguments
  - *Each function* will produce an output
- Remember:
  - objects are *nouns*
  - functions & operators are *verbs*
  - arguments are *adverbs*

# Recap of using variables

Where do you find functions?

- Some exist in R by default
  - `t.test()`
  - `cor()`
  - `scale()`

Lots of people all over the world write their own functions. And they (rightly!) think it's useful to share these functions.





















# Packages

What is a **package**?


- A collection of functions and datasets
- Open source


Packages are the reason R is so powerful!


- While you can definitely write your own functions, most of what you need to do someone else has already done for you!


Files Plots <b>Packages</b> Help Viewer				
<div>  Install            Update            Packrat           <input type="text"/>  </div>				
Name	Description	Ver...		
<b>System Library</b>				
<input type="checkbox"/> <a href="#">abind</a>	Combine Multidimensional Arrays	1.4-5		
<input type="checkbox"/> <a href="#">acepack</a>	ACE and AVAS for Selecting Multiple Regression Transformations	1.4.1		
<input type="checkbox"/> <a href="#">arm</a>	Data Analysis Using Regression and Multilevel/Hierarchical Models	1.11-1		
<input type="checkbox"/> <a href="#">AsioHea...</a>	'Asio' C++ Header Files	1.12.2-1		
<input type="checkbox"/> <a href="#">askpass</a>	Safe Password Entry for R, Git, and SSH	1.1		
<input type="checkbox"/> <a href="#">assertthat</a>	Easy Pre and Post Assertions	0.2.1		
<input type="checkbox"/> <a href="#">backports</a>	Reimplementations of Functions Introduced Since R-3.0.0	1.1.6		
<input checked="" type="checkbox"/> <a href="#">base</a>	The R Base Package	4.0.0		
<input type="checkbox"/> <a href="#">base64...</a>	Tools for base64 encoding	0.1-3		

















Files | Plots | Packages | Help | Viewer

 Install





















 Update





















 Packrat























	Name	Description	Ver...		
<b>System Library</b>					
<input type="checkbox"/>	abind	Combine Multidimensional Arrays	1.4-5		
<input type="checkbox"/>	acepack	ACE and AVAS for Selecting Multiple Regression Transformations	1.4.1		
<input type="checkbox"/>	arm	Data Analysis Using Regression and Multilevel/Hierarchical Models	1.11-1		
<input type="checkbox"/>	AsioHea...	'Asio' C++ Header Files	1.12.21		
<input type="checkbox"/>	askpass	Safe Password Entry for R, Git, and SSH	1.1		
<input type="checkbox"/>	assertthat	Easy Pre and Post Assertions	0.2.1		
<input type="checkbox"/>	backports	Reimplementations of Functions Introduced Since R-3.0.0	1.1.6		
<input checked="" type="checkbox"/>	base	The R Base Package	4.0.0		
<input type="checkbox"/>	base64...	Tools for base64 encoding	0.1-3		






















Files	Plots	Packages	Help	Viewer		
 Install	 Update	 Packrat	<input type="text" value=""/>			
	Name	Description	Ver...			
<b>System Library</b>						
<input type="checkbox"/>	abind	Combine Multidimensional Arrays	1.4-5			
<input type="checkbox"/>	acepack	ACE and AVAS for Selecting Multiple Regression Transformations	1.4.1			
<input type="checkbox"/>	arm	Data Analysis Using Regression and Multilevel/Hierarchical Models	1.11-1			
<input type="checkbox"/>	AsioHea...	'Asio' C++ Header Files	1.12.21			
<input type="checkbox"/>	askpass	Safe Password Entry for R, Git, and SSH	1.1			
<input type="checkbox"/>	assertthat	Easy Pre and Post Assertions	0.2.1			
<input type="checkbox"/>	backports	Reimplementations of Functions Introduced Since R-3.0.0	1.1.6			
<input checked="" type="checkbox"/>	base	The R Base Package	4.0.0			
<input type="checkbox"/>	base64...	Tools for base64 encoding	0.1-3			





















Files	Plots	Packages	Help	Viewer		
 Install	 Update	 Packrat	<input type="text"/>			
Name	Description	Ver...				
<b>System Library</b>						
<input type="checkbox"/> <a href="#">abind</a>	Combine Multidimensional Arrays	1.4-5				
<input type="checkbox"/> <a href="#">acepack</a>	ACE and AVAS for Selecting Multiple Regression Transformations	1.4.1				
<input type="checkbox"/> <a href="#">arm</a>	Data Analysis Using Regression and Multilevel/Hierarchical Models	1.11-1				
<input type="checkbox"/> <a href="#">AsioHea...</a>	'Asio' C++ Header Files	1.12.2-1				
<input type="checkbox"/> <a href="#">askpass</a>	Safe Password Entry for R, Git, and SSH	1.1				
<input type="checkbox"/> <a href="#">assertthat</a>	Easy Pre and Post Assertions	0.2.1				
<input type="checkbox"/> <a href="#">backports</a>	Reimplementations of Functions Introduced Since R-3.0.0	1.1.6				
<input checked="" type="checkbox"/> <a href="#">base</a>	The R Base Package	4.0.0				
<input type="checkbox"/> <a href="#">base64...</a>	Tools for base64 encoding	0.1-3				





















Files	Plots	Packages	Help	Viewer			
 Install	 Update	 Packrat	<input type="text"/>				
Name		Description	Ver...				
<b>System Library</b>							
<input type="checkbox"/>	abind	Combine Multidimensional Arrays	1.4-5				
<input type="checkbox"/>	acepack	ACE and AVAS for Selecting Multiple Regression Transformations	1.4.1				
<input type="checkbox"/>	arm	Data Analysis Using Regression and Multilevel/Hierarchical Models	1.11-1				
<input type="checkbox"/>	AsioHea...	'Asio' C++ Header Files	1.12.2-1				
<input type="checkbox"/>	askpass	Safe Password Entry for R, Git, and SSH	1.1				
<input type="checkbox"/>	assertthat	Easy Pre and Post Assertions	0.2.1				
<input type="checkbox"/>	backports	Reimplementations of Functions Introduced Since R-3.0.0	1.1.6				
<input checked="" type="checkbox"/>	base	The R Base Package	4.0.0				
<input type="checkbox"/>	base64...	Tools for base64 encoding	0.1-3				

Files Plots Packages Help Viewer

 Install  Update  Packrat

	Name	Description	Ver...		
<b>System Library</b>					
<input type="checkbox"/>	abind	Combine Multidimensional Arrays	1.4-5		
<input type="checkbox"/>	acepack	ACE and AVAS for Selecting Multiple Regression Transformations	1.4.1		
<input type="checkbox"/>	arm	Data Analysis Using Regression and Multilevel/Hierarchical Models	1.11-1		
<input type="checkbox"/>	AsioHea...	'Asio' C++ Header Files	1.12.2-1		
<input type="checkbox"/>	askpass	Safe Password Entry for R, Git, and SSH	1.1		
<input type="checkbox"/>	assertthat	Easy Pre and Post Assertions	0.2.1		
<input type="checkbox"/>	backports	Reimplementations of Functions Introduced Since R-3.0.0	1.1.6		
<input checked="" type="checkbox"/>	base	The R Base Package	4.0.0		
<input type="checkbox"/>	base64...	Tools for base64 encoding	0.1-3		

Files	Plots	Packages	Help	Viewer		
 Install	 Update	 Packrat	<input type="text"/>			
Name	Description	Ver...				
<b>System Library</b>						
<input type="checkbox"/> <a href="#">abind</a>	Combine Multidimensional Arrays	1.4-5				
<input type="checkbox"/> <a href="#">acepack</a>	ACE and AVAS for Selecting Multiple Regression Transformations	1.4.1				
<input type="checkbox"/> <a href="#">arm</a>	Data Analysis Using Regression and Multilevel/Hierarchical Models	1.11-1				
<input type="checkbox"/> <a href="#">AsioHea...</a>	'Asio' C++ Header Files	1.12.21				
<input type="checkbox"/> <a href="#">askpass</a>	Safe Password Entry for R, Git, and SSH	1.1				
<input type="checkbox"/> <a href="#">assertthat</a>	Easy Pre and Post Assertions	0.2.1				
<input type="checkbox"/> <a href="#">backports</a>	Reimplementations of Functions Introduced Since R-3.0.0	1.1.6				
<input checked="" type="checkbox"/> <a href="#">base</a>	The R Base Package	4.0.0				
<input type="checkbox"/> <a href="#">base64...</a>	Tools for base64 encoding	0.1-3				

Files	Plots	Packages	Help	Viewer			
 Install	 Update	 Packrat	<input type="text"/>				
	Name	Description	Ver...				
<b>System Library</b>							
<input type="checkbox"/>	abind	Combine Multidimensional Arrays	1.4-5				
<input type="checkbox"/>	acepack	ACE and AVAS for Selecting Multiple Regression Transformations	1.4.1				
<input type="checkbox"/>	arm	Data Analysis Using Regression and Multilevel/Hierarchical Models	1.11-1				
<input type="checkbox"/>	AsioHea...	'Asio' C++ Header Files	1.12.2-1				
<input type="checkbox"/>	askpass	Safe Password Entry for R, Git, and SSH	1.1				
<input type="checkbox"/>	assertthat	Easy Pre and Post Assertions	0.2.1				
<input type="checkbox"/>	backports	Reimplementations of Functions Introduced Since R-3.0.0	1.1.6				
<input checked="" type="checkbox"/>	base	The R Base Package	4.0.0				
<input type="checkbox"/>	base64...	Tools for base64 encoding	0.1-3				

# How do I get packages?

Packages can be downloaded from the *CRAN* (Comprehensive *R* Archive Network)

You will do this from inside [R](#)

**Need to be connected to the internet!**

# 2 ways to install packages

1. Install button in the Packages tab
2. R Code

*Either way, you need to know the name of the package*



# Install Button

Install Packages

Install from: [? Configuring Repositories](#)

Repository (CRAN)

Packages (separate multiple with space or comma):

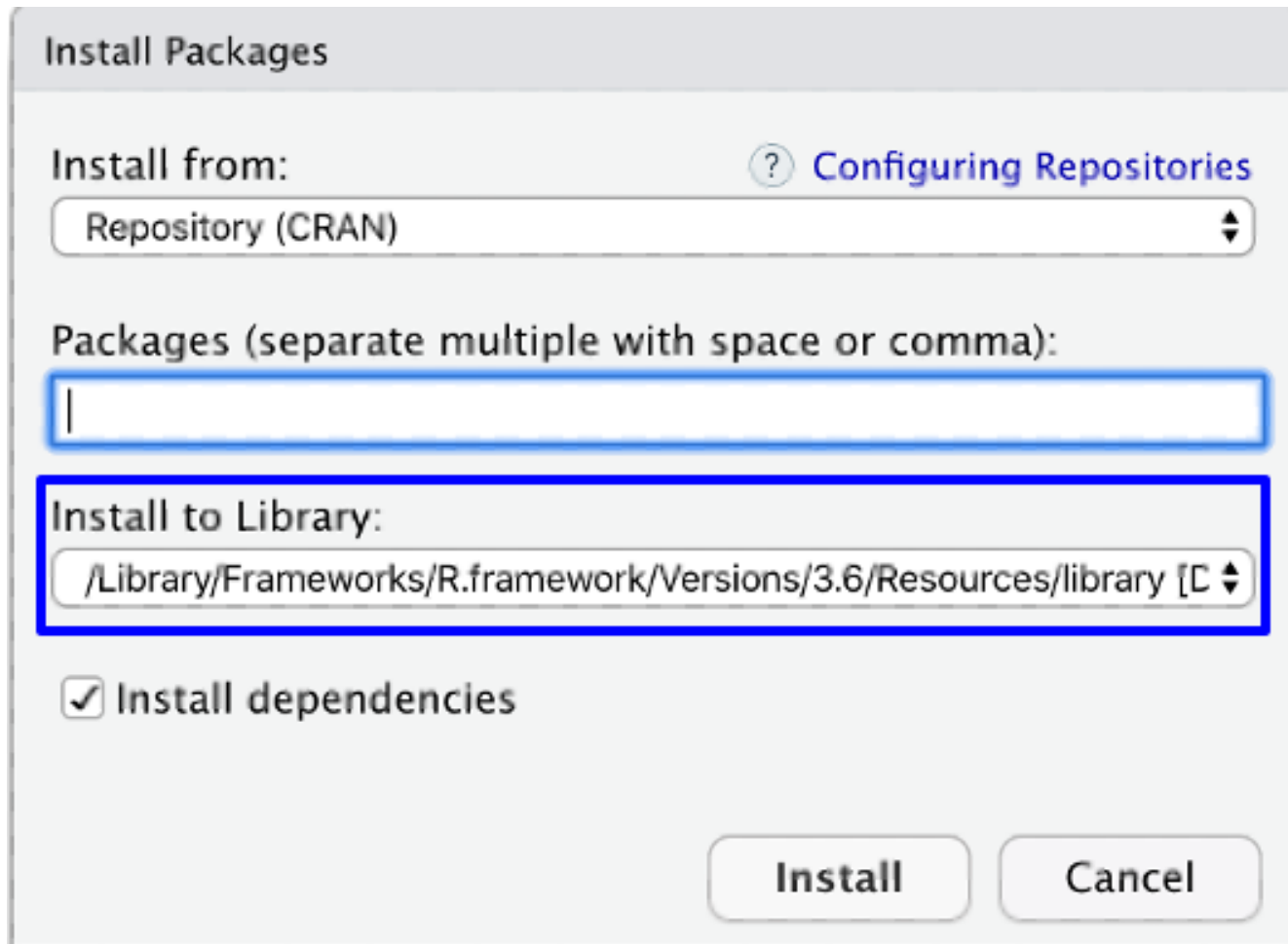
Install to Library:

/Library/Frameworks/R.framework/Versions/3.6/Resources/library [C]

☒ Install dependencies

Install Cancel

# Install Button



The image shows the 'Install Packages' dialog box in RStudio. It has a title bar 'Install Packages'. Below it, the 'Install from:' section shows a dropdown menu set to 'Repository (CRAN)' with a help icon and a link to 'Configuring Repositories'. The 'Packages (separate multiple with space or comma):' section has an empty text input field. The 'Install to Library:' section has a text input field showing the default R library path, which is highlighted with a blue border. At the bottom, there is a checked checkbox for 'Install dependencies' and two buttons: 'Install' and 'Cancel'.

Install Packages

Install from: [? Configuring Repositories](#)

Repository (CRAN)

Packages (separate multiple with space or comma):

Install to Library:

/Library/Frameworks/R.framework/Versions/3.6/Resources/library [C]

☒ Install dependencies

Install Cancel

# Install Button



The image shows the 'Install Packages' dialog box in RStudio. It has a title bar 'Install Packages'. Below it, the 'Install from:' section shows a dropdown menu set to 'Repository (CRAN)' with a help icon and a link to 'Configuring Repositories'. The 'Packages (separate multiple with space or comma):' section has an empty text input field. The 'Install to Library:' section shows a text input field with the default path: '/Library/Frameworks/R.framework/Versions/3.6/Resources/library'. At the bottom, there is a checked checkbox labeled 'Install dependencies' and two buttons: 'Install' and 'Cancel'. The 'Install dependencies' checkbox and the 'Install' button are highlighted with blue rectangles.

Install Packages

Install from: [? Configuring Repositories](#)

Repository (CRAN)

Packages (separate multiple with space or comma):

Install to Library:

/Library/Frameworks/R.framework/Versions/3.6/Resources/library [C]

☒ Install dependencies

Install Cancel

# R code to install packages

```
install.packages("psych")
```

# Packages

## INSTALLING

- Downloading the package and saving it to your computer
- Like installing Microsoft Word on your computer
- Do this **ONCE**

## LOADING

- Like opening Microsoft Word to write a paper
- Once a package is loaded, you can use all of it's functions and datasets are ready to use
- You need to do this **EVERY TIME** you open a new **R** session

# 2 ways to load packages

1. Checkbox in the packages tab (not recommended)
2. R code

*Either way, you need to know the name of the package*

# R code to load packages

```
library(psych)
```

# Dependencies

```
> library(lme4)  
Loading required package: Matrix  
Loading required package: Rcpp
```

Uses functions from other packages

Installed automatically

Loaded automatically



# Help! (again)

Ways to find documentation:

`?psych` -- opens documentation specific to that package or function

`??psych` -- searches for this in all documentation (that you have installed and loaded)

To find a package that does what you need: **Google**

# Summary

Packages are a collection of functions and data sets

1. You **install** the package once; must be connected to the internet
2. You **load** the package every time you use it; do not need to be connected to the internet

How do you find the function you need? How do you now what package it's in?

- **G-o-o-g-l-e!**
- "structural equation modeling in R"

How do you know how to use the function? What are the function's arguments?

- Help documentation in R
- **? function.name**